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Table of Contents

Determining the Most Appropriate Hotel with Multi-Criteria Decision Making Techniques: The Example of Mersin Province.....	1
Mete Sezgin, Simge Tokay.....	1
Wireless Energy Consumption Tracking on Adhoc Network.....	12
Rohan Stanley, Ananya Iyer, Rohit B. Chaurasiya.....	12
Variation In Mean Heart Dose By Treatment Plan Optimization During Radiotherapy For Left Sided Breast Cancer.....	18
Rohini Khurana, Akshyaya Pradhan, Sandip Barik, Kamal Sahni.....	18
Attitude and Nursing Care Practices among primary care nurses before and after Structured Nursing Care Rounds.....	27
Sr.Lilly Joseph (Lillykutty M.J) , Dr.Rebecca Samson.....	27
Bibliometric analysis of “IEEE Transactions on Electromagnetic Compatibility”: 2010-2015.....	31
Mrs. Supriya A. Bejalwar.....	31
Solution of Partial Differential Equations with Variables Coefficients Using Double Sumudu Transform.....	37
Mukhtar Osman, Mohammed Ali Bashir.....	37
Descriptive evaluation of ureteric urolithiasis between genders.....	47
AUB Pethiyagoda, K Pethiyagoda.....	47
Factors Affecting Career Track and Strand Choices of Grade 9 Students in the Division of Antipolo and Rizal, Philippines.....	51
Juan O. Abarro.....	51
Contemporary Bollywood Dance: Analyzing It through the Interplay of Social Forces.....	54
Esha Bhattacharya Chatterjee.....	54
Manufacturing of Concrete Paving Block by Using Waste Glass Material.....	61
Koli Nishikant, Aiwale Nachikat, Inamdar Avadhut, Sanger Abhishek.....	61
Development and Validation of a Computer Aided Instructional Material in Selected Topics in Elementary Algebra.....	78
Vivian F. Abarro.....	78
A legitimate tax plan that minimizes a multinational technology company’s taxes.....	81
Caesar K. Simpson.....	81
Importance of Education in Religious Teachings and the Role of Religious Leaders in its Promotion for all.....	89
Nasir Ateeq.....	89

LOW COST LINE FOLLOWER OBSTACLE DETECTOR AND DTMF TONE ROBOT.....	92
ARNAV KUMAR, HARSH SINHA, UROOJ REHMAN, Prof. P.D.YADAV.....	92
Pervaporation Separation of Water-Isopropanol mixtures using Halloysite nanoclay (HNC) incorporated in the Poly (Vinyl alcohol) Membranes.....	101
U. Sajankumar ji Rao, K.Sreenivasulu, Y.Maruthi, P. Kumara Babu, G.Nagarjuna M.C.S.Subha, K. Chowdoji Rao.....	101
Soil Quality Indicators and Microbial Development in Organic and Conventionally Farmed Paddy Wetlands Ecosystem in Kerala – India.....	112
Akhilesh Vijay and S. Bijoy Nandan.....	112
Estimate some of the aerodynamic characteristics of urban areas by using wind tunnel.....	118
Aqeel Ghazi Mutar.....	118
Antecedents to Employee Engagement: A Qualitative Study of 28 Senior Secondary School Teachers in Nigeria.....	128
Oluwole A. Shokunbi.....	128
Application of Geographical Information System Techniques in Urban Flood Risk Assessment and Vulnerability Mapping.....	136
Ismail Usman Kaoje.....	136
Factors Affecting the Net Interest Margin of Commercial Bank of Ethiopia.....	150
Fentaw Leykun.....	150
‘Manufacturing Emotion’: a study of the Emotion Work performed & Burnout experienced by Managers from a few selected manufacturing companies in India.....	162
Ambreen Grewal Virk- SPHR, Prof. (Dr.)Meenakshi Malhotra.....	162
Roman Domination Number of a Graph.....	172
Mallikarjun B Kattimani and N C Hemalatha.....	172
Structural study and comparison of properties of hybrid green composites.....	174
Muhammad Faizan Munir, Qazi Siddique Akbar, Junaid Niaz, Dr. Yasir Nawab, Abdul Moqet Hai, Khubaib Shakir,Muhammd Umair	174
A Novel Image Thinning Method for Signature Recognition System.....	196
Soumya S Thulasi, Jyothi R L.....	196
Histogram Based Connected Component Analysis for Character Segmentation.....	200
Shilpa C Vijayan, Jyothy R.L,Anilkumar A.....	200
Physicochemical, microbiological and sensory properties of probiotic drinking yoghurt developed with goat milk.....	203
GGAP Gamage, AMJB Adikari, WAD Nayananjalie, PHP Prasanna, NWIA Jayawardena, and RHGR Wathsala.....	203

A Conceptual Framework of the Implementation of E-Learning in University of Business and Technology (UBT).....	209
Abdelrahim.M.Zabadi & Amnah H. A. Dammas.....	209
Ethnobotanical survey of Medicinal Plants used as Hepatoprotective in Imphal east and west district of Manipur, India.....	217
Anita Devi Thokchom, Sanjoy Singh Ningthoujam, Anupam Das Talukdar, Brajakishore Singh Chingakham, Manabendra Dutta Choudhury, Kumar Singh Potsangbam, Guru Aribam Shantibala Devi.....	217
Social Justice in the Public Sector: The Sierra Leone Police in Focus.....	225
Turad Senesie.....	225
An empirical investigation of the Human Resources Nexus to Frauds in the Nigerian Banking Sector.....	231
IBOR, Bassey Ina.....	231
Strategic Planning Practices for Improved Organizational Performance: A Case of MP Shah Hospital, Nairobi.....	248
Faith Mueni Ngao, Ben O. Osuga.....	248
Test for Fixing a Humangroup During Deportation: Case of Matsouanistes Ofdjambala.....	254
Dr. Dominique OBA.....	254
Utilization of Service Charters in Public Hospitals in Kenya: A Case of Thika Level 5 Hospital, Kiambu County.....	258
Charles OnyambuMasee, Wanja Mwaura-Tenambergen and Lillian Muiruri.....	258
Growth and Characterization of CdS Thin Films by Chemical Bath Deposition.....	264
Dilip Maske.....	264
Effect Thickness of Frontal Member in Frontal Crash.....	267
Mr. Sandeep Dokhale, Associate Prof. Bhaskar Borkar.....	267
Solar Powered Reciprocating Pump.....	274
Dave Umang Y., Nena Vivek, Thakor Nirmal, Parmar Krunal.....	274
Enhancement of Data Security on Transmission Network Using Fuzzy Logic.....	279
Onwughalu, M.K, Ogwata, C.M.....	279
Assessment on factors controlling nutrient dynamics in a small tropical river using multivariate analysis.....	282
Prince George and Sabu Joseph.....	282
A Single Image Haze Removal Algorithm Using Color Attenuation Prior.....	291
Manjunath.V, Revanasiddappa Phatate.....	291
Core Syllabus for OJI Promise (POCO).....	298
Oji, Promise Chukwuma.....	298

Bacteriological Analysis of Salad Vegetable in Eke Awka Market, Anambra State, Nigeria.....	305
Oji, Promise Chukwuma.....	305
Effect of yield, quality attributes and cost of rice (<i>Oryza sativa</i> L.) variety under System of rice intensification (SRI) Organic & Conventional methods of rice cultivation.....	313
Shivkant Shukla, Joanna Bloese, Tapan Ray.....	313
Social Injustice from the Presence of the Bauxite Mining Companies. Study in Tayan Hilir, Sanggau District.....	317
Fatmawati.....	317
Functional Analysis of Clause Complex in the Language of News Websites Texts: A Comparative Study of Two Articles.....	323
Mr. Fahd Mohammed Sagheer Eid.....	323
Office Design and its impact on employees' productivity: Evidence from Islamic Banks of Karachi.....	335
Muhammad Faisal Sultan, Muhammad Raghif Zafar, Anila.....	335
Rural Tourism and Sustainable Livelihoods, A Case Study of Majuli Island of Assam.....	343
Bikash Hazarika.....	343
The Effect of Financial Management on Financial Performance of the Presbyterian Church Guest Houses in Rwanda.....	346
Madeleine Nyirabageni, Kule Julius Waren, Peter Mbabazi.....	346
New meaning for old knowledge- Reinvigorating Participatory Approaches to Conservation and Sustainable Management of Biodiversity and Ecosystem Services.....	358
Ms. Preeti Singh, Unnikrishnan Payyappalli.....	358
Impact of Emotional Intelligence, Nature of Course and Gender on Problem Focused Coping Style among College Students.....	369
Dr.K.Subramanyam & R.Srinivasa Rao.....	369
Implementation of Student Safety System Using RFID.....	373
Aye Su Mon Kyaw, Chaw Myat Nwe, Hla Myo Tun.....	373
SMEs Policies and Challenges: A Comparative Analysis of Zimbabwe and South Korea.....	377
Tasara Majoni, Jephias Matunhu, Billiat Chaderopa.....	377
Optimal Linear Control of an Energy Harvesting System.....	385
Ukoima Kelvin Nkalo.....	385
Characterization and Classification of Soils of Aba-Midan Sub Watershed in Bambasi Wereda, West Ethiopia.....	390
Daniel Adhanom, Tefera Toshome.....	390
The Impact of Small Scale Irrigation on Household Income in Bambasi Woreda, Benishangul-Gumuz Region, Ethiopia.....	400
Mr. Tsegazeab Gebremariam Yihdego, Dr. Surajit Ghosal.....	400

Research Capabilities of Public Secondary and Elementary School Teachers in the Division of Antipolo City.....	407
Abarro, Juan O., Mariño, Wilfredo P.....	407
Phytochemical screening and Thin layer chromatographic identification of Terpenoids from the root extract of <i>Achyranthes aspera</i> l.- An Indian Ethanomedicine.....	411
Asmita Singh, .Manisha Mathur, Ajay kumar, Gajendra Pal Singh.....	411
Development of MRI Brain Image Segmentation- technique with Pixel Connectivity.....	415
S. Abdalla and N. Al-Aama, Maryam A. Al-Ghamdi.....	415
Economic Role of Women in Ancient Kashmiri Society.....	430
zuha qadir.....	430
A Night of a Thousand Laughs: A Pragmatic Study of Humour in Nigeria.....	433
Oyebola Folajimi Kehinde.....	433
PERFORMANCE APPRAISAL USING BASIC T-NORMS BY SOFTWARE FUZZY ALGORITHM.....	434
Dr. G.Nirmala, G.Suvitha.....	434
Error Analysis in the Use of Simplex Method in Determining the Optimal Solution in Linear Programming.....	442
Mary Loreen V. Cayabyab.....	442
A Study on different types of Super plasticiser used for Self Compacting Geo-polymer Concrete.....	446
Parth Dharmeshkumar Parikh.....	446
Edge Detection Through Integrated Morphological Gradient and Type 2 Fuzzy Systems.....	450
Priyanka Thakur, Dr.Arshia Azam.....	450
Academic Achievement and LET Performance of the Bachelor of Elementary Education Graduates, University of Northern Philippines.....	455
Glenda Chan-Rabanal.....	455
The Effects of Hagiazo Chi Alpha Campus Ministry in the Lives of Its Members.....	462
Peter R. Rabanal, Glenda Chan-Rabanal.....	462
Phytochemical based pesticides as Grain Protectants.....	468
Dr. Vandana Singh.....	468
PERFORMANCE TEST ON VAPOUR COMPRESSION REFRIGERATION SYSTEM USING R290 & R134a MIXTURE.....	470
Vicknesh.K.....	470
A step-wedge simple randomized trial to assess the use of Case Managers to Increase Linkage to HIV Care and Early retention of Newly Diagnosed HIV-positive Persons at a regional Referral Hospital in W.....	477
Burmen B, Mutai K.....	477

Single Axis Solar Tracking System using Microcontroller (ATmega328) and Servo Motor.....	486
Krishanu Das, Hridi Ghosh, Maitrayee Sengupta.....	486
Impact of Organizational Justice and Perceived Creative Performance Mediating role of Employee Innovative Behavior.....	490
Muhammad Salman, Mula Nazar Khan , Uzair Mufti, Fahad Islam, Arslan Aslam.....	490
Rainfall variation on the windward and leeward side of the Central Highland of Sri Lanka.....	496
K.W.G. Rekha Nianthi.....	496
The Teaching of Professional Education Subjects in University of Rizal System, Philippines.....	501
Juan O. Abarro.....	501
A Study on Compliance with the Two-Thirds Gender Rule in Appointments and Promotions of Staff in Public Universities Elevated In 2012 And 2013.....	506
Samuel K. Gitaka, Professor Clifford G. Machogu.....	506
Isolation and identification of antagonistic Lactobacillus acidophilus from curd.....	514
Abhinav Pathak, Nimisha Dutta.....	514
Matrix Representations of Intuitionistic Fuzzy Graphs.....	520
M.G.Karunambigai,O.K.Kalaivani.....	520
Motivation, Satisfaction and Difficulty Encountered by Higher Education Institution in Manila Graduate Students in Pursuing Graduate Studies.....	538
Prof. Thelma DS. Cruz, Dr. E. Jean DR. Ramirez.....	538
Evaluation of Consumers' Satisfaction towards Rural Primary Health Care Services in Babylon Governorate.....	548
Mohammed M. Radhi, Mohammed F. Khalifa.....	548
A Theoretical Framework for Enhanced Forecasting of Electrical Loads.....	554
A.E. Okoye and T.C. Madueme.....	554
Utilization of WRF-Chem Modelling for Barujari Mount of Volcanic Ash Distribution Analysis.....	561
Pande Putu Hadi Wiguna, Kadek Setiya Wati, Fajar Setiawan.....	561
Decadal Pattern of Female Main and Marginal Worker Participation in India: A Spatial Evaluation.....	567
Ankita Borbora.....	567
A Study on Effectiveness of the Internal Control System in the Private Banks of Trincomalee.....	600
Mrs.S.Kumuthinidevi.....	600
Facial Expression Recognition System for Autistic Children in Virtual Reality Environment.....	613
Udayakumar.N.....	613

IMPACT OF WORLD BANK, INTERNATIONAL DEVELOPMENT ASSOCIATION AND INTERNATIONAL FINANCE CORPORATION ON THE NIGERIAN ECONOMY (1990-2010).....	623
Aguwamba S. M, Ogbeifun, O. R, Ekienabor E. E.....	623
A Conceptual Solution for Consumers' Data Security Protection in the U.S. General and HealthCare Industry.....	631
Kay K. Kim.....	631
Influence of economy and development in the Capital Market of Lybia.....	638
Emad Mohamed Brgig.....	638
Implementation of Secured Embedded Web server on FPGA.....	642
Mrs.K.Sasikala M.E., Mrs.S.Kalaivani M.Tech.....	642
Strategic Framework for Managing Forces of Continuity and Change in Pharmaceutical Industry.....	647
Iqbal,H, and Asim,M.....	647
Performance Evaluation of Web Application Security Scanners for More Effective Defense.....	660
Chanchala Joshi , Umesh Kumar Singh.....	660
CFD study for cross flow heat exchanger with integral finned tube.....	668
Zena K. Kadhim, Muna S. Kassim, Adel Y. Abdul Hassan.....	668
Sixth Sense Technology.....	678
Sumit Lathwal, Madhur Rajput.....	678
Thermalstability and Photostability of new Azo dye.....	681
Hana,a Kadhem Egzar , Noor Mustafa Kamal, Hana,a Adii Ali , and Muthana Saleh Mashkour.....	681
Enhancement Factor Simulation of H ₂ S Absorption by Fe ₂ (SO ₄) ₃ Aqueous.....	687
Waleed Nour Eldien, Bukhari.M. Mmohammed Zakaria A.Z, Ahmed Sohily.....	687
Evaluation of Nurses Practices Concerning Sterile Techniques Critical Care Units in Al-Najaf AL-Ashraff City Hospitals.....	694
Haitham Ibrahim Faris, Dr. Huda Baker Hassan.....	694
Attitude and Level of Motivation in Rhythmic Activities of College Students in Selected Capiz State University Campuses.....	701
Angeline L. Vestidas.....	701
Level of Student Satisfaction on the Frontline Services of Capsu Satellite Colleges.....	703
Olga Llanera.....	703
Leadership Practices of Secondary School Principals in the Province of Capiz.....	706
Reynaldo G. Peralta.....	706

Therapeutic effect of bee venom formulation in the treatment of FMD viral infection: Preclinical and clinical evaluation.....	711
Amira M. Mansour, Abir A. Elfiky, Aly Fahmy, Ayman Diab.....	711
Statistical Study of Rainfall Pattern in Gombe Metropolis, and its Implication on the Attainment of Sustainable Development Goals (SDGs).....	730
Yahaya, Ibrahim, Adamu, Sani Jauro.....	730
Exploring Consumers Footwear's Brand Preference and Its Antecedents between age groups and gender: In Case of dire Dawa administration.....	740
Mulugeta Girma.....	740
Study On The Role Of NT-pro-BNP (Brain Natriuretic Peptide) And Troponin I In The Detection Of Anthracycline Induced Cardiotoxicity.....	749
Akshyaya Pradhan, Rohini Khurana, Abhishek Singh, Vijayant Devenraj, Jyoti Bajpai, M. L. B. Bhatt, Sanjay Mehrotra.....	749
Decrease In Use of Natural Ventilation Techniques From Modern Day Construction of Buildings.....	758
Ar Gauri Kirolikar, Ms Bharti Deshmukh.....	758
Economic Effects of Bad Roads on Vehicle Maintenance in Nigeria.....	761
G.C. Enwerem and G.A. Ali.....	761
Transformation Process Cultural Values in Local Government Bureaucracy Jayapura.....	767
Beatus Tambaip, Suratman, Sangkala, Gita Susanti.....	767
Organizational Culture In Perspective Anthropology.....	773
Safriadi, Supriadi Hamdat, Munsu Lampe, Musran Munizu.....	773
Challenges and Prospectus of Ethiopian Tourism Industry.....	774
Tekabe Sintayehu Sheferahu.....	774
Synthesis and Characterization of Manganese (II), Nickel (II) and Zinc (II) Complexes of Uramido Benzoic Acid.....	785
S. Prema, Dr. A. Pasupathy and Dr.S.R. Bheeter.....	785
Synthesis and Characterization of Manganese (II) and Cobalt (II) Complexes of O – Benzoyl Benzoic Acid.....	788
S. Prema, Dr. A. Pasupathy and Dr.S.R. Bheeter.....	788
Synthesis and Characterization of Manganese (II), Cobalt (II) and Nickel (II) Complexes of Phenyl glycine-o-Carboxylic Acid.....	792
S. Prema, Dr. A. Pasupathy and Dr.S.R. Bheeter.....	792
Growth, Dielectric studies on pure and CuSO ₄ added L(+) - tartaric acid single crystals.....	796
S. Johnson Navamani, P. Sumithraj Premkumar, G. Narayanasamy.....	796

Phase-Based Binarization of Ancient Document Images.....	800
Ms. Priyanka R. Patil, Prof. Dr. S. L. Lahudkar.....	800
Role of Bone Morphogenetic Proteins in Periodontics.....	804
Dr.Jaishree Tukaram Kshirsagar, MDS, Dr.Aruna Kaveri.....	804
Isolation and Molecular Characterization of acne causing Propionibacterium acnes.....	809
Roselin Polugari, Shailaja Raj Marla, Shailaja. D.....	809
Working Capital Management and Its Impact on Profitability Evidence from Food Complex Manufacturing Firms in Addis Ababa.....	815
Dr. Arega Seyoum, Tadele Tesfay, Tadesse Kassahun.....	815

Determining the Most Appropriate Hotel with Multi-Criteria Decision Making Techniques: The Example of Mersin Province

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Abstract- Tourism enterprises are obliged to keep at the highest level the service quality and customer satisfaction in order to compete with the competitors in the sector within today's increasing competitive environment. Accommodation enterprises, which are among the cornerstones of tourism sector, have a quite important position. Therefore, the services offered by these enterprises and their capability of meeting the customers' needs and desires are also a matter of great importance. Certain features of accommodation enterprises should be taken into account in this regard. The criteria of hotels and weighting these criteria are determinant in assessment of multi-criteria decision making process.

In this study, the hotels, which are located in the province of Mersin of great importance with regards to domestic tourism and situated in Turkey's Mediterranean Region and rank among the top 5 based on customer points on Booking.com website, were evaluated. The level of weights were determined with Analytical Hierarchy Process (AHP) method on the basis of the criteria scored by customers such as number of stars, cleanliness, location, personnel, wifi, comfort, opportunities, price/benefit balance. The hotels were assessed by using the resulting weights in TOPSIS method which is among the multi-criteria decision making techniques and the best hotel in this province was found out.

Index Terms- Multi-Criteria Decision Making, Analytical Hierarchy Process, TOPSIS.

I. INTRODUCTION

Tourism industry is one of the most rapidly growing sectors in the world. According to the data of World Travel and Tourism Council (WTTC), the world tourism sector has been growing by 6% on average per year since 2003 (World Travel and Tourism Council, 2015). The number of hotel enterprises has also increased with this growth. Hotel enterprises constitute the main units of tourism sectors. These enterprises consist of the businesses where the production and consumption of touristic goods and services occur simultaneously. Consumers experience intensely at the same time the financial, sociological and psychological aspects of the goods and services within the process of getting the service of accommodation, eating-drinking, recreation and entertainment in the hotel enterprises where the service is experienced intensely (Gönenç Güler, 2009: 61-62).

One of the basic objectives also for hotels as in all enterprises is to be superior to their competitors. Customers' preferences related to the quality, the change and progress of their expectations have turned the quality in an indispensable competitive factor for hotel enterprises. Hotel enterprises must adopt a quality approach that will satisfy the expectations of customers. The hotels that have adopted this approach, are more advantageous compared to their competitors in respect of business profitability and continuity by gaining customer pleasure (Kemerlioğlu, 2014: 58). In this context, the policies followed for customers who take an important part in the continuity of businesses, even the reason of their existence, are of vital importance. The purchase of a product not meeting the expectation may cause conflicts that arise or may arise between the customer and the enterprise, even this circumstance may result in not preference of that enterprise again by this customer. In this case, there will be considerable economic losses for this enterprise. Specifically, this matter is even more important in terms of hotel enterprises which are the labor-intensive service enterprises. Because the intangibility of the products produced by these enterprises in general and the complexities resulted from this situation for ensuring customer satisfaction in particular, direct hotel enterprises to struggle much more on this subject (Emir, Kılıç and Pelit, 2010: 292). From this point of view, nowadays consumers get access to e-information sources about the places where they stay and refer to the comments. Potential consumers perceive e-comments as expert opinions. E-comments are important references with respect to assessment and inference. In this sense, e-comments seem more convincing than the information available on other marketing instruments and advertisement by consumers as the source of information. The websites publishing consumers' comments direct consumers as the source of information for these purposes. For example, Booking.com, which is a platform related to tourism and travel, independently provides consumers with the information that they can use in the selection of facilities, besides it offers rankings on the basis of enterprises in the sector. To take part among top rankings in these comment pages of this and such platforms, directs the preferences of consumers although being a source of commercial credibility (Göral, 2015).

The purpose of this study is to determine the most convenient hotel that is able to provide the highest satisfaction to hotel customers and able to meet sufficiently the requests of customers by taking advantage of the scoring in the electronic media done by hotel customers with the method of TOPSIS

based on AHP. In this context, five hotels operating in the province of Mersin and having the highest evaluation scores on Booking.com website were evaluated. The hotels dealt within scope of the study, were assessed with respect to the criteria for customer satisfaction specified by Booking.com website.

II. HOTEL BUSINESSES AND CUSTOMER SATISFACTION

Hotels are described in 67th Article of the ‘Regulation on Tourism Investment and Enterprises Qualifications’ based on Tourism Encouragement Law numbered 2632 in Turkey as follows: “Hotels are the facilities having at least 10 rooms, which are supposed to meet overnight requirements of customers as their main function, in addition to this service, they may also contain auxiliary and complementary units for eating and drinking, entertainment requirements” (Andaç, 2013).

Customer can be defined as “a person or organization who purchases a specific brand product of a specific enterprise for commercial or personal purposes” (Taşkın, 2000: 19).

Customer satisfaction can be defined as “cognitive and emotional response of the service, emerging as a result of comparison of the customers’ expectation towards a service and the service experience” (Yağcı et al., 2004: 53). In another words, customer satisfaction is the extent of satisfaction of a customer’s needs, desires and expectations that affects the subsequent demand for goods or services and the interest in goods or services during the consumption of goods and services” (Atılğan, 2001). Meanwhile in another source, customer satisfaction is defined as “evaluations of the post-consumption experience obtained by the customer, depending on the relationship between the perception of a product by the customer and the objective elements of that service or product” (Oliver, 1997). In general, customer satisfaction occurs at the intersection of the customer’s expectations and the benefits provided by the good or service purchased (Kılıç and Pelit, 2004: 114).

It is possible to mention many advantages provided by customer satisfaction to enterprises. When examined the studies carried out on the subject; it is observed that there are many positive impacts upon increase of the customer satisfaction such as the increase of customer’s desire for establishing and continuing relationship with the enterprise (Kelley and Davis, 1994; Morgan and Hunt, 1994; Lee and Heo, 2009), sharing positive experiences with others and in this direction being a positive reference on behalf of the enterprise (Söderlund, 1998), creating customer loyalty (Anderson et al., 1994; Oliver et al., 1999; Selvi and Ercan, 2006), providing positive feedback to the enterprise (Söderlund, 1998, Webb and Jagun, 1997), the increase of number of customers and accordingly increase in profitability (Durmaz, 2006; Çakıcı, 1998; Hançer, 2003), contributing to customer citizenship behavior (Bettencourt, 1997) and eventually enhancement of enterprise performance (Gronholdt et al., 2000).

Satisfaction criteria in respect of the services offered to the customers who prefer these enterprises, become more complex since the hotel enterprises have a labor-intensive characteristic and the products produced rather have intangible characters. Enterprises are required to make further efforts on this subject (Emir, vd, 2010: 294). In this direction, customers in hotel enterprises determine the satisfaction by comparing the service

and products offered and the goods and service they hoped for (Lau et al., 2005: 47, Emir, 2007). Although the assessment of satisfaction in hotel enterprises is made during the service delivery in general, it consists of an interaction between the customer and the employee offering the service (Pizam and Ellis, 1999: 330).

Satisfaction in tourism is among the fundamental concepts that help explaining the tourism behavior. As a travel activity, customer satisfaction in tourism can be achieved by considering firstly customers’ demands and expectations (Dunnross and Iso-Ahola, 1991).

Nowadays, the studies intended for achievement of customer satisfaction have also been accelerated since the customers become more conscious and customer protection movements gain intensity. The factors like the increased international competition, new developments in quality concept and emergence of relational marketing concept, awareness of consumers along with the rising education level in particular have revealed the importance required to be placed on the customer satisfaction (Kılıç and Pelit, 2004: 114).

Customer satisfaction is important in hotel enterprises operating in constantly developing tourism sector with respect to the customer expectations to be met by hotel enterprises, the sustainability of activities and the continuity of profitability when the business success and accordingly the economic inputs brought to the country are taken into account.

III. ANALYTICAL HIERARCHY PROCESS (AHP) AND TOPSIS TECHNIQUES

The analytic hierarchy process (AHP) is a multiple criteria decision making tool for organizing and analyzing complex decisions and firstly developed by Thomas L. Saaty (1980). This method is used to solve a complex decision making problem having several attributes by modeling unstructured problem under study into hierarchical forms of elements. The essential components of a hierarchical system are the main goal, criteria that affect the overall goal, sub-criteria that influence the maincriteria and finally the alternatives available to the problem. To obtain the degree of relative importance of elements at each level, a pairwise comparison matrix is developed using Saaty 1-9 preference scale as shown in Table 1. Then the eigenvector and the maximum eigenvalue (λ_{max}) are derived from pairwise comparison matrices. The significance of the eigenvalue is to assess the strength of the consistency ratio CR (Saaty, 2000) of the comparative matrix in order to validate whether the pairwise comparison matrix provides a completely consistent evaluation. The final step is to derive the consistency index and consistency ratio.

Table 1: Saaty AHP Paired Comparison Scale

Significance values	Value Description
1	Status of both factors’ equal importance
3	Status of Factor 1 is more

	important than Factor 2
5	Status of Factor 1 is far more important than Factor 2
7	Status of Factor 1 is highly significant compared to Factor 2
9	Status of Factor 1 is very highly significant compared to Factor 2
2,4,6,8	Intermediate values of degrees in the above description in the choice between two factors

Reference: Saaty, 2008;86.

In problem solving with AHP, object (problem) is determined first, then AHP solution steps are implemented starting from the object. Solution phase with AHP operates in the following way (Timor 2011;18, Önder and Önder 2014;23-24);

Step 1: Decision problem is defined and purpose is determined.

Step 2: Necessary decision criteria are set to achieve the objective.

Step 3: Possible decision alternatives are determined.

Step 4: The hierarchical structure of decision problems are created.

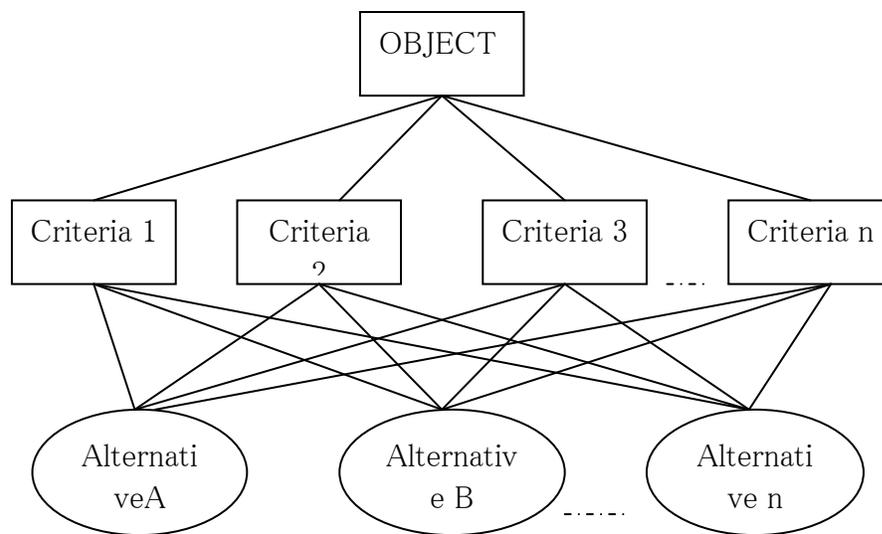


Figure 1. AHP's Hierarchical Structure

Step 5: Paired comparison of the criteria for each level of the hierarchy and the degree of importance of criteria is determined by taking advantage of eigenvectors.

At this stage, inter-criteria comparison matrix is a $n \times n$ dimensional square matrix. Matrix components on the diagonal of this matrix takes the value 1. Comparison matrix is shown below:

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix}$$

Comparison of criteria is done one-to-one and mutual according to importance values that they have relative to each other. In comparison of criteria mutually AHP comparison scale

in Table 1 is used. In order to determine the weight of these criteria in integrate, in other words their percent importance distributions, it is utilized from column vectors forming the comparisons matrix and B column vector with **n number** and **n component** is generated. This vector is shown below:

$$B_i = \begin{bmatrix} b_{1,1} \\ b_{2,1} \\ \cdot \\ \cdot \\ \cdot \\ b_{n,1} \end{bmatrix}$$

In the calculation of B column vector, it is utilized from

$$b_{ij} = \frac{a_{ij}}{\sum_{i=1}^n a_{ij}} \quad \text{formula.}$$

When the steps described above is repeated for the other evaluation criteria, B column vector will be obtained about the number of criteria. When n number B column vector is combined in a matrix format, C matrix will be formed as shown below:

$$C = \begin{bmatrix} c_{11} & c_{12} & \dots & c_{1n} \\ c_{21} & c_{22} & \dots & c_{2n} \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ c_{n1} & c_{n2} & \dots & c_{nn} \end{bmatrix}$$

Benefitting from the C matrix, percent importance distributions which indicate importance values of the criteria relative to each other can be obtained. For this, as shown in the Formula (1), arithmetic average of the line components composing C matrix is taken and W column vector, called **Priority Vector**, is obtained. W vector is shown below:

$$w_i = \frac{\sum_{j=1}^n c_{ij}}{n} \tag{1}$$

$$W = \begin{bmatrix} w_1 \\ w_2 \\ \cdot \\ \cdot \\ w_n \end{bmatrix}$$

Step 6: The consistency of the comparison matrix obtained in the previous step is determined.

AHP , with **Consistency Rate (CR)** obtained, provides the opportunity to test the priority vector which was obtained and

hence the consistency of one-to-one comparisons which were made between the criterias. AHP attributes the essence of CR calculation to the number of criteria and the comparison of a factor (λ) which is called **Basic Value**. For calculating λ , first, D column vector is obtained from matrix multiplication of A comparison matrix with W priority vector.

$$D = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix} \begin{bmatrix} w_1 \\ w_2 \\ \cdot \\ \cdot \\ w_n \end{bmatrix} = X$$

Dividing the corresponding elements of D column vector that was found and W column vector, the value for each evaluation criterion (E) is obtained. The arithmetic average of these values (2) gives the basic value (λ) related to the comparison. After calculating (λ), **Consistency Index (CI)** can be calculated by utilizing the formula (3). At the final stage CR is obtained by dividing CI into standard correction value (4) called **Random Index (RI)** shown at Table 2.

$$\lambda = \frac{\sum_{i=1}^n E_i}{n} \tag{2} \qquad CI = \frac{\lambda - n}{n - 1} \tag{3}$$

$$CR = \frac{CI}{RI} \tag{4}$$

If the calculated value of CR is smaller than 0.10, this indicates that decision maker made consistent comparison. If CR value is greater than 0.10, this shows there is a calculation error in AHP or inconsistency in decision making's comparisons.

Table 2: Random Index (RI) Values

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RI	0	0	0,58	0,90	1,12	1,24	1,32	1,41	1,45	1,49	1,51	1,48	1,56	1,57	1,59

Source: Saaty and Özdemir, 2003; 241.

Step 7: Severity of the alternatives and criteria (weights) are determined. Alternative having the highest weight is the best alternative, criteria having the highest weight is the best criteria.

For the assessment of hotel selection, one of the MCDM (Multiple-criteria decision making) methods named TOPSIS has been applied in this research. TOPSIS (Technique for Order Preference by Similarity to Ideal Solution), developed by Hwang and Yoon (1985), is one of the MCDA/MCDM methods for resolving realworld decision problems satisfactorily. TOPSIS

attempts to indicate the best alternative that simultaneously has the shortest distance from the positive ideal solution and the farthest distance from the negative ideal solution (2007). The positive ideal solution is a solution that tries to maximize the profit criteria and minimize the cost criteria, whereas the negative ideal solution is just opposite to previous one (Chen, Lin, & Huang, 2006, Wang & Chen, 2007, Wang & Elhag, 2006, Wang, 2007). According to Wang 2007, the positive ideal solution is composed of all the good values attainable of criteria, whereas the negative ideal solution consists of all worst values

attainable of criteria (Karim and Karmaker, 2016:8-10). In the TOPSIS method, precise scores that each alternative receives from all the criteria are used in the formation of a decision matrix and normalized decision matrix. By taking into consideration the rates of all attributes, positive and negative ideal solutions are found. By comparing the distance coefficient of each alternative, the preference order of the alternatives is determined.

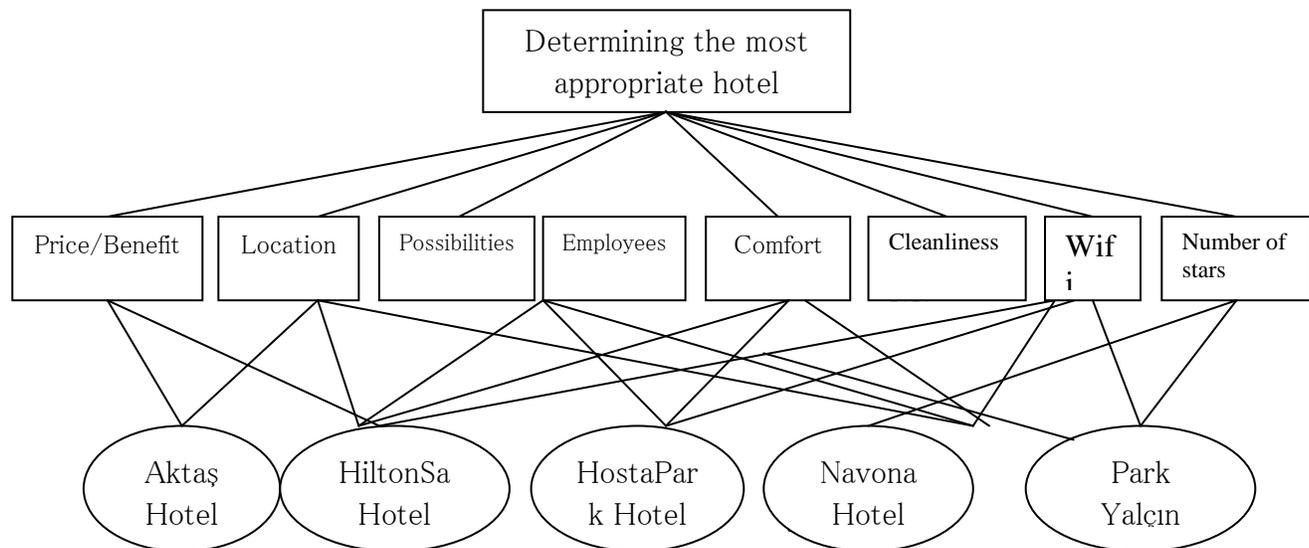
IV. METHODOLOGY

One of the fundamental principles of AHP is separation. The separation means hierarchically configuration of the problem (Saaty, 1986: 841). Objective, criteria and alternatives are three basic level of hierarchical configuration. More complex problems may include the sub-criteria of the main criteria. The number of levels when composing the decision hierarchy, depends on the complexity of the problem and the detailing extent needed by the decision maker while solving the problem (Zahedi, 1986: 98). However, the number of alternatives and criteria to be compared at each level should not go beyond nine (Saaty and Özdemir, 2003: 233). In this context, the first five hotels located in the province of Mersin and received most comments on Booking.com website were evaluated as the alternative of the hierarchical structure. Seven criteria used in the scoring carried out on Booking.com website and additionally the number of stars was used exactly in the study as the criteria. The instructors working at Beysehir Tourism Faculty were asked for their evaluations through the questionnaire form prepared according to Saaty 1-9 scale so as to ascertain the weights of these criteria.

Afterwards, the personal judgments of each decision maker were converted to joint group decision by means of geometric mean and their weights were calculated in Super Decision software. The weights of the criteria were used as weighting criteria in TOPSIS technique. In the meantime, the customer scores in Booking.com website were included in the calculations as the values received by the alternatives. Microsoft Office Excel 2003 was employed in TOPSIS calculations.

4.1. Identification of the Decision Problem through AHP method, Creating the Hierarchical Model by Specifying the Target, Criteria and Alternatives

The purpose and decision problem of the application; is “the selection of the best hotel in the province of Mersin” within scope of the scores given by the customers. Hotel customer scoring criteria on Booking.com website, which is a platform about tourism and travel, were chosen as the criteria concerning the selection of the best hotel in the province of Mersin. In this context, there are 8 criteria including number of stars, cleanliness, location, personnel, wifi, comfort, opportunities, price/benefit balance in the decision problem. Meanwhile, 5 hotels that have received the most hotel customer comments in the province of Mersin on Booking.com website were determined as alternatives. Therefore, there are 5 alternatives in the Decision problem. In the light of this information, a Hierarchical Model of the Decision Problem was generated. The model for the problem was combined with arrows so as to be from top to bottom.



4.2. Determination of Significance Degrees (Weights) of the Criteria through Paired Comparison of the Criteria for Each Level of the Hierarchy with AHP Method

All clusters in the model were compared by taking into consideration the goal node (the selection of the best hotel) of the nodes (number of stars, cleanliness, location, employees, wifi, comfort, possibilities, price/benefit balance) available in the criteria cluster after generating the nodes. The geometric mean of the personal judgments of 5 instructors working at Beysehir

campus, was calculated by using Saaty’s 1-9 scale (table-1) and the data used in the comparison (Table 3).

AHP method can be applied in individual and group decisions. If any decision is made as a result of participation of a group people not of a single person, this situation is called AHP with group decision making (Giriner and Çevdar, 2007: 104-105). One of the methods commonly used by making a group decision in AHP, is the unification of individual judgments contained in paired comparison matrixes. The geometric mean is the most

appropriate method in the cases where decision makers are equally important with regards to the unification of the judgments of a group (Forman and Peniwati, 1998: 169, Asma and Bahurmoz, 2006: 10, Timor 2011: 38, Ömürbek and Tunca 2013: 56-57, Önder and Önder 2014: 35-37, Çelik, 2007: 74). If the geometric mean calculated is between 1-9, the comparison result has been entered without making any change to the left side of the questionnaire form of Super Decision software. If the geometric mean is a decimal number, the nearest integer value has been taken. If the geometric mean value calculated for the decision makers is between 0-1, the value of "1" is divided by

this value (like 1/0,60). If the value obtained as a result of the division becomes a decimal, it is calculated as "1/the value obtained" by considering the nearest integer value. It was determined as such with the fractional figures contained in the common view column of Table 3 and was included in the calculations so as to take part at the right side of the questionnaire form of Super Decision software (Ömürbek and Tunca 2013: 58-59). The matrix was created for the criteria after entering the data (Figure 2).

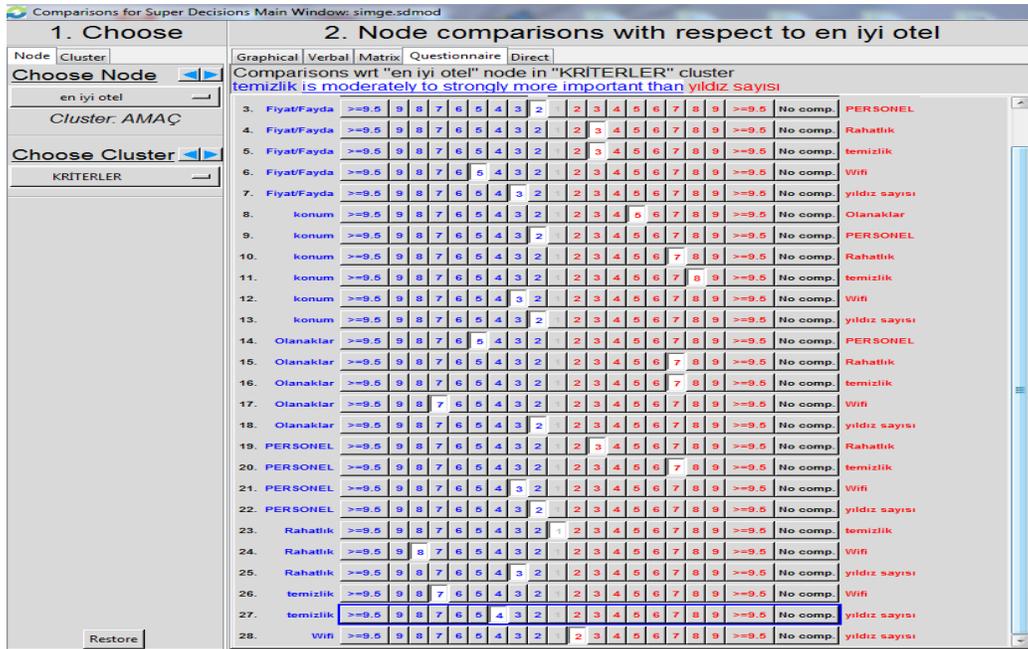


Figure 2. Paired Comparison Matrix Concerning the Criteria

In general, a complex decision problem contains quantitative and qualitative criteria. Therefore, the judgments obtained from paired comparisons are subjective by nature. Furthermore, the comparisons may not be consistent by human nature. Inconsistency in the comparisons may lead to the inconsistency of the priority values of ordering preferences for the alternatives. "0" inconsistency rate shows that all decision maker judgments are consistent. 10% and less value concerning this rate is usually deemed acceptable (Hafeez et al., 2002; 39-5, Forman and Selly, 2001; 49). The values of the priority vector have been accepted as interpretable, because of the inconsistency

value (0,09828<0,10) of the paired comparisons of decision makers' individual judgments calculated by taking geometric mean in the study, is between the acceptable boundaries. In this context, the weight value of the criteria as a result of the comparisons are as follows; Price/Benefit (0,11), Location (0,05), Opportunities (0,11), Personnel (0,05), Comfort (0,28), Cleanliness (0,31), Wifi (0,02), Number of stars (0,04). According to these results, the most important criterion is Cleanliness, and the least important criterion is Wifi in the selection of hotels for decision makers (Figure-3).

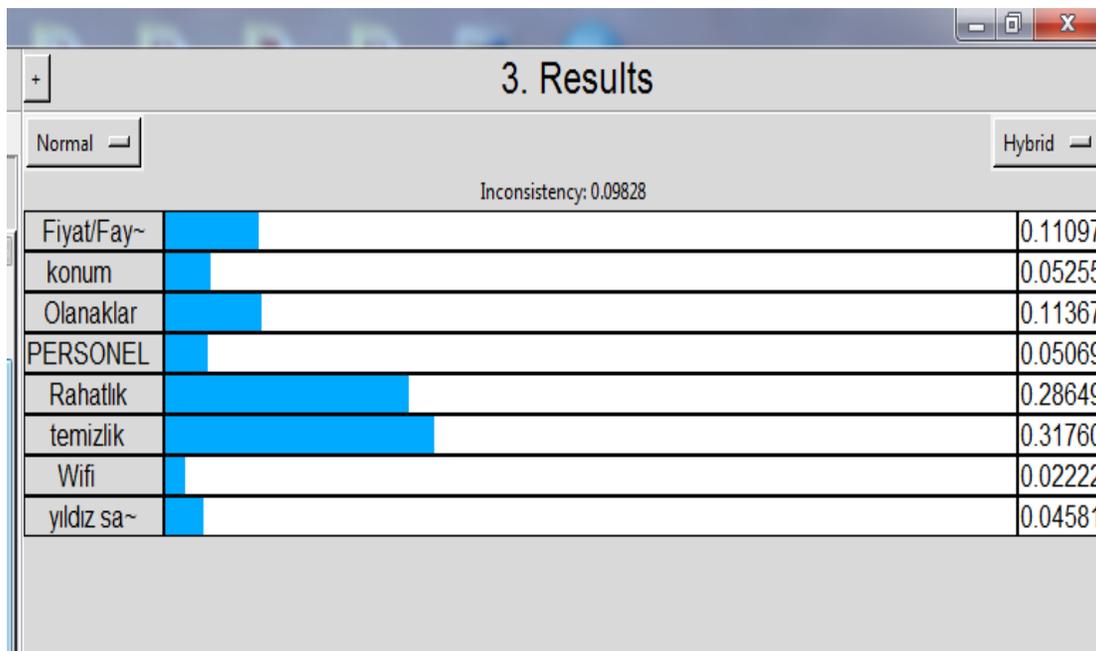


Figure 3. Degree (Weight) of Importance on All Criteria

Here, the weight values concerning the criteria will be used while making calculations with TOPSIS method.

4.3. Establishment of TOPSIS Decision Matrix

The decision matrix is the first matrix required to be created by the decision maker in TOPSIS technique. While the decision maker indicates the decision points along the lines, contains factors in the columns. The values used in the establishment of the decision matrix were obtained from

Booking.com website. These values include the data of 5 hotels which have located in the province of Mersin and have received the most comments. The decision matrix in which there are the weights of the criteria obtained with AHP technique is seen in Table 3. Additionally, these scorings were used instead of the number of stars according to the scoring criteria of Culture and Tourism Ministry. Accordingly, 5-star hotels have 560 scores, 4-star hotels 420, and 3-star hotels 285.

Table 3. TOPSIS Decision Matrix and Weights of the Criteria

Weight	0,04	0,05	0,11	0,05	0,28	0,31	0,02	0,11
Alternatives	Number of stars	Location	Possibilities	Employees	Comfort	Cleanliness	Wifi	Price/benefit
Aktaş	285	8,3	7,8	8,8	8	8,2	8,6	8,1
HiltonSa	560	8,9	8,1	8,8	8,5	8,5	4,9	7,4
HostaPark	285	8,2	7,5	8,7	8	8,4	8,2	8,2
Navona	420	8,5	8,1	8,9	8,8	9,1	8,5	8
Park Yalçın	285	7,7	8,6	9,1	8,5	9,2	8,2	8,8

4.4. The Acquisition of the Normalized Matrix and Weighted Normalized Matrix

$$\frac{a_{ij}}{\sqrt{\sum_{i=1}^m a_{ij}^2}}$$

After squaring the values of the decision criterion corresponding to each alternative in the Acquisition of the normalized matrix, the values of each column were summed and their square root was taken. Then, the process (9) was carried out for each cell (Table 4).

(9)

Table 4. Normalized Matrix

	Number of stars	Location	Possibilities	Employees	Comfort	Cleanliness	Wifi	Price/benefit
Aktaş	0,332	0,445	0,434	0,444	0,427	0,422	0,492	0,446
HiltonSa	0,653	0,477	0,451	0,444	0,454	0,437	0,28	0,408
HostaPark	0,332	0,440	0,417	0,439	0,427	0,432	0,469	0,452
Navona	0,490	0,456	0,451	0,449	0,470	0,468	0,487	0,441
Park Yalçın	0,332	0,413	0,479	0,459	0,454	0,473	0,469	0,485

Afterwards, the Weighted Normalized Matrix values were obtained by multiplying each normalized matrix value by the significance degrees (weights) of the criteria procured with AHP method (Table 5).

Table 5. Weighted Normalized Matrix

	Number of stars	Location	Possibilities	Employees	Comfort	Cleanliness	Wifi	Price/benefit
Aktaş	0,013	0,022	0,047	0,022	0,119	0,130	0,009	0,049
HiltonSa	0,026	0,023	0,049	0,022	0,127	0,135	0,005	0,044
HostaPark	0,013	0,022	0,045	0,021	0,119	0,133	0,009	0,049
Navona	0,019	0,022	0,049	0,022	0,131	0,145	0,009	0,048
Park Yalçın	0,013	0,020	0,052	0,022	0,127	0,145	0,009	0,053

4.5. The Acquisition of Ideal and Negative Ideal Solution Value

Here, the maximum values of each column were taken into account for ideal solution values. Meanwhile, the minimum values of each column were taken into account for negative ideal solution values.

Table 6. İdeal ve Negative İdeal Solution Values

İdeal Solution	0,026	0,023	0,052	0,022	0,131	0,145	0,009	0,053
Negative İdeal	0,013	0,020	0,045	0,021	0,119	0,130	0,005	0,044

4.6. The Acquisition of the Distance Values to Ideal and Non-Ideal Points

The distance values are determined to the positive and negative solution respectively by subtracting positive ideal and negative ideal values from the values on the columns of each criterion.

Table 7. Relative Closeness Coefficient to the İdeal Solution

	Number of stars	Location	Possibilities	Employees	Comfort	Cleanliness	Wifi	Price/benefit	Total	S ⁺
Aktaş	0,00000	0,00000	0,00001	0,00000	0,00002	0,00010	0,00002	0,00008	0,00059	0,024289
HiltonSa	0,00017	0,00000	0,00005	0,00000	0,00014	0,00014	0,00000	0,00002	0,00023	0,015165
HostaPark	0,00005	0,00000	0,00001	0,00000	0,00000	0,00000	0,00000	0,00003	0,00052	0,022803
Navona	0,00017	0,00001	0,00000	0,00000	0,00002	0,00000	0,00000	0,00000	0,00009	0,003000
Park Yalçın	0,00017	0,00001	0,00000	0,00000	0,00002	0,00000	0,00000	0,00000	0,0002	0,014142

Table 8. Relative Closeness Coefficient to the Negative İdeal Solution

	Number of stars	Location	Possibilities	Employees	Comfort	Cleanliness	Wifi	Price/benefit	Toplam	S ⁻
Aktaş	0,00017	0,00001	0,00002	0,00000	0,00006	0,00003	0,00000	0,00000	0,00005	0,007071

HiltonSa	0,00000	0,00000	0,00000	0,00000	0,00000	0,00001	0,00002	0,00003	0,00029	0,017029
HostaPark	0,00004	0,00000	0,00002	0,00000	0,00014	0,00023	0,00002	0,00002	0,00006	0,007745
Navona	0,00000	0,00000	0,00005	0,00000	0,00006	0,00023	0,00002	0,00008	0,00047	0,021679
Park Yalçın	0,00000	0,00000	0,00005	0,00000	0,00006	0,00023	0,00002	0,00008	0,00044	0,020976

4.7. The Calculation of Relative Proximity to Step Ideal Solution

$$C_i^* = \frac{S_i^-}{S_i^- + S_i^*}$$

(10) formula is used in calculation of the relative proximity to the ideal solution. The results were given in Table 9 according to this formula.

Tablo 9. İdeal Solution Table

	S⁺	S⁻	C*	Sıralama
Aktaş	0,024289	0,007071	0,225478	5
HiltonSa	0,015165	0,017029	0,528949	3
HostaPark	0,022803	0,007745	0,253535	4
Navona	0,003000	0,021679	0,878439	1
Park Yalçın	0,014142	0,020976	0,597301	2

The most convenient is Navona Hotel (0,8784) among the hotels evaluated in the province of Mersin, based on weighting the expert judgments and the evaluation points given by the customers.

V. CONCLUSION

Customers now reach the comments and some websites in the internet environment before deciding the hotel where they will lodge and for holiday selections as a result of the advanced technology. The use of internet has become indispensable for tourism sector. This sector involves a risk factor because of the prominence of service and presence of abstract products in this sector. Therefore, the hotels constituting one of the most important parts of the sector must provide customer satisfaction. Because scientific studies have also proved that enterprises are able to survive in the competitive environment by providing customer satisfaction. Other potential customers can also form an opinion from the scorings made by hotel customers. Consequently, although there are many websites where customers can comment on the enterprises in the sector, Booking.com is among the most significant ones. In the study, the top five hotels which are located in the province of Mersin and have the highest scores in Booking.com were evaluated. The criteria used in the scorings made on the website were used exactly as they are, and the criterion of the number of stars was also added to this. The instructors working at Beyşehir Tourism Faculty were asked for their evaluations according to Saaty 1-9 scale so as to ascertain the weights of these criteria. Afterwards, their weights were calculated in Super Decision

software. The most convenient one was determined among the alternative five hotels by combining the weights of the criteria and the customer scorings on Booking.com website with TOPSIS technique. The most convenient hotel evaluated in the province of Mersin is Navona Hotel, the criterion deemed most important is Cleanliness.

This study evaluates together multi-criteria decision making techniques and customer scorings depending on customer satisfaction. Even though similar studies have been conducted in the past years, this study contributes to the literature due to the absence of such study in the Mediterranean Region that is the most important tourism region in Turkey. In this respect, the execution of the study in Mersin, a province located within the destination of the Mediterranean, is of great importance. Furthermore, the administrations of these five hotels located in the province of Mersin can also obtain information by benefiting from the study results about the hotels' statuses and for providing competitive advantage.

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Wireless Energy Consumption Tracking on Adhoc Network

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Abstract- In countries where Energy consumption is a critical issue, many rural areas have power failures very frequently and one of the biggest reasons for this problem is poor power management in urban areas. This poor power management issue occurs because of ignorance of the consumers which is more prominent as consumers do not keep a track of their energy consumption levels. Project SEM is a design proposed to help solve this problem. This system is specifically designed to tap voltage and current at the upstream of mains of a specific area, to calculate instantaneous active power values and to eventually calculate energy consumed by the systems in that area. This reading of energy, power, voltage and current is then sent to the android device for further processing and display. The sEm android app will show the user these real-time values as well as estimated bill amount till that moment of that specific month. The app will also allow the user to set bill limits in order to get a notification when energy usage has crossed the pre-defined limit.

Index Terms- Energy metering, adhoc, real-time values, android solution, tariff notification.

I. INTRODUCTION

With increase in inventions and development in technological field, we have more and more electronic and electrical systems built everyday. With increasing electronic and electrical products for the general public as well as for the industrial area, we have gigantic electricity bills on our desks. There is also a fair amount of Research and Development work going on for optimizing the power consumptions in these systems, by using advanced power management methods so as to reduce or limit the power consumed by these individual systems. But pace of this research is not even close to the pace of increase in the number of systems in each household, industry etc. Even if one (layman) knows about his/her energy consumption units, it is a very tedious job to get it converted in terms of money. This becomes a major aspect in the process of ignorance towards one's energy usage. But what if the user gets a regular energy usage reading on his android device, in terms of estimated electricity bill to be paid till date. sEm is a energy metering project with a much more transparent approach towards the user. It has two main sections in brief. First is the Main energy meter unit. Second is the sEm Android application. The main unit is to be connected at the mains upstream of the desired area, energy consumption of which is to be put under monitoring. Now you let the sEm system do the rest.

The last thing user has to do is to have the sEm android app in his/her android device and sync it with the main unit via Bluetooth. Now the app will show the user real time readings of Voltage levels, Current consumption by appliances connected in that area, Active Power reading, total energy consumption as well as the electricity bill amount to be paid till that instant of the particular month. The sEm application also allows the user to set tariff bill limit for the ongoing month and as soon as the limit is exceeded the app will pop up a notification, thus alerting the user to start optimizing his/her energy consumptions.

II. PROPOSED METHODOLOGY

This methodology is pretty straight forward. There are 4 important circuits used. The Voltage sensing circuit connected to the mains upstream in ladder topology to continuously stepdown and condition the wave form to provide equivalent peak values as well as a Zero Crossing Detector for interrupt output. The Current Sensing circuit consists of waveform conditioning circuits for equivalent peak values and Comparators for producing current interrupt. The power supply unit is designed to provide constant 5V and 3.3V DC levels for other sections. The 4th and most important circuit is the controller board. The code is completely interrupt based and not in a loop. The methodology is such that after initializations of on-chip modules the microcontroller goes into low power mode and waits for interrupt. Either of the voltage or current interrupt may occur first. But it is most unlikely that current interrupt will occur first as most of the loads connected to the mains are inductive loads causing the voltage to always lead the current. Suppose the voltage interrupt occurs, the corresponding ISR is executed which includes capturing the ADC value and calculating the Vpeak value. This ISR will also initiate a timer and wait for the current interrupt to appear. As soon as the current interrupt appears, its ISR will capture ADC value and calculate Ipeak as well as stop the initiated timer. Using this timer count reading we find out the time between the two interrupts or rather to be more precise time between voltage and current wave forms zero crossing. Using this reading we calculate phase angle. Now we calculate the RMS values of current and voltage by

$$V_{rms} = \frac{V_{(peak)}}{\sqrt{2}} \quad (1)$$

$$I_{rms} = \frac{I_{peak}}{\sqrt{2}} \quad (2)$$

Next thing in the algorithm is to calculate power $P = V_{rms} \times I_{rms} \times \cos(\text{phase angle})$. Now as the load in any area may not be constant we need to calculate the area under the curve of active power reading. With dt as sampling period. Calculate Energy using power in kW and time in hour (time since controller reset) to get the energy reading in kW-hr. Next step is to send these real time readings on an android device via Bluetooth 4.0 (BLE). This data will be further processed by sEm android application. The android app will first acquire the data from the Bluetooth adapter API and display the real time values of Voltage, current, power and energy. The app will then calculate the bill amount based on the energy consumption level and standard electricity tariff table of the particular region. The app will display the tariff till that instant on a gauge with maximum level as the limit set by the user. As soon as the limit is reached the app will notify the user.

III. ALGORITHM

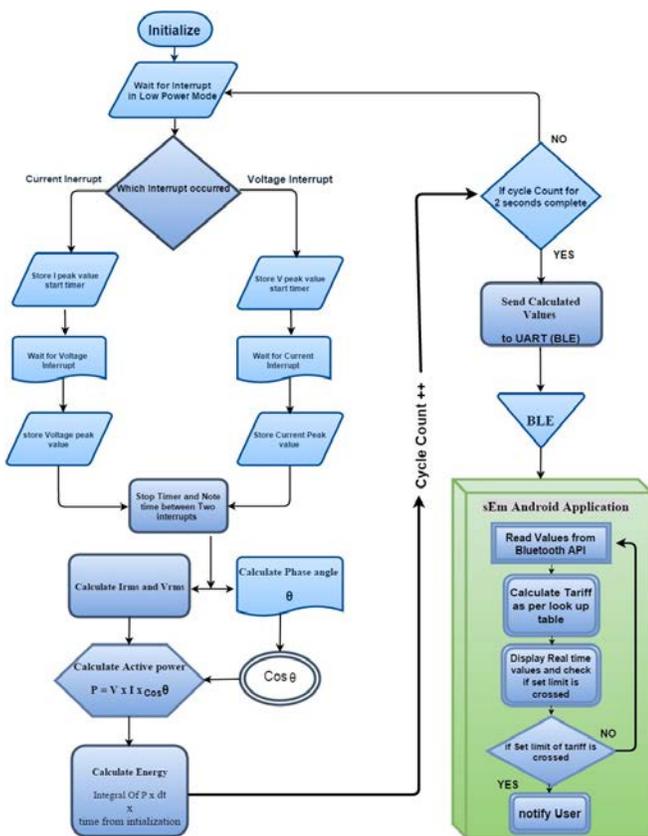


Fig. 1: sEm System Flow Chart

IV. DESIGN AND IMPLEMENTATION

The controller used is based on MSP430 architecture designed by Texas Instruments. Texas instruments provides a wide range of variants of MSP430 specially designed as low power MCUs. The specific variant used in this project is MSP430F5529LP. [2]

Current Sensing Unit: For current sensing we have used ACS712 Hall effect sensor module. This hall effect sensor module is connected in series with the Line of the mains and its output voltage corresponds to the current in Amperes flowing through the Line. Output of this module is at $V_{cc}/2$ dc offset level, which means that for 0A current flowing through it (with $V_{cc} = 5V$) its output will be 2.5V. It has a sensitivity of 0.066V/A, which means for every 1A through it its output will rise by 66mV. Therefore for conditioning this signal according to our needs we used op-amps, OPA2340 to be specific. With V_{cc} at 3.3V for the sake of protecting the on-chip ADC in undesirable cases. 2 Op-amp circuits are used: first is the peak detector since the algorithm created requires peak value in positive half cycle. Taking into consideration the 66mV/A sensitivity of Hall effect module and the 3.3V VDD of op-Amps, a maximum of 12 A can be accurately sensed in this system above which the output of Op-Amps will be saturated. Second Op-Amp circuit used is a Comparator with 2.5V as reference used such that if output of Hall effect sensor increases over 2.5V (which means Line Current through the sensor has reached its Zero crossing), the output of comparator will have a transition, Thus providing a interrupt for the controller. Fig 2 shows the schematic of Current Sensing Board [1]

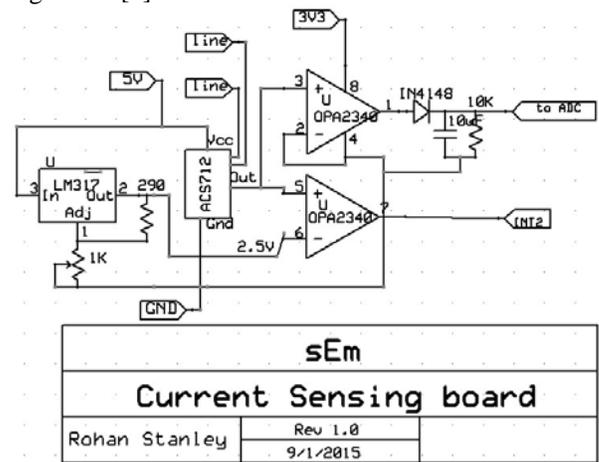


Fig. 2: Current Sensing unit Circuit

Voltage Sensing Unit: The voltage sensing circuit basically consists of a 3V, 500mA transformer with its primary winding connected parallel in ladder topology to the mains upstream of the region under energy monitoring and secondary connected to the trimmer on the voltage sensing board for voltage level adjustments. By using transformer at the beginning we can both step-down the voltage level as well as stay isolated from the grid. The output voltage of this trimmer is given to two op-amp circuits, one of them is a peak detector and the other one is a ZCD. The peak detector output is given to another ADC input channel of MSP430 and the ZCD output is given

as V - interrupt to MSP430 Fig 3 shows the schematic of voltage sensing board. [1]

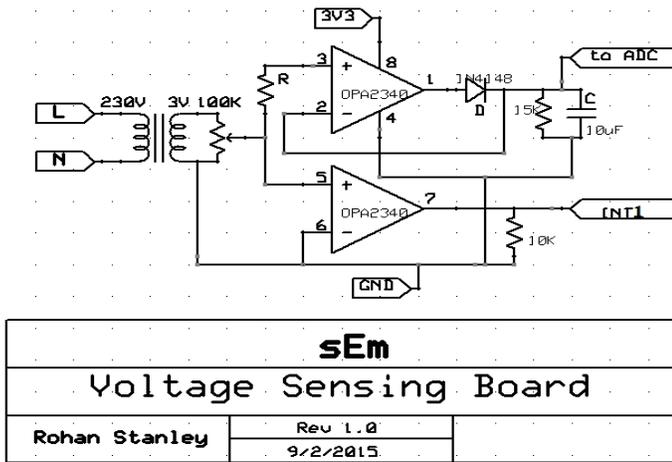


Fig. 3: Voltage Sensing Unit

Power Supply Unit (PSU): The power supply unit is specifically made to produce 5V and 3.3V for the Sensing and controller board. For generating 5V for the hall effect sensor the most commonly used regulator IC 7805 is connected with filtering capacitors .For generating 3.3V for op-Amps biasing as well as for the controller, IC LM317 variable regulator circuit is used. Due to use of low power components, the current and power requirements of the sEm circuits is very less and therefore these regulator ICs were sufficient for this project. [1]

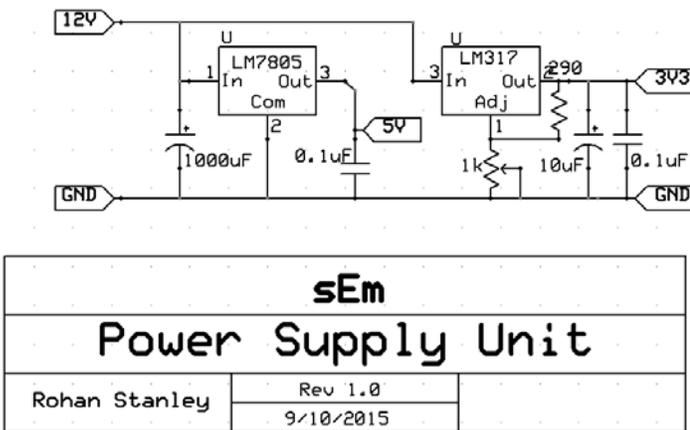


Fig. 4: Power Supply Unit

Bluetooth 4.0 (BLE): The communication module used for connecting to the android device is BLE 4.0 module. The ble module is connected to the vacant UART port of MSP430. This specific variant was selected because of its low power consumption levels and few other features which makes it much better from previous versions of Bluetooth. Previous Bluetooth version had:100msec of wake time latency ,which means when its in not connected state and in sleep mode, it takes 100 msec to wake up and start functioning. Minimum total time to send data is 100msec, which also increases its power consumption slightly. Power consumption: 1W as per reference .Current consumption: less than 30 mA.[10] While

BLE has following features: Wake latency : 6msec, Minimum total time to send data is 3msec, Power consumption: 0.01W to 0.5W, Current consumption : less than 15 mA.

V. SYSTEM BLOCK DIAGRAM

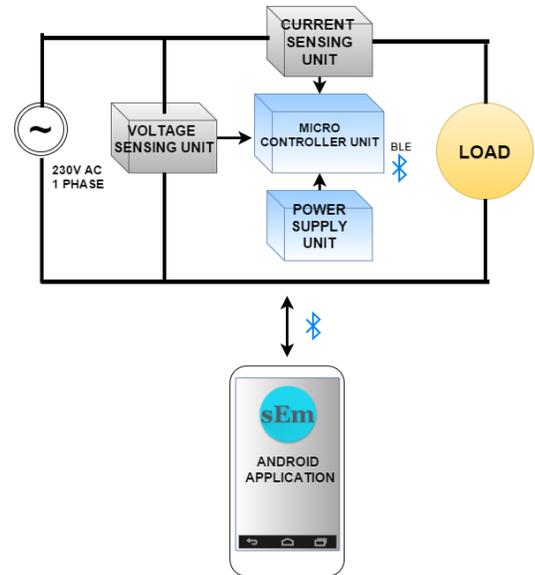


Fig. 5: System Block Diagram

VI. NORMALIZATION OF VALUES

For voltage sensing the ADC value read is passed through a simple equation

$$V_{peak} = \frac{ADCvalue}{4095.0} \times 3.3 \tag{3}$$

to get the voltage value. This voltage value is actually the peak value of the conditioned or rather attenuated version of grid voltage value. Therefore to get the actual grid voltage value we need to multiply this value with attenuation factors. After getting the peak value of Input grid voltage. We can get the RMS value by passing it in a simple equation

$$V_{RMS} = \frac{V_{peak}}{1.414} \tag{4}$$

, which is same as

$$V_{RMS} = \frac{V_{peak}}{\sqrt{2}} \tag{5}$$

For current sensing the input is from ACS712 hall effect sensor which provides an output with dc offset at Vcc/2, that means in our case the output will be shifted to 2.5V.The sensitivity of ACS712 is 66mV, which means output will change by 66mV for every 1 A alternating current flowing through the sensor. Therefore ADC value will be first converted to voltage value, same as in voltage sensing.This voltage value must first be freed from DC offset or DC shift provided by sensor. Therefore we perform

$$I = I - 2.5 \tag{6}$$

to get value having 0V reference.Now this value is divided by sensitivity of sensor ,

$$I_{peak} = \frac{I}{0.066} \quad (7)$$

to get actual current value in Ampere flowing from the grid into the monitored area. The RMS value of current will be calculated in the same way as for voltage values.

VII. CAPTURING PHASE ANGLE FOR POWER FACTOR CALCULATION

First we find out the time between current and voltage waveforms zero crossing instant by calculating time between the two interrupts rising edge. That is done by using the onchip timer module. When the Voltage Interrupt occurs we run the timer and as soon as the current interrupt arrives we halt the timer and using the count stored in timer register we can easily calculate the time between the two interrupts (timeInterval). We can then calculate phase angle by the time value using

$$PhaseAngle = timeInterval \times 50.0 \times 360.0. \quad (8)$$

VIII. POWER AND ENERGY CALCULATIONS

For calculating instantaneous power consumption we use the RMS values of voltage and current calculated before. We pass the phase angle into a trigonometric COS function to get Cos of phase Angle, which is the POWER FACTOR. Now we use the standard formula for active power [4]

$$Active\ Power\ (P) = V_{RMS} \times I_{RMS} \times Cos(phaseAngle) \quad (9)$$

As the load in a predefined area may change any time, the power is never a constant value. It will change as and when the load changes. We need to integrate the power values to find out the area under the curve.[4]

$$\int P \times dt$$

The above equation is implemented for discrete time samples as

$$\frac{\sum P \times SamplingPeriod}{NumberOfSamples} \quad (10)$$

This integrated power value (in kilowatts) is then multiplied with time (in hours) from reset to get Energy (in kw-hr)

$$Energy_{kw-hr} = Power_{kw} \times time_{hours} \quad (11)$$

IX. SEM ANDROID APPLICATION

sEm (smart Energy Monitor) App was designed to function synchronously with the sEm meter unit. A smart meter is usually an electronic device that records consumption of electric energy in intervals of an hour or less and communicates that

information at least daily back to the utility for monitoring and billing. Smart meters can gather data for remote reporting and displays the data on the app. Such an advanced metering infrastructure differs from traditional automatic meter reading by the fact that in this metering the unit wirelessly sends the data to the app using Bluetooth. Main Activity: The main activity is the first page that is viewed by the user when the app is launched. This activity displays the values of the various parameters calculated by the SEM energy meter unit. The values are current, voltage, power, energy. The tariff value or bill amount calculated by the app is also displayed on this activity. These values refresh in a period of 2 seconds in connected state.

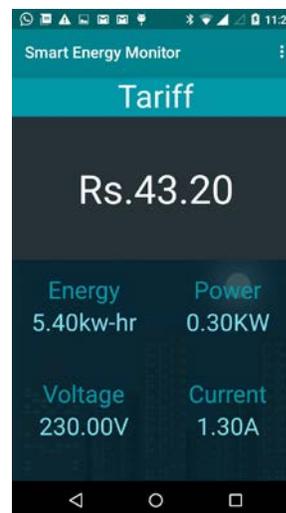


Fig. 6: Main Activity

Menu Activity: This activity creates a drop down menu which in this specific project shows the intents to Setting page, About Developer page and reset .The Reset button will reset the value of tariff from Rs. 0000. Setting Activity: This activity provides us with different options such as settings the bill limit, enabling and disabling the limit, About the app and connect button. The bill limit edit box will allow the user to set the limit for tariff, crossing which the app will notify the user .As soon as the bill limit is set the app will assign the maximum value of the gauge in main activity to the maximum bill limit and the gauge will move accordingly. The limit enable check box will allow the user to enable/disable the limit notifying feature. When the check box is enabled the limits are set on the tariff values and the limit is removed when check box is un-tick. The connect button takes the user to the Bluetooth enquiry activity, where after asking permissions for enabling Bluetooth the app will initiate device enquiry for nearby Bluetooth devices. About the app button /intent will take the user to the About App activity where the user can read the various features of app as well as important instructions.

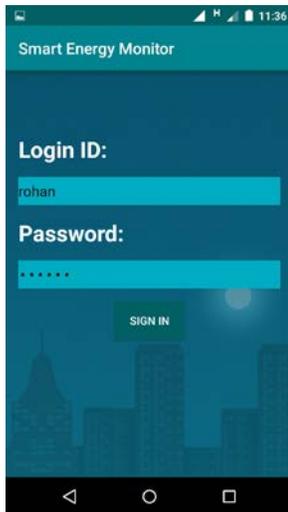


Fig. 7: Login Activity

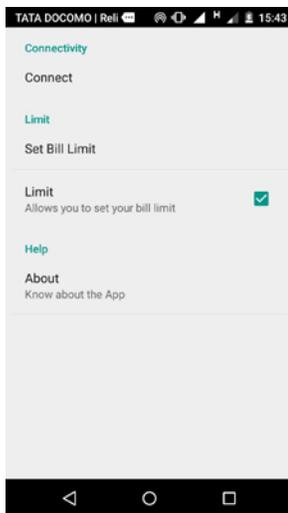


Fig. 8: Settings Activity

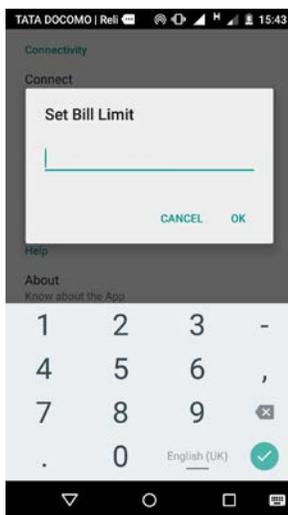


Fig. 9: Bill Limit Edit Preference

X. RESULTS

Fig 10 shows the wave form at no load condition, fig 11 shows wave forms with 300W load connected. The yellow waveform is

the V_{out} for sensing which goes to ADC and the blue wave form is the interrupt signal which appears every 20ms for a 50Hz signal.



Fig. 10: No load Output waveforms

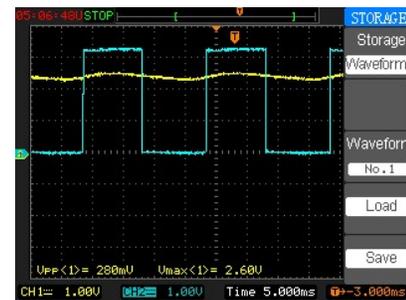


Fig. 11: With Load Current waveforms

Fig 12 shows the output wave forms of voltage sensing boards. Yellow waveform is V_{out} , peak detector output with holding time of 100msec. Blue waveform indicates the ZCD output which is used as interrupt to MSP430. Fig 13 shows both current and voltage interrupts at the same time. The yellow waveform is Voltage interrupt rising edge and blue waveform is Current interrupt rising edge. As we can see due to inductive load connected in downstream Mains , voltage is leading current by 500uSec.

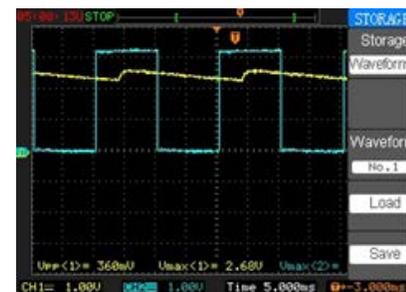


Fig. 12: Voltage Sense Unit Output Waveforms

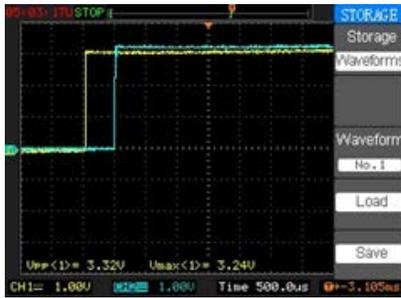


Fig. 13: Voltage ,Current Interrupt occurrence

XI. CONCLUSION

Project SEM has two functional sections, the Energy meter and android application working hand in hand to serve a larger purpose which is providing the user, information about his power consumption levels as well as bill amount till date so that he/she gets motivated as well as alerted to modify and optimize their power consumptions in order to keep the electricity bill amount in desirable limits. This will also affect various energy related problems such as requirement of load shedding, when implemented on a large scale. This concept will prove to be affective as the user begins to know the closely estimated amount to be getting out of his/her pocket in terms of electricity bills, he/she will surely start optimizing domestic energy usage due to the instinct to save money. The current system uses bluetooth for connecting to the user. The advancements which can be made in the currently proposed system are: The system can be connected to a server via Ethernet, using Ethernet LAN or Wifi module , to send the real time data to the server and the server can display it on a web app made using HTML, CSS, Jquery etc. This system can then be monitored from anywhere in the world. Some features can be added to control switching of appliances from user side. Using relays which are also controlled by sEm unit we can control and optimize power consumption from user end. Divisions can be made in SEM energy meter unit such that there will be a mother unit connected to the app and individual daughter unit connected before every appliance ,then we can monitor the individual power consumption levels of each Mains 230V outlet.

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Variation In Mean Heart Dose By Treatment Plan Optimization During Radiotherapy For Left Sided Breast Cancer

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Abstract-

Introduction: Radiotherapy (RT) plays a major role in the management of breast cancer. Cardiac Toxicity is an important late complication of radiotherapy for left sided Breast cancer. Cardiac morbidity can be minimized through careful treatment planning.

Aim: To study the variation of dose to the heart by change in the depth of normalization point during Radiotherapy planning.

Settings and design: Prospective, dosimetric evaluation study.

Materials & Methods: Twenty patients who underwent Left sided Breast Conservation Surgery and registered for Radiotherapy (RT) were simulated on CT Simulator and the Computed tomography images were transferred to the treatment planning system. Target volume and the organ at risks were contoured. Radiotherapy Planning for whole breast was done with tangential fields with additional loco-regional nodal radiotherapy where indicated. The tangential fields were optimized with change of normalization points (P1, P2, P3 and P4) in four different RT plans. Dose to the whole breast and heart was compared for all plans. Patients underwent pretreatment cardiac assessment and echocardiography

Results: In optimization of the tangential field for whole breast RT all plans have shown adequate coverage of Planning Target Volume (PTV). The mean heart dose received was 5.07 Gray (Gy), 4.85 Gy, 5.0 Gy and 5.86 Gy by normalization at P1, P2, P3 and P4 respectively. Simple optimization can vary mean heart dose by 17% with absolute decrease in mean heart dose by 1.01Gy.

Conclusion: Optimization of tangential fields can be a useful and easy tool to decrease mean dose to the heart for treating left sided breast cancer especially at centers with limited resources.

Index Terms- Breast cancer, cardiac toxicity, plan optimization, radiotherapy.

I. INTRODUCTION

Breast cancer is the most commonly diagnosed cancer in women. The number of estimated new cases of breast cancer in 2016 as per American cancer society is approximately 246,660 and estimated death is 40,450[1]. The treatment strategy for breast cancer patients includes surgery (radical or breast-conserving), radiotherapy, chemotherapy, endocrine therapy and targeted therapy. Historically mastectomy was the standard surgery but in recent years breast conservation surgery (BCS) followed by Radiotherapy has demonstrated equivalent loco-regional control in a large number of randomized trials [2,3].

Cardiac Toxicity is an important sequel of breast radiotherapy, particularly among patients treated for left sided disease [4-6]. The Early Breast Cancer Trialists' Collaborative Group (EBCTCG) reports an increased rate of mortality from heart disease with RT (Risk Ratio=1:27) [7]. With improved therapies patients are often cured and survive long enough for late toxicities to become apparent [8]. Exposure of heart to radiation during radiotherapy for breast cancer, increases the subsequent risk of ischemic heart disease and cardiomyopathy[9]. To reduce the risk of cardiac toxicity, three-dimensional conformal radiotherapy (3DCRT), Intensity Modulated Radiotherapy (IMRT), Breath Controlled or Gated treatment techniques have been used. But these are resource and labor intensive techniques, not available in all the centers.

Thus we undertook this study to see the variations in dose to the heart by optimization during radiation planning in patients who have undergone Breast conservation surgery for Left sided Breast cancer.

II. RESEARCH ELABORATIONS

Twenty patients who underwent Left sided Breast Conservation Surgery were registered for RT were simulated on Computer Tomography (CT) Simulator and the CT images were transferred to the treatment planning system. Patients underwent pretreatment cardiac assessment and echocardiography. Target volume and the organ at risks were contoured by radiation oncologist using Radiation Therapy Oncology Group (RTOG) contouring guidelines (Figure1). Radiotherapy Planning for whole breast was done on a linear accelerator with 1 cm multileaf collimator (Elekta Infinity/synergy). Wedged tangential fields with additional locoregional nodal radiotherapy where indicated were used. The tangential fields were optimized with change of normalization points (P1, P2, P3 and P4) in four different RT plans (Figure 2). Dose to the whole breast and heart was compared for all plans (Figure3).

All patients received a dose of 50 Gy prescribed in 25 fractions to the whole breast and a boost of 10-16 Gy to the tumor bed. In order to avoid hot spots and achieve more homogeneity for the tangential fields, two wedges with 15-30° angles were used when required. Forward IMRT with field in field technique was done to achieve homogenous dose distributions.

In this study variation in dose distribution to heart, left lung and planning target volume (PTV) was studied by changing the depth of the normalization point. The normalization point is a point that is supposed to receive 100% of the prescription dose.

The Treatment planning system (TPS) alters the amount of radiation until this point receives the prescribed dose. The normalization point is positioned in four various locations.

The locations of the four points were as follows:

- P1: Below the skin surface.
- P2: Isocenter
- P3: Middle of isocenter and chest wall.
- P4: Border between the lung and chest wall.

The dose distributions with these points were compared. The dose distribution and Dose Volume Histogram (DVH) was calculated for PTV, mean lung (D mean lung), V20 of lung (V20 is the percentage of lung volume that has received a dose of 20 Gy or more) and mean dose to heart for each of the four plans. In this study for data analyses, SPSS statistical software, version 20 was used.

III. FINDINGS

The average PTV dose received by optimization at P1, P2, P3&P4 was 49.46 Gy, 49.61Gy, 49.11Gy & 52.01Gy respectively. As depicted in table 1 Points P1, P2 and P3 have almost similar mean dose to PTV, which is acceptable as per International Commission for Radiological Units (ICRU 62).

The average of mean heart dose received by all patients was 5.07 Gy in P1, 4.85 Gy in P2, and 5.0 Gy in P3 and 5.86 Gy in P4 (Table 2). The variation in mean heart dose between these points was 17% with 1.01 Gy absolute decrease in mean heart dose by simple method of optimization. The same fact is illustrated for lung dose. The mean lung dose was 10.17 Gy to P1, 9.97 Gy to P2, 10.62 Gy to P3 and 10.63 Gy to P4 respectively. While V20 for P1 was 18.93%, P2 18.63%, P3 19.84% and P4 19.60% (Table 3). The mean lung dose and the V20 lung have both decreased at P2 by 6.20% and 1.21%

IV. DISCUSSION

Following BCS in early stage breast cancer, for all risk groups RT halves the rate of local recurrence and decreases breast cancer mortality by one sixth. For every four women prevented to have local recurrence, one woman is saved 4:1 ratio [3]. The mean heart and left anterior descending coronary artery doses are greatest when left breast is treated, causing an increased risk of cardiac mortality when compared to right breast [10].

To decrease risk of cardiac toxicity, three-dimensional conformal radiotherapy (3DCRT), Intensity Modulated Radiotherapy (IMRT), Breath Controlled or Gated treatment techniques have been used. Several studies have demonstrated that IMRT planning provides better homogeneity and improved dose coverage to target volume with reduced dose in cardiac, lung and contralateral breast than 3DCRT [11,12]. Previous use

of cardio toxic chemotherapy, and targeted therapy further add to cardiac morbidity [13]. Organ movements secondary to respiratory motion are one of the main concerns during RT. IGRT is especially helpful to manage inter and intra fraction motion thereby protecting normal tissues. Breath hold strategies like Deep Inspiratory Breath Hold (DIBH) have shown greatest promise in reducing heart doses. DIBH can reduce the projected increased risk of heart disease by 13.6% and reduce projected percentage increase in the rate of major coronary events by 25% [14].

Exposure to Radiotherapy for breast cancer increase the rate of major coronary events linearly with mean dose received by heart, i.e. 7.4% per Gray with no apparent threshold [9]. The increased risk of cardiac mortality and morbidity due to radiation exposure is reported to be dose dependent [9, 15]. It is estimated that there is a 4% increase in the risk of heart disease for each 1 Gy increase in mean heart dose [15]. Hence the mean dose to the heart has to be given priority during radiotherapy planning. Even subtle decrease in the mean dose to the heart can decrease major coronary events, thereby transforming into long term gain for patients. If it is important for the physician to reduce the dose received by the lung and heart, optimization of plan by normalizing at various points is suggested since in this method average received dose to heart and lung have been reduced in comparison to other methods. In optimization of tangential field all methods cover PTV. Thus selection of normalization point in radiotherapy planning, which is done regularly in day to day practice should be done carefully to minimize mean heart dose without compromising target volume.

V. CONCLUSION

Optimization of tangential fields by normalization at suitable point in the target volume can be a useful tool for decreasing mean heart dose during breast radiotherapy especially at recourse constrained centers.

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Figure 1: Digitally Reconstructed Radiograph of a patient with left sided Breast Conservative Surgery in treatment position showing target volume and organs at risk in heart and lung.

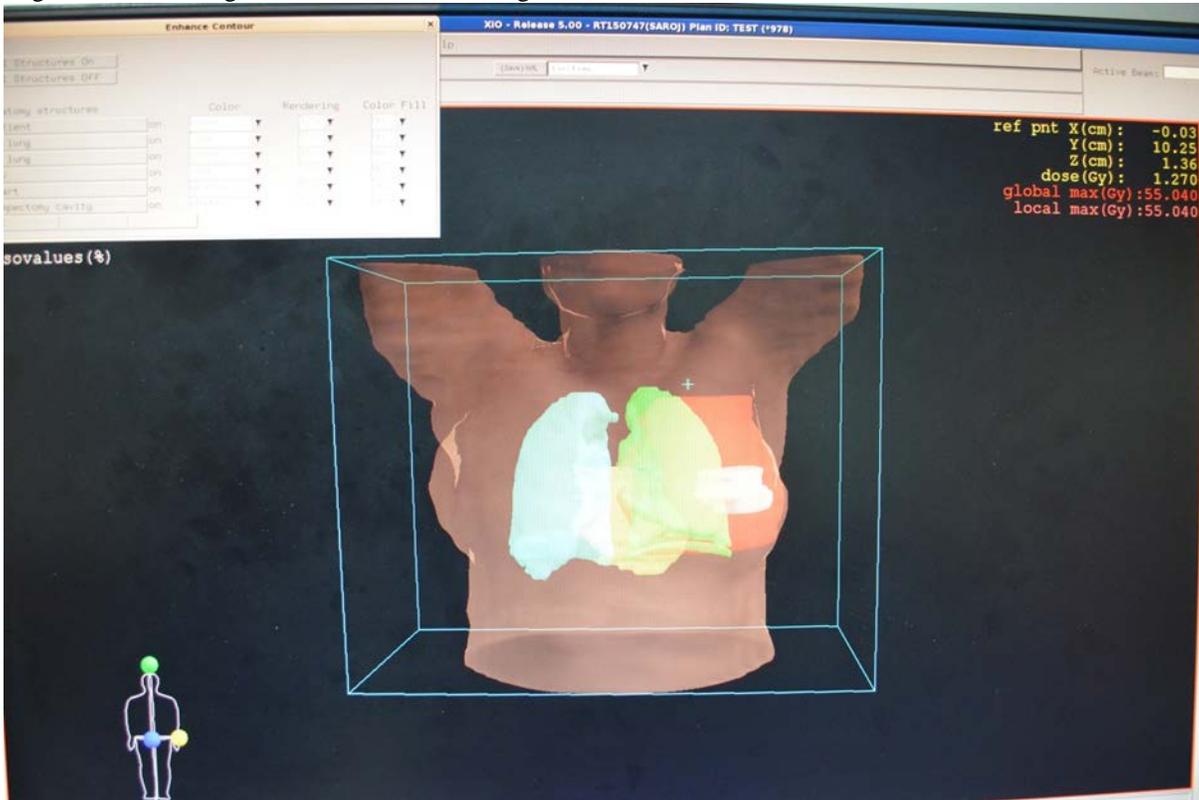


Figure 2: Wedged Tangential field RT plan optimized at various points P1,P2,P3,P3,P4.



Figure 3: Comparison of two plans in terms of dose to target and heart as depicted with solid and dotted line on DVH.

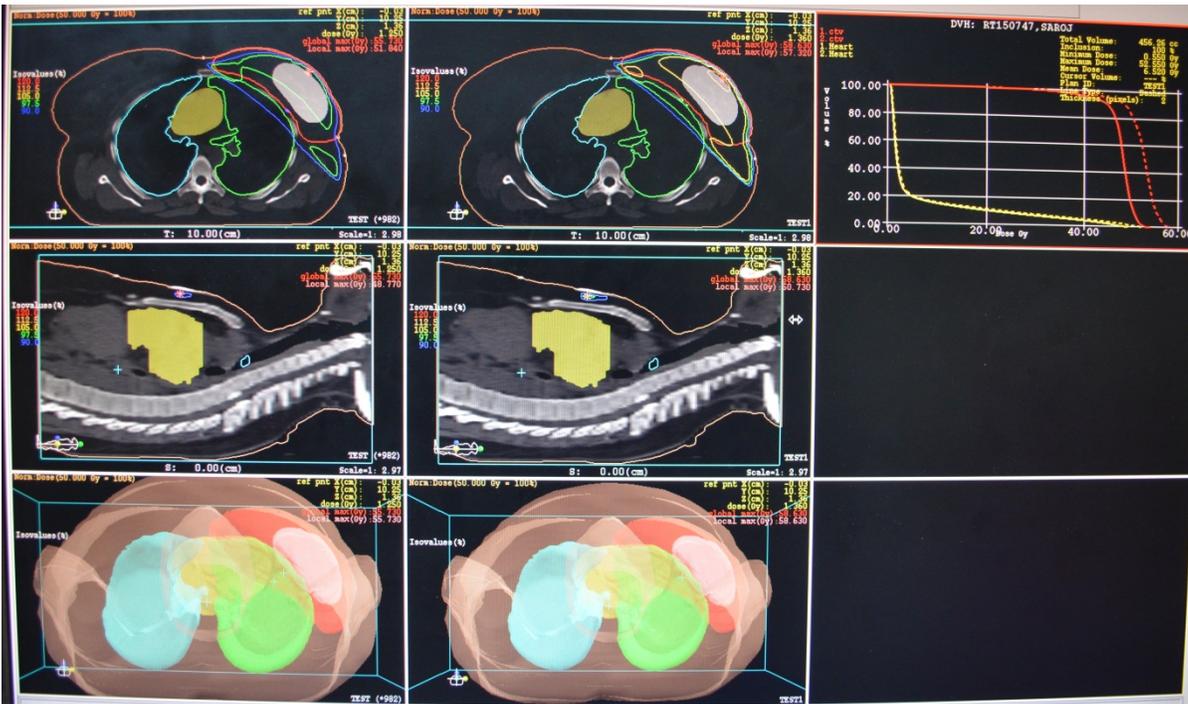


Table 1: Showing Average of mean PTV dose received by 20 pts at various points of normalization

Optimization Point	Mean Dose to PTV(Gy)
P1	49.46
P2	49.61
P3	49.11
P4	52.01

Table 2: Showing Average of mean heart dose received by 20 pts at various points of normalization.

Optimization Point	Average Mean Dose to the Heart(Gy)
P1	5.07
P2	4.85
P3	5.0
P4	5.86

Table 3: Showing Average of mean Lung dose (D mean) and V20 received by 20 pts at various points of normalization

Optimization Point	D mean Lung(Gy)	V20 Lung(%)
P1	10.17	18.93
P2	9.97	18.63
P3	10.62	19.84
P4	10.63	19.60

Attitude and Nursing Care Practices among primary care nurses before and after Structured Nursing Care Rounds

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Abstract- This article presents the findings from a pre-test post-test two group comparative study that was conducted in six medical surgical wards, as part of a pilot study for a much larger investigation. This research explored the effect of implementing the Structured Nursing Care Rounds (SNCR) on primary care nurses' attitude and perceptions of nursing care practices. Its goal was to engage front-line hospital nurses for improving the quality of nursing care practices and the patient's experience of care. Primary care nurses' role was of vital importance in SNCR implementation. During hourly visits, bedside care were bunched up and viewed as a package of '9 P's' interventions. Nurses in participating units completed the Nurses' Attitude Scale (NAS) and Nurses' Modus Operandi Scale (NMOS) prior to the two weeks training period and after four weeks period during which structured nursing care rounds were conducted in the intervention wards. Total NAS score significantly improved in primary care nurses of intervention wards during the SNCR implementation period (pre-29.80±2.28; post-54.10±1.82, p= ≤0.001**). Total NMOS score in the intervention group significantly lifted with SNCR implementation (pre-77.96 ±5.61; post-102.0 ±3.84, p= ≤0.001**).

Index Terms- nursing care practices, primary care nurses, structured nursing care rounds

I. INTRODUCTION

An early evidence-based framework that stretches as far back as the 1860s with Florence Nightingale is that 'regular rounding' on hospitalized patients. The attributes of Nightingale-style rounds are noteworthy feature of nursing profession that she spent many hours in the wards, checked on each patient, gave personal care to the wounded, provided measureless amount of compassion and while making rounds on patients, she established her image as the "Lady with the Lamp"¹. Nurse rounding in literature is "nursing staff visiting each patient on a predetermined schedule"². The effects of nurse rounding has been documented in previous studies as improving the overall quality of care, reducing a adverse events such as patient falls, and improving both nurse and patient satisfaction with care³⁻⁵. Nightingale style rounds and innovative thinking are always indispensable in modern nursing in order to provide quality cares that help one patient overcome a troublesome symptom, other times, benefits millions of patient's system world wide⁶.

Need for the study: On the suggestions of growing body of evidence that more nursing time per patient results in better patient outcomes⁷, the researcher embraced an evidence-based hourly nurse rounding model⁸⁻⁹ named Structured Nursing Care Rounds (SNCR), a bottom-up approach that empowered primary care nurses to suggest, test and implement new ways to improve patient care practices. The goals of hourly visits to patients were to increase the time nurses spend in direct patient care; to improve quality, reliability and safety of patient care, to create patient-centred care and to reduce errors and adverse events¹⁰⁻¹². However, there has been less attention on ensuring visible nursing presence hourly during the day and second hourly in the night as far as local setting was concerned and also no previous studies have attempted to relate the effect of regular nursing care visits on nurses' attitude and perception of nursing care practices.

Purpose of the study: The purpose of this study was to reach at valid conclusions about relationship between structured nursing care rounds (independent variable) and primary care nurses' attitude and nursing care practices (dependent variables) in a tertiary care hospital inpatient setting.

Statement of the Problem

A study to assess the effect of Structured Nursing Care Rounds (SNCR) on attitude and nursing care practices among primary care nurses at one of the tertiary care hospital, Kerala.

Objectives of the study

1. To assess attitude towards SNCR in experimental group at pre and post-test level
2. To compare attitude scores in experimental and control group at post-test level
3. To assess nursing care practices in experimental group at pre and post-test level
4. To compare nursing practices in experimental and control group at post-test level

Hypotheses

1. There is significant difference in attitude towards SNCR among experimental group of nurses as represented by their pre and post-test mean scores
2. There is significant difference in nursing care practices among experimental groups of nurses as represented by their pre and post-test mean scores

- There is significant difference in nursing care practices between experimental and control groups as represented by their post-test mean scores

II. MATERIALS AND METHODS

Research approach and Design: Pre-test post-test comparison group quasi experimental research design attempted to determine the effect of structured nursing care rounds on primary care nurses' attitude and nursing care practices. This design enabled the researcher to test the research hypotheses by exposing a comparison group that was similar to the experimental (structured nursing care rounds wards) group as possible. The purpose of the control group was to discern the effect of nursing rounds in contrast to the usual changes in routine care occur coupled with advancement of time.

Setting: The study was conducted in six medical surgical wards of tertiary care hospital, Kerala. The experimental and control wards were with similar medical surgical patient loads at the time of study implementation.

Sample and Sampling Process: In this design the wards were randomly assigned at 1:1 ratio to experimental and usual conditions. The study subjects were total enumeration sample of registered nurses (Experimental n=30; control n=22) working full time in the participating medical surgical wards: one group engaged with structured nursing care rounds and another group that maintained usual care.

Ethical Considerations: Ethical principles that governed the study process were that the study was approved by Institutional Ethics Committee, all nurses who participated in the study were those who actually agreed to complete the study, nurses were approached with a full description of the study and its aim, after which the nurses were free to participate in the study or reject and confidentiality of the nurses was protected throughout the study.

Data Collection Tools: Two tools were designed specifically to collect data of the study objectives. The first tool NAS, a Likert type scale consisting of 12 items was used to collect quantitative data for both pre- & post-test phases of the education in order to measure the attitude level of the primary care nurses regarding structured nursing care rounds. This scale had few negatively keyed items (reverse scoring) in which the numerical scoring scale runs in the opposite direction. The

second tool, NMOS¹³ was similar in SNCR content to obtain score on nursing care practices among primary care nurses. This was developed by the researcher after reviewing the related literature and consisted of 28 items of actions integrated into workflow of primary care nurses during structured nursing care rounds.

Intervention: Intervention was a structured nursing care rounds which incorporated nine specific actions intended to engage primary care nurses with hourly patient visits during the day and every two hours at night without disturbing their rest and sleep. The nine components were: Person, Plan, Performing scheduled tasks Position, Priorities, Phlebitis, Pain, Patient education and Presence. Actions integrated into workflow of nursing staff members during rounds included person-centred approach by introducing the patients to nursing personnel and nursing personnel to patients, informed the plan for frequent visits to provide excellent care, performed scheduled tasks during which they also determined risks for fall and pressure ulcer, met the nutritional, hygienic and environmental needs, observed for the IV related phlebitis, conducted pain assessment and managed the need for pain medication, imparted health education and supplemented discharge process. At the end asked: Is there anything I can do before I leave? Nurses told the patients that any one member of the nursing team will be back in one hour to check on them again.

Training: Formal staff education developed by the researcher after reviewing the related literature and actual practice in the local set up, was conducted at convenient times in each of the units included 6 hours for every 10 nurses. Ward-level mentoring support including discussions, clarifications, behavioural prompts like gestures and words at rounds were also included in fixing the new model of care into their scheduled work being done.

Data collection: Baseline data was collected during first four weeks from primary care nurses of six medical surgical wards. After two weeks of training on structured nursing care rounds, nursing staff of experimental wards performed structured nursing care rounds at one-hour during the day and two-hour intervals using a protocol that incorporated nine specific actions into unit work flow and also from another three medical surgical control wards in which primary care nurses continued with usual care. Post-test was completed at the end of 4th week.

III. RESULTS

Table 1. Attitude towards SNCR in experimental group at pre and post-test level

Exp: Group (n=30)	Category	f	%	Mean	SD	Mean difference	Paired 't' value	p value
Pre-test	Disagree	8	36.4	29.80	2.28	24.60	42.50	≤0.001**
	Neither agree nor disagree	14	63.6					
	Agree	0	0					
Post-test	Disagree	0	0	54.10	1.82			
	Neither agree nor disagree	0	0					
	Agree	30	100					

As for the attitude towards SNCR implementation in the experimental group, **table 1** shows that pre-test mean score among primary care nurses was 29.80 ± 2.28 and that rose to 54.10 ± 1.82 at post-test level. The calculated 't' value obtained was greater than the table value at $0.001(p \leq 0.001^{**})$ level of

significance. Hence it was inferred that there is significant improvement in the attitude towards working with SNCR among the primary care nurses. Furthermore, after intervention the entire sample (100%, n=30) had agreement to SNCR practice.

Table 2. Attitude scores in experimental and control group at post-test level

Group	Category	f	%	Mean	SD	Mean difference	't' value	p value
Experiment (n=30) Post-test	Disagree	0	0	54.10	1.82	24.37	47.79	$\leq 0.001^{**}$
	Neither agree nor disagree	0	0					
	Agree	30	100					
Control (n=22) Post-test	Disagree	6	27.3	29.72	1.80	24.37	47.79	$\leq 0.001^{**}$
	Neither agree nor disagree	16	72.7					
	Agree	0	0					

For a comparison between experimental and control groups with regard to attitude scores towards SNCR at post-test level, as noticeable in **table 2**, mean post score in experimental group of primary care nurses was 54.10 ± 1.82 . In the same period, mean post score in control group was 29.72 ± 1.80 . The

calculated 't' value obtained was greater than the table value at $0.001(p \leq 0.001^{**})$ level of significance. Hence it is inferred that there is significant increase in attitudes working with SNCR among the primary care nurses.

Table 3. Nursing care practice scores in experimental group at pre- to post-test level

Experimental Group (n=30)	category	f	%	Mean	SD	Mean difference	Paired 't' value	p value
Pre-test	Poor	0	0	77.96	5.61	24.03	17.69	$\leq 0.001^{**}$
	Average	19	63.3					
	Good	11	36.7					
Post-test	Poor	0	0	102.0	3.84	24.03	17.69	$\leq 0.001^{**}$
	Average	5	16.7					
	Good	25	83.3					

It is distinguishable from **table 3** that the mean score on nurses' perception of nursing care practices after SNCR rose to 102.0 ± 3.84 from pre-test mean score 77.96 ± 5.61 . The calculated 't' value obtained was greater than the table value at $0.001 (p \leq 0.001^{**})$ level of significance. Results indicate that SNCR has strong influence on quality of nursing care practices

as perceived by primary care nurses. It is also evident that with SNCR an overwhelming majority (83%, n=25) of sample perceived nursing care practice was 'good' when compared to pre-implementation phase where majority of the sample (63.3%, n=19) perceived quality of nursing care delivery is only 'average'.

Table 4. Comparison of experimental and control groups at post-test level

Group	category	f	%	Mean	SD	Mean difference	't' value	P value
Experimental n= 30	poor	0	0	48.31	3.27			
	average	5	16.7					

	good	25	83.3			53.68	52.93	≤0.001**
Control n= 22	poor	0	0	102.0	3.84			
	average	22	100					
	good	0	0					

Table 4 testifies that post-test mean score on nursing care practices in intervention group was 102.0 ±3.84 and in the control group, it was only 48.31 ±3.27. The calculated 't' value obtained was greater than the table value at 0.001 (p= ≤ 0.001**) level of significance. Hence it may be inferred that the significant increase in nursing care practices was the effect of SNCR.

IV. CONCLUSION

This study assessed the effect of engaging primary care nurses with structured nursing care rounds on their attitude and perception of nursing care practices. The findings generally point to significant improvements in these two variables. The results are fascinating and propose that an improved attitude towards structured nursing care rounds may lead to reorganized nursing care practices among primary care nurses in hospitals. However, further research is needed that uses larger sample and an extended period of time, to test cause and effect relationships. It will be important to measure outcomes of this practice within each of the medical surgical wards of the study hospital in order to generate in-house evidence for promotion of this practice in similar settings.

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Bibliometric analysis of “IEEE Transactions on Electromagnetic Compatibility”: 2010-2015

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Abstract- Analysis of 982 research papers published in the Journal “IEEE Transactions on Electromagnetic Compatibility” during the period 2010-2015 has been carried out. The data was collected from the archives of the journal available in online form. This paper examines the articles for year wise growth of the articles published, authorship pattern, degree of collaboration, subject wise distribution of articles, average number of references per article etc.

Index Terms- Bibliometrics, authorship pattern and degree of collaboration

I. INTRODUCTION

Bibliometrics is an important tool for quantitative analysis of the research output produced by researchers. The term Bibliometrics was first coined by Pritchard (1969). Earlier Coles & Eales (1917) used the term “Statistical Analysis” for similar kind of study. Hulme (1923) used the term “Statistical Bibliography” for mapping the literature in graphical way. Dr. S. R. Ranganathan (1969) used the term “Librametry” for the study related to library and its services, applying statistical approaches. Pritchard used the term Bibliometrics to describe “all 'studies which seek to quantify the process of written communication’”. Fairthorne (1969) defined it as “The quantitative treatment of the properties of recorded discourse and behavior pertaining to it”. In other words Bibliometrics is the statistical analysis of bibliographic data, commonly focusing on citation analysis of research outputs and publications.

According to Organization for Economic Co-operation and Development(OECD) “Bibliometric analysis use data on numbers and authors of scientific publications and on articles and the citations therein (and in patents) to measure the “output” of individuals/research teams, institutions, and countries, to identify national and international networks, and to map the development of new (multi-disciplinary) fields of science and technology”. Researchers publish their research outputs in various journals. Bibliometric study of these journals helps us to find out the trend in the publication for making decisions. The factual inferences can be used to identify top performing journals in subject areas, top researchers in subject areas, trends in authorship and collaboration in research publications by scientists, citation studies and soon. Bibliometric methods which are commonly used by researchers to measure different aspects of publication are content analysis and citation analysis.

The present study uses content analysis method to identify the trend in papers published in IEEE Transactions on Electromagnetic compatibility during the period 2010-2015.

II. IEEE TRANSACTIONS ON ELECTROMAGNETIC COMPATIBILITY

IEEE Transactions on Electromagnetic compatibility is a peer-reviewed scientific journal published by IEEE Electromagnetic Compatibility Society. It is a bimonthly journal (ISSN No. 0018-9375) which publishes original and significant work of authors in field of electromagnetic compatibility (EMC). It also publishes special issues related to the subject apart from regular issues. The major subject area covered includes Electromagnetic Environments; Interference Control; EMC and EMI Modeling; High Power Electromagnetic; EMC Standards, Methods of EMC Measurements; Computational Electromagnetic and Signal and Power Integrity, Transmission Lines; Electrostatic Discharge and Lightning Effects; EMC in Wireless and Optical Technologies; EMC in Printed Circuit Board and System Design etc. The journal has Impact factor 1.297, Eigen factor 0.00508 and Article influence score 0.466.

III. OBJECTIVES OF THE STUDY

1. To determine the year wise distribution of articles.
2. To study subject wise coverage of journal articles.
3. To study the authorship pattern.
4. To study the length of journal articles.
5. To study number of references versus number of articles.

IV. LITERATURE REVIEW

Dr. Thanuskodi carried out Bibliometrics analysis of the journal titled “*Library Herald*” published during 2006-2010. The studies showed that out of 138 articles 72(52.17%) articles were single authored while 66(47.83%) articles were contributed jointly. It also showed that (89.85%) were from India and the rest (10.15%) were contributed from foreign sources.

Sujatha and Padmini analyzed 3442 papers published in the journal *IEEE Transactions on Antennas and Propagation* during the period 2010-2014. They found that on an average 688 papers are published annually between the above said period. Number of publications in the journal from Indian authors was found to be very less as compared to European and Western countries.

Jena studied papers published in *Indian Journal of Fiber and Textile Research* for the period of 1996-2004. The study shows

an increasing trend of articles from the year 1996 till 2004. The average citations per article were found to be 16.00. The average length of article is 6.45 pages.

Hazarika, Goswami and Das analyzed bibliometric trend of the Journal *Indian Forester* during the period 1991-2000. Study revealed that multiple authorship papers were dominant in the Journal (64.55%) followed by single author (35.45%) and double author (31.03%). Average length of papers showed that 45.29% papers covers 4-6 pages followed by 7-9 pages (27.96%) which shows the ideal length of a research paper.

Roy and Basak examined articles published in *Journal of Documentation* for authorship pattern, degree of collaboration, geographical distribution of papers and citation analysis. The studies found that majority of papers are multi-authored. The degree of collaboration is found to be 0.51. Contribution of authors from United Kingdom was highest. The average citation per paper was 43.

Santhi and Jeyachitra studied papers published in IEEE Transactions on Control systems Technology from 1998-2007. Study was carried out for each cited reference on following point – Number of authors, type of document, continent of origin of the document etc. The study revealed that one paper contribution constituted 85.4 percent of total output and the authors who have contributed 5-21 paper constitute 0.43% alone. The above study supports the fact that when the number of published paper increases, the number of contributed author decreases.

Paramasivam and Venkatachalam examined the journal titled “*The Indian concrete*” Journal from January 2012 to December 2012. The study revealed that maximum number of papers have been written by 23(39%) of two authors in the articles contribution, which shows collaborative research practice in The Indian Concrete Journal articles are mostly cited from

Journals, Books, Conferences, Proceedings and Technical Reports, ASTM standards .

Kumar & Moorthy carried out Bibliometrics analysis of DESIDOC Journal of Library & Information Technology during 2001-2010. According to the study maximum numbers of papers were published in 2008 & 2009. The maximum number of single authored papers was 37.6% followed by two authored papers with 36.9%.

V. METHODOLOGY

Six volumes, Vol. (52-57) containing 32 issues and 982 papers of *IEEE Transactions on Electromagnetic Compatibility* published during the year 2010 - 2015 are considered for the study. The data collected has been studied by applying filters on basis of different criterion. Quantitative techniques have been adapted for the study. The journal is analyzed for number of issues and papers published, number of authors, number of references, year wise growth in papers, subject wise coverage of articles for the period of study.

VI. ANALYSIS OF THE STUDY

- a) **Year wise distribution of papers:** Total 982 research papers were published by the journal with 6 volumes and 32 issues during the period of study (6 years). Maximum no. of papers published in 2015 with 209(21.28 %) while lowest in the year 2010 with 118(12.01%). There is increasing trend in publication of articles from the year 2010 to 2015. Table no. 1 shows distribution of issue wise and volume wise publication of papers for the period of study.

Table No. 1- Year wise distribution of articles

S. No.	Vol	Year	Issue No.1	Issue No. 2	Issue No. 3	Issue No. 4	Issue No.5	Issue No.6	Total	Percentage
1	52	2010	27	24	31	36	-	-	118	12.01
2	53	2011	34	36	36	28	-	-	134	13.66
3	54	2012	31	29	25	24	27	17	153	15.60
4	55	2013	24	20	23	23	23	50	163	16.60
5	56	2014	28	30	28	31	30	58	205	20.87
6	57	2015	18	19	40	33	45	54	209	21.28
	Total No. of articles		162	158	183	175	125	179	982	100

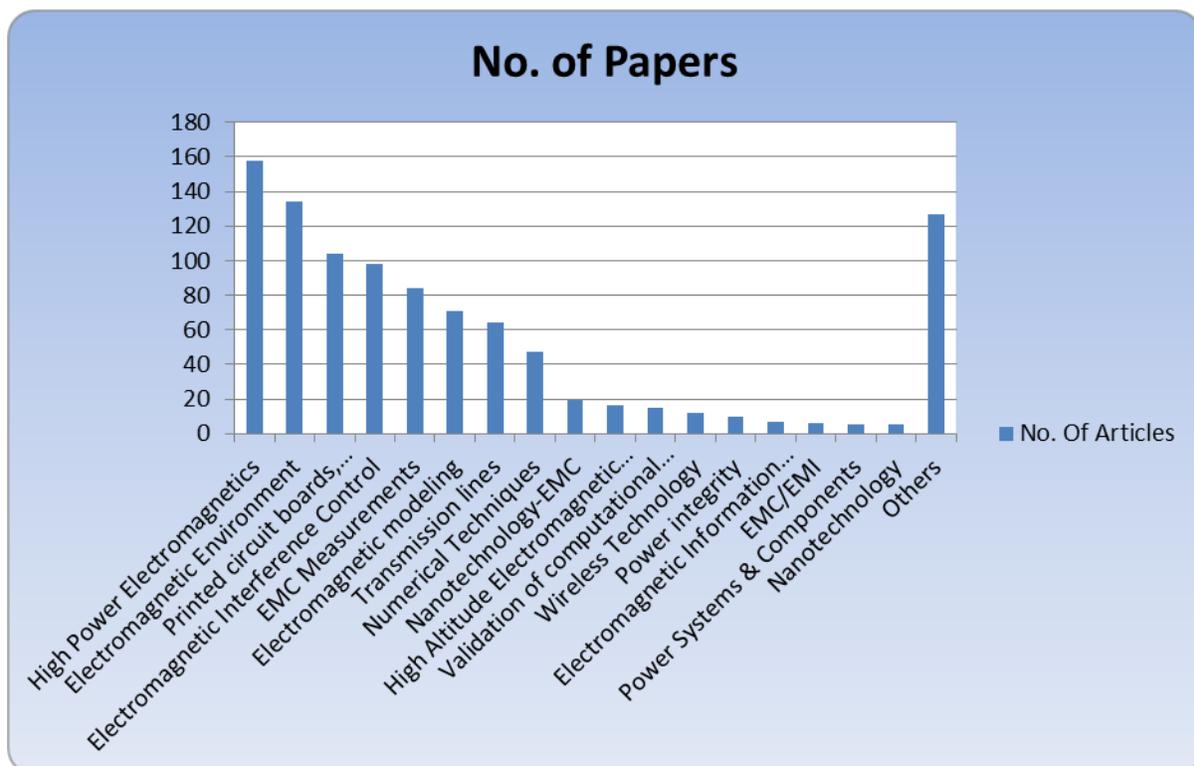
- b) **Subject wise coverage of journal papers:** IEEE Transactions on Electromagnetic Compatibility publishes papers on all aspects of electromagnetic. Table No.2 and Figure 1 reveals that maximum numbers of papers published were on the subject High Power Electromagnetic (16.07%) followed by Electromagnetic Environment (13.62%), Printed circuit boards,

Interconnect and signal integrity (10.58%), Electromagnetic Interference Control (9.96%), and EMC Measurements (8.82%). The journal covers all the domains of electromagnetic and this is what is reflected from the no. of papers published on the subject.

Table No. 2. Subject wise coverage of journal articles

S. No.	Subject	No. of Papers	Percentage
1	High Power Electromagnetic	158	16.07
2	Electromagnetic Environment	134	13.62
3	Printed circuit boards, interconnects & signal integrity	104	10.58
4	Electromagnetic Interference Control	98	9.96
5	EMC Measurements	84	8.82
6	Electromagnetic modeling	71	7.22
7	Transmission lines	64	6.5
8	Numerical Techniques	47	4.78
9	Nanotechnology-EMC	19	1.92
10	High Altitude Electromagnetic Pulse(HEMP)	16	1.61
11	Validation of computational electromagnetic	15	1.5
12	Wireless Technology	12	1.2
13	Power integrity	10	1
14	Electromagnetic Information Security	7	0.7
15	EMC/EMI	6	0.6
16	Power Systems & Components	5	0.5
17	Nanotechnology	5	0.5
18	Others	127	12.92
19	Total	982	100

Figure 1- No. of Papers Vs No. Of Subjects



c) **Year-wise Authorship pattern:** Table No. 3 reveals that out of 982 papers single authored contribution is 64(6.51%) while the remaining 918(93.49%) papers were contributed jointly.

Collaborative research is important feature of research in every field and also in this journal. Table No. 3 & Table No. 4 shows the authorship pattern of papers published during the period 2010 to 2015. Maximum number of papers i.e. 223 (22.70%) is contributed by 3 authors

followed by two authors with 212(21.60%), 4 authors 200(20.38%). 165 papers (16.80%) were contributed by more than 6 authors followed by 118 papers (12.01%) contributed by 5 authors and lastly only 64 papers (6.51%) contributed by single authors. The study shows that joint authorship is most preferred way of publication of the papers in the journal "IEEE Transactions on Electromagnetic Compatibility" during the period of study.

Table No. 3. Year-wise Authorship pattern

Authorship	Year						Total	Percentage (%)
	2010	2011	2012	2013	2014	2015		
Single	10	12	15	13	6	8	64	6.51
Joint	108	122	138	150	199	201	918	93.49
Total	118	134	153	163	205	209	982	100

Table No. 4. Authorship Pattern

Authors	2010	2011	2012	2013	2014	2015	Total	Percentage (%)
1	10	12	15	13	6	8	64	6.51
2	21	39	30	40	51	31	212	21.60
3	27	33	29	34	53	48	223	22.70
4	27	21	35	31	34	52	200	20.38
5	12	15	13	21	29	28	118	12.01
more than 6	21	14	31	24	32	42	165	16.80
Total	118	134	153	163	205	209	982	100

Degree of Collaboration (DC): The DC gives the proportion of multiple authored papers, as measures of strength of collaboration in a discipline. The DC can be interpreted as a degree that lies between 0 and 1. It gives a zero weight to single-authored papers and does not differentiate among levels of multiple authorships. The DC equals 1 for maximal collaboration.

Table 4(a) shows the degree of collaboration in the discipline of Electromagnetics. The degree of collaboration of authors in the papers may be counted based on the formula given by Subramanyam in 1983.

$$C = \frac{N_m}{N_m + N_s}$$

Where C= degree of collaboration in the discipline
 N_m= number of multi-authored papers
 N_s= number of single authored papers

$$C = \frac{918}{918 + 64}$$

$$C = 0.93$$

Table No. 4(a) Degree of Collaboration

Year	N _s	N _m	N _m + N _s	DC
2010	10	108	118	0.915
2011	12	122	134	0.910
2012	15	138	153	0.901
2013	13	150	163	0.920
2014	6	199	205	0.970
2015	8	201	209	0.961
Total	64	918	982	0.934

The degree of collaboration shows that research in the field of Electromagnetic compatibility is predominant by team research. Table 4(a) represents degree of collaboration over the years from 2010- 2015. It is observed that the degree of collaboration in the “IEEE Transactions on Electromagnetic Compatibility” varies from 0.901 to 0.970 which is very high. In the present study the average value of C is 0.94.

As a result, the degree of author collaboration in the journal under study clearly indicates its dominance on multiple author contributions.

- d) **Length of Articles:** Table no. 5 reveals that the majority of papers 433(44.10%) have the length 9-12 pages followed by 396(40.33%) with the length 5-8 pages, 106(10.79%) with 1-4 pages while the remaining 47 (4.78%) papers have the length of 13 or more than 13 pages.

Table No. 5 - Length of Articles

Pages	Year						Total	Percentage
	2010	2011	2012	2013	2014	2015		
1-4	9	15	23	17	19	23	106	10.79
5-8	53	51	51	79	84	78	396	40.33
9-12	47	61	66	58	97	104	433	44.10
13 & more	9	7	13	9	5	4	47	4.78
Total	118	134	135	163	205	209	982	100

- e) **Number of references versus number of papers:** The table shows that in the year 2010 the references were 3002 but next year it came down to 2768 but since then there is gradual increase in the number of references listed in articles from 2010 to 2015, maximum number of 5047(24.14%) references in the year 2015. This also indicates that as there is increase in number of papers

in the journal there is increase in no. of references. The average references per article are also reflected in same way, i.e. for the year 2011 it came down to 20.65 from 25.44 in previous year. Later on there was gradual increase till 2014 to 24.53 and in year 2015 it again came down to 24.14.

Table No. 6- Number of references versus number of papers

Year	Vol.	No. of references in issues						Total	Total No. of articles	Average Ref per article	
		1	2	3	4	5	6				
2010	52	677	837	701	787	-	-	3002	118	25.44	
2011	53	665	674	815	614	-	-	2768	134	20.65	
2012	54	704	740	532	663	555	345	3539	153	23.13	
2013	55	634	444	628	673	440	1135	3954	163	24.25	
2014	56	694	691	727	744	748	1425	5029	205	24.53	
2015	57	511	399	989	766	1145	1237	5047	209	24.14	
								Total References	23339	982	142.14/6 =23.69

VII. SUMMARY & CONCLUSIONS

It published 982 papers during the span of 6 years from 2010 to 2015 with maximum number of papers in the year 2015 and an average of 163 papers per year. It has been found that largest numbers of papers were published in issue no. 3, 6 and 4. The

Journal published 713 papers in core areas of electromagnetic like High Power Electromagnetic (158), Electromagnetic Environment (134), Printed circuit boards, Interconnects & signal Integrity (104), Electromagnetic Interference control (98),

EMC Measurements (84), Electromagnetic modeling (71), Transmission Lines (64). These are the fields which received highest attention in research justifying the journal title "Electromagnetic Compatibility". Majority of papers 223(22.7%) were contributed by 3 authors.

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Solution of Partial Differential Equations with Variables Coefficients Using Double Sumudu Transform

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Abstract- In this paper, we study the properties of sumudu transform and double Sumudu Transform and solve the partial differential equation with variables Coefficient By using Double sumudu transforms. The applicability of this relatively double sumudu transform is demonstrated using some special functions. Double sumudu transform method is a strong method to solve such PDEs

Index Terms- doubles Sumudu Transform, Inverse doubles Sumudu Transform, Laplace transform, partial differential equations,

I. INTRODUCTION

Sumudu transform is the integral transform of similar Laplace transform part, introduced in the early 1990s by Gamage K. Watugala [4] to solve differential equation. It is equivalent to the

$$\mathcal{L}[f(t)] = \int_0^{\infty} e^{-st}f(t)dt, \text{Re}(s) > 0, \tag{1}$$

And the sumudu transform

$$A = \left\{ f(t) \exists M, \tau_1, \tau_2 > 0, \left| f(t) \right| < Me^{\frac{t}{\tau_1}}, \text{if } t \in (-\tau_1) \times [0, \infty), \right\} \tag{2}$$

$$\text{By } F(u) = S[f(t)] = \int_0^{\infty} f(ut)e^{-t}dt, u \in (-\tau_1, \tau_2) \tag{3}$$

The Double Sumudu Transform

Sumudu transform gives a clear and relatively unified way for the introduction of a double Sumudu transform, gave that function has a power series transformation concerning its variables. Double Laplace Transform technique of function of two variables identified in the positive quadrant of the xy-plane [see 4] is given by

$$\mathcal{L}_2[f(x,y); (p, q)] = \int_0^{\infty} \int_0^{\infty} f(x,y)e^{-(px+qy)} dx dy, \tag{4}$$

As p and q are the transforms of the variables x and y, straight.

Definition

Let $f(t, x); t, x \in \mathbb{R}_+$ be a function that can be expressed shaped an infinite series close, then, the double Sumudu r transform is given by

Laplace transform replaced with $p = 1/u$. The Sumudu transform, from these features, displayed in this paper, is yet not widely known, nor used. The Sumudu transform may be applied to determine problems without resorting to a different frequency domain. In 2003, Belgacem et al. gave it to be the theoretical dual to the Laplace transform; also, therefore .It comes from this fact our interest in this new doubles Sumudu transform. Certainly can cure most problems (may be of an integral, differential, or the nature of the control engineering). The hat would normally be handled by the well-known and used widely Laplace transform [3]. Since this is a new transform it has very distinctive and useful properties. It can help with complex applications in science and engineering. The transform would also be a natural choice for solving the problems scale and units preserving requirements. For that, our goal is applications. We point out that the Laplace transform is defined by,

$$\begin{aligned}
 F(u, v) &= S_2[f(t, x); (u, v)] = S[S\{f(t, x); t \rightarrow u\}; x \rightarrow v] \\
 &= \frac{1}{uv} \int_0^\infty \int_0^\infty e^{-\left(\frac{t}{u} + \frac{x}{v}\right)} f(t, x) dt dx
 \end{aligned} \tag{5}$$

We offer Sumudu double applications converted to some functions that relate to those obtained in the solution formulas for the dynamics of population age structure. However, it is a frivolous practice to demonstrate that double Sumudu and Laplace transformations are also a dual theory. That is

$$F(u, v) = \mathcal{L}_2 \left[f(x, y); \left(\frac{1}{u}, \frac{1}{v} \right) \right] \tag{6}$$

As \mathcal{L}_2 is run double Laplace Transform technique

Theorem

let $f(x, y), x, y \in R_+$ be a real valued function, then

$$S_2[f(x + y); (u, v)] = \frac{1}{u - v} \{uF(u) - vF(v)\} \tag{7}$$

The case of $(x - y)$ is even more interesting from the viewpoint of biology, where often encountered these jobs in Mathematical Biology, with f representing the population density, x the age, and y the time, or vice-versa. The proof for the case $x \geq y$ is simple and enough, but with a tedious manipulation. Therefore, geometrically, if the line dividing the first quadrant into two equal parts represents the η -axis (the lower part being represented by Q1, and the upper part Q2), although that dividing both the second and fourth quadrants represents the ζ -axis (arrow pointing upwards) and ξ - axis (arrow from origin into the fourth quadrant), sequentially, then the test is as follows: Let f be an even function, then

While for $f(0)$ odd, we have

$$S_2[f(x - y); (u, v)] = \frac{1}{uv} \int_{Q_1} \int f(x - y) e^{-\left(\frac{x}{u} + \frac{y}{v}\right)} dx dy - \frac{1}{uv} \int_{Q_2} \int f(x - y) e^{-\left(\frac{x}{u} + \frac{y}{v}\right)} dx dy \tag{8}$$

Let

$$x = \frac{1}{2}(\zeta + \eta); y = \frac{1}{2}(\zeta - \eta)$$

Then

$$\begin{aligned}
 \int_{Q_1} \int f(x - y) e^{-\left(\frac{x}{u} + \frac{y}{v}\right)} dx dy &= \frac{1}{2} \int_0^\infty f(\zeta) d\zeta \int_0^\infty e^{-\frac{1}{2}\left(\frac{1}{u} + \frac{1}{v}\right)\zeta - \frac{1}{2}\left(\frac{1}{u} - \frac{1}{v}\right)\eta} d\eta \\
 &= \frac{uv}{u - v} \int_0^\infty e^{-\frac{\zeta}{v}} f(\zeta) d\zeta
 \end{aligned}$$

$$= \frac{uv^2}{u-v} F(u)$$

Similarly,

$$\int \int_{Q_1} f(x-y) e^{-\left(\frac{x}{u} + \frac{y}{v}\right)} dx dy = \frac{v^2 u}{u-v} F(v)$$

Hence, for f even

$$S_2[f(x-y)]; (u, v) = \frac{uF(u) + vF(v)}{u-v} \tag{9}$$

And for odd function

$$S_2[f(x-y)]; (u, v) = \frac{uF(u) - vF(v)}{u+v} \tag{10}$$

From equations (3) and (9), it is obvious that if f is an even function, then

$$(u+v)S_2[f(x-y)] = (u-v)s_2[f(x+y)] \tag{11}$$

Where a and b are positive constants (double Sumudu transform one like its equivalent is to extend the range to maintain).

Lemma Let $f(x), x \in \mathbb{R}_+$ and $H(0)$ represents the Heaviside function then

$$(i) S_2 \left[f(x)H(x-y); (u, v) = F(u) + \left(\frac{W}{v} - 1 \right) F(W) \right]$$

$$W = \frac{uv}{u+v}$$

$$(ii) S_2 \left[f(x)H(x-y); (u, v) = \left(1 - \frac{W}{v} \right) F(W) \right]$$

The proof is easy, for the case, by writing the left-hand side of the equation in (ii) as

$$\frac{1}{uv} \int_0^\infty f(x) e^{\frac{x}{u}} \int_x^\infty e^{\frac{y}{v}} dx dy$$

Integration and performance, taking into account the fact that Fubini theory, the result followed.
 Corollary 4.5

$$\begin{aligned} \text{(i)} S_2[H(x-y); (u, v)] &= \frac{v}{u+v} \\ \text{(ii)} S_2[H(y-x); (u, v)] &= \frac{u}{u+v} \end{aligned}$$

Consequently,

$$S_2[f(x)H(y-x)] + S_2[f(x)H(x-y)] = F(u) \tag{12}$$

Apply DST to partial derivatives as follows: Let $f(0, a) = F_0(a)$, then

$$S_2 \left[\frac{df}{dt} f(t, a); (u, v) \right] = \frac{1}{uv} \int_0^\infty \int_0^\infty e^{-\left(\frac{t+a}{u+v}\right)} \frac{\partial}{\partial t} f(t, a) dt da = \frac{1}{v} \int_0^\infty e^{-\frac{a}{v}} \left\{ \frac{1}{u} \int_0^\infty e^{-\frac{t}{u}} f(t, a) dt \right\} da$$

The inner integral gives (see [6]),

$$\frac{F(u, a) - f(0, a)}{u} \tag{13}$$

$$\begin{aligned} S_2 \left[\frac{\partial f(t, a)}{\partial t}; (u, v) \right] &= \frac{1}{u} \left\{ \frac{1}{v} \int_0^\infty e^{-\frac{a}{v}} F(u, a) da - \frac{1}{v} \int_0^\infty e^{-\frac{a}{v}} f_0(a) da \right\} \\ &= \frac{1}{u} \left\{ \frac{1}{v} F(u, v) - F_0(v) \right\} \end{aligned} \tag{14}$$

Also,

$$\begin{aligned} S_2 \left[\frac{\partial f(t, a)}{\partial a}; (u, v) \right] &= \frac{1}{v} \int_0^\infty e^{-\frac{a}{v}} \left\{ \frac{1}{u} \int_0^\infty e^{-\frac{t}{u}} \frac{\partial}{\partial a} f(t, a) dt \right\} da \\ &= \frac{1}{v} \int_0^\infty e^{-\frac{a}{v}} \frac{\partial}{\partial a} F(u, a) da \\ &= F_u(u, v) \end{aligned} \tag{15}$$

Alternatively,

$$\begin{aligned} S_2 \left[\frac{\partial f(t, a)}{\partial t}; (u, v) \right] &= \frac{1}{u} \int_0^\infty e^{-\frac{t}{u}} \left(\frac{1}{v} \int_0^\infty e^{-\frac{a}{v}} \frac{\partial f}{\partial a} da \right) dt \\ &= \frac{1}{u} \int_0^\infty e^{-\frac{t}{u}} \frac{1}{v} [F(t, v) - f(t, 0)] dt \end{aligned}$$

$$= \frac{1}{v} (F(u, v) - F_0(u)) \tag{16}$$

Where $F(u, 0) = F_0(u)$ and $F(0, v) = F_0(v)$. It is obvious from equations (4.14) and (5.15) that,

$$F_v(u, v) = \frac{F(u, v) - F_0}{v}$$

If u and v are equal, there is the case of DST, here in the is unique that Sumudu frequency converter, Compared to the Laplace transform [3]. Thus, the iterative Sumudu transform any particular function of two variables $f(x, y)$, for example, is defined by

$$[f(x, y); (v, u)] = S_2[f(x, y); (u, u)] = \frac{1}{u^2} \int_0^\infty \int_0^\infty e^{-\left(\frac{x+y}{u}\right)} f(x, y) dx dy. \tag{17}$$

Therefore, the SD of the general convolution function

$$f^{(2)}(x) = \int_0^x f(x-y, y) dy$$

is related to the iterated Sumudu transform as follows:

$$S[f^{(2)}(x); u] = \frac{1}{u} \int_0^\infty e^{-\frac{x}{u}} f^{(2)}(x) dx = \frac{1}{u} \int_0^\infty e^{-\frac{x}{u}} \int_0^\infty f(x-y, y) dx dy \tag{18}$$

By letting $x = s + t$ and $y = t$ in equation (18), we obtain

$$S[f^{(2)}(x)] = \frac{1}{u} \int \int_{\Omega} f(s, t) e^{-\left(\frac{s+t}{u}\right)} ds dt = u S_2[f(s, t); (u, u)] = u [f(s, t); (u, v)]$$

with the convolution integral taken in the classical sense, and $x, y, s \in \mathbb{R}^+$.

Theorem 4.1: Sumudu transform inflates the power series of factors,

$$f(t) = \sum_{n=0}^\infty a_n t^n,$$

By sending it to the power series function,

$$G(u) = \sum_{n=0}^\infty n! a_n u^n$$

Proof: Let $f(t)$ be in $G(u) = \sum_{n=0}^\infty a_n t^n$ in some interval $I \subset \mathbb{R}$, then by Taylor's function theorem,

$$f(t) = \sum_{n=0}^\infty \frac{f^{(n)}(0)}{n!} t^n$$

Therefore, by (4.3), and that of the gamma function Γ (see Table 4.1), we have

$$S[f(t)] = \int_0^{\infty} \sum_{k=0}^{\infty} \frac{f^{(n)}(0)}{n!} (ut)^n e^{-t} dt = \sum_{k=0}^{\infty} \frac{f^{(n)}(0)}{n!} u^n \int_0^{\infty} t^n e^{-t} dt$$

$$= \sum_{k=0}^{\infty} \frac{f^{(n)}(0)}{n!} u^n dt \Gamma(n+1) = \sum_{k=0}^{\infty} f^{(n)}(0) u^n$$

consequently

$$S[(1+t)^m] = S \sum_{n=0}^m C_n^m t^n = S \sum_{n=0}^m \frac{m!}{n!(m-n)!} u^n = \sum_{n=0}^m \frac{m!}{(m-n)!} u^n = \sum_{n=0}^m P_n^m u^n$$

Also a requirement that $S[f(t)]$ coincide, in an interval containing $u = 0$, is

Provided by the following conditions when satisfied, namely, that

- (i) $f^{(n)}(0) \rightarrow 0$ as $n \rightarrow \infty$
- (ii) $\lim_{n \rightarrow \infty} \left| \frac{f^{(n+1)}(0)}{f^{(n)}(0)} u \right| < 1$

This means that the convergence radius r of $S[f(t)]$ depends on the sequence $f^{(n)}(0)$,
 Since

$$r = \lim_{n \rightarrow \infty} \left| \frac{f^{(n)}(0)}{f^{(n+1)}(0)} u \right|$$

It is clear that Sumudu converter can be used in signal processing or disclosures

Theorem: Let $G(u)$ be the sumudu transform of $f(t)$ such that

- (i) $G(1/s)/s$ is a monomorphic function, with characteristics having $\text{Re}(s) < \gamma$, and
- (ii) There survives a circular area with radius R and positive steady, M and K , with

$$\left| \frac{G(1/s)}{s} \right| < MR^{-k}$$

Then the function $f(t)$ is given on using the Cauchy Residue Theorem As follows

$$S^{-1}[G(s)] = \frac{1}{2\pi i} \int_{\gamma-i\infty}^{\gamma+i\infty} e^{st} G\left(\frac{1}{s}\right) \frac{ds}{s} = \sum \text{residues} \left[e^{st} \frac{G\left(\frac{1}{s}\right)}{s} \right]$$

Definition 1: (Hassan Eltayeb,2010)

Let $f(t, x)$ and $g(t, x)$ having double sumudu transform. Then double Sumudu transform of the double convolution of the $f(t, x)$ and $g(t, x)$,

$$(f ** g)(t, x) = \int_0^x \int_0^t f(\zeta, \eta) g(t - \zeta, x - \eta) d\zeta d\eta$$

Is given by

$$S_2[(f ** g)(t, x); u, v] = uvF(u, v)G(u, v)$$

Also, in the following we discuss double Sumudu transform of partial derivative with respect to x of double convolution,

$$S_2 \left[\frac{\partial}{\partial x} (f ** g)(t, x); u, v \right] = uv S_2 \left[\frac{\partial}{\partial x} (t, x); u, v \right] = S_2 [g(t, x); u, v]$$

Or

$$uv S_2 [f(t, x); u, v] S_2 \left[\frac{\partial}{\partial x} g(t, x); u, v \right]$$

Similar to t. Thus we can conclude that the relation between double Sumudu Of convolution and double Laplace transform of double convolution can be given by

$$S_2 [(f ** g)(t, x); u, v] = \frac{1}{uv} L_t L_x [(f ** g)(t, x)]$$

To use Sumudu Transform to solve PDEs we need the partial derivatives of This Transform. Thus, application of double sumudu transform to second Partial derivatives with respect to x is given by

$$S_2 \left[\frac{\partial^2}{\partial x^2} f(t, x); u, v \right] = \frac{1}{v^2} F(u, v) - \frac{1}{v^2} F(u, 0) - \frac{1}{v} \frac{\partial}{\partial x} F(u, 0)$$

Similarly, second partial derivative with respect to t is given by

$$S_2 \left[\frac{\partial^2}{\partial t^2} f(t, x); u, v \right] = \frac{1}{u^2} F(u, v) - \frac{1}{u^2} F(0, v) - \frac{1}{u} \frac{\partial}{\partial t} F(0, v)$$

Applications

The following two samples explain the application of the double Sumudu transform. It well recognized that to get the solution of partial differential Equations by integral transform techniques we need the following two actions: Beginning, we transform the partial differential equations to algebraic equations By employing double new integral transform technique. Further, on applying Inverse Double new integral transform, we see the solution of PDEs. Respect The general linear telegraph equation (Tarig.M.Elzaki et al..2012) in the form

$$U_{tt} + aU_t + bU = c^2 U_{xx} \text{ where } a, b, c \text{ are constant} \tag{19}$$

With initial condition:

$$U(x, 0) = f_1(x), \quad U_t(x, 0) = g_1(x) \tag{20}$$

And boundary conditions:

$$U(t, 0) = f_2(t), \quad U_x(0, t) = g_2(t) \tag{21}$$

Solution:

$$k_2 [U_{tt}(x, t); (u, v)] = \frac{A(u, v)}{v^4} - \frac{A(u, 0)}{v^3} - \frac{1}{v} \frac{\partial A(u, 0)}{\partial t}$$

$$k_2 [U_t(x, t); (u, v)] = \frac{A(u, v)}{v^2} - \frac{A(u, 0)}{v} \quad k_2 [U_t(x, t); (u, v)] = A(u, v)$$

$$k_2 [U_{xx}(x, t); (u, v)] = \frac{A(u, v)}{u^4} - \frac{A(0, v)}{u^3} - \frac{1}{u} \frac{\partial A(u, 0)}{\partial x}$$

$$A(u, 0) = F_1(u) = \frac{1}{u} \int_0^{\infty} e^{-\frac{x}{u}} U(x, 0) dx = \frac{1}{u} \int_0^{\infty} e^{-\frac{x}{u}} f_1(x) dx \quad (22)$$

$$A(0, v) = F_2(v) = \frac{1}{v} \int_0^{\infty} e^{-\frac{t}{v}} U(0, t) dt = \frac{1}{v} \int_0^{\infty} e^{-\frac{t}{v}} f_2(t) dt \quad (23)$$

$$\frac{\partial A(u, 0)}{\partial t} = G_1(u) = \frac{1}{u} \int_0^{\infty} e^{-\frac{x}{u}} \frac{dU(x, 0)}{dt} dx = \frac{1}{u} \int_0^{\infty} e^{-\frac{x}{u}} g_1(x) dx \quad (24)$$

$$\frac{\partial A(0, v)}{\partial x} = G_1(v) = \frac{1}{v} \int_0^{\infty} e^{-\frac{t}{v}} \frac{\partial U(0, t)}{\partial x} dt = \frac{1}{v} \int_0^{\infty} e^{-\frac{t}{v}} g_1(t) dt \quad (25)$$

Use the double new integral transform of Eq (19) and single new integral the transform of conditions, and then we have::

$$\left(\frac{A(u, v)}{v^4} - \frac{A(u, 0)}{v^3} - \frac{1}{v} \frac{\partial A(u, 0)}{\partial t} \right) + a \left(\frac{A(u, v)}{v^2} - \frac{A(u, 0)}{v} \right) + bA(u, v) = c^2 \left(\frac{A(u, v)}{u^4} - \frac{A}{u^3} \right)$$

Substituting initial and boundary conditions (2) – (3) in equation above we Have

$$\frac{A(u, v)}{v^4} - \frac{1}{v^3} F_1(u) - \frac{1}{v} G_1(u) + \frac{a}{v^2} A(u, v) - \frac{a}{v} F_1(u) + bA(u, v) - \frac{c^2}{u^4} A(u, v) + \frac{c^2}{u^3} F_2(v)$$

After some simple algebraic operations we get :

$$A(u, v) = \frac{F_1(u)(vu^3 + au^3v^3) - c^2v^4F_2(v) - c^2u^2v^4G_2(v) + u^3v^3G_1(u)}{u^3 + au^3v^2 + bu^3v^4 - c^2u^4} \quad (25)$$

Take the inverse of double new integral transform to get the solution of general Linear telegraph Eq (19) in the form

$$U(x, t) = K_2^{-1}[A(u, v); (x, t)] = K_2^{-1}[N(u, v); (x, t)] = D(x, t) \quad (26)$$

Example 1.1: Consider the linear telegraph equation in the form:

$$U_{xx} = U_{xx} + U_t + U \quad (27)$$

With initial conditions:

$$U(x, 0) = f_1(x) = e^x, U_t(x, 0) = g_1(x) = -e^x \quad (28)$$

And boundary conditions:

$$U(0, t) = f_2(t) = e^{-t}, U_x(0, t) = g_1(t) = e^{-t} \quad (29)$$

Solution: We take a new double transform on integral part of the equation (10) and single new integral transform of conditions, and then we have:

$$\frac{A(u, v)}{u^4} - \frac{A(0, v)}{u^3} - \frac{1}{u} \frac{\partial A(0, v)}{\partial x} = \frac{A(u, v)}{v^4} - \frac{A(u, 0)}{v^3} - \frac{1}{v} \frac{\partial A(u, 0)}{\partial t} + \frac{A(u, v)}{v^2} - \frac{A(u, 0)}{v} + A(u, v)$$

$$A(u, 0) = \frac{u}{1-u^2}; A(0, v) = \frac{v}{1-v^2}; \frac{\partial A(u, 0)}{\partial t} = -\frac{u}{1-u^2}; \frac{\partial A(0, v)}{\partial x} = \frac{v}{1-v^2}$$

Substituting initial and boundary conditions (11)-(12) above we have:

$$\frac{A(u, v)}{u^4} - \frac{1}{u^3} \left(\frac{v}{1+v^2} \right) - \frac{1}{u} \left(\frac{v}{1+v^2} \right) = \frac{1}{v^4} A(u, v) - \frac{1}{v^3} \left(\frac{u}{1+u^2} \right) + \frac{1}{v} \left(\frac{u}{1-u^2} \right) + \frac{1}{v^2} A(u, v) - \frac{1}{v} \left(\frac{u}{1-u^2} \right)$$

After some simple algebraic operations we get:

$$A(u, v) = \frac{uv}{(1-u^2)(1+v^2)} \tag{30}$$

Take inverse of double new integral transform to obtain the solution of linear telegraph Eq.(17) in the form :

$$A(x, t) = K_2^{-1}[A(u, v); (x, t)] = e^{x-t} \tag{31}$$

Example 1.2: Consider wave equation in the form

$$U_{tt} - U_{xx} = 3(e^{x+2t} - e^{2x+t})(x, t) \in R_+^2 \tag{32}$$

With initial conditions:

$$U(x, 0) = f_1(x) = e^{2x} + e^x, U_t(x, 0) = g_1(x) = e^{2x} + 2e^x \tag{33}$$

And boundary conditions:

$$U(0, t) = f_2(t) = e^t + e^{2t}, U_x(0, t) = g_2(t) = 2e^t + e^{2t} \tag{34}$$

Solution:

Use the double new integral transform of Eq.(32) and single new integral transform of conditions, and then we have:

$$\left(\frac{A(u, v)}{v^4} - \frac{A(u, 0)}{v^3} - \frac{1}{v} \frac{\partial A(u, 0)}{\partial t} \right) - \left(\frac{A(u, v)}{u^4} - \frac{A(0, v)}{u^3} - \frac{1}{u} \frac{\partial A(0, v)}{\partial x} \right) = 3 \left(\frac{uv}{(1-u^2)(1-2v^2)} - \frac{uv}{(1-2u^2)(1-v^2)} \right) \tag{35}$$

$$A(u, 0) = \frac{u}{1-2u^2} + \frac{u}{1-u^2}; A(0, v) = \frac{v}{1-v^2} + \frac{v}{1-2v^2}$$

$$\frac{\partial A(u, 0)}{\partial t} = \frac{u}{1-2u^2} + \frac{2u}{1-u^2}; \frac{\partial A(0, v)}{\partial x} = \frac{2v}{1-v^2} + \frac{v}{1-2v^2}$$

Substituting initial and boundary conditions (33)-(34) in Eq. (35) and after some simple algebraic operations we have:

$$A(u, v) = \frac{uv}{(1 - 2u^2)(1 - v^2)} + \frac{uv}{(1 - u^2)(1 - 2v^2)} \quad (36)$$

Take the inverse of double new integral transform to reach the solution of wave Eq.(32) in the form

$$U(x, t) = K_2^{-1}[A(u, v); (x, t)] = e^{2x+t} + e^{x+2t} \quad (36)$$

II. CONCLUSION

This paper discusses the properties of sumudu transform and double Sumudu Transform and solves the partial differential equation with variable coefficient. By using double sumudu transforms, the applicability of this relatively double sumudu transform is demonstrated using some special functions. The double sumudu transform method is the strong method to solve such PDEs. We may conclude that double sumudu transform is so powerful and efficient in getting the logical answer for a broad range of beginning value boundary problems. The relationship of the double sumudu transforms with double Laplace transform performs is much deeper, and we can detect other relatives of the double sumudu transform.

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Descriptive evaluation of ureteric urolithiasis between genders

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Abstract- Urolithiasis is a common clinical disorder. A descriptive cross sectional study was done to compare the presentation of ureteric urolithiasis with respect to gender. According to the literature the first episode of urinary tract stone occurs commonly in young people (20-40 years) and peak incidence is reported in second or third decades of life. There was a higher prevalence of male patients in the 6th and 7th decades of life which is similar to the findings reported in other studies. X-ray Kidney, Ureter, Bladder (KUB) and ultra sound KUB data and ureteric stone site and size were collected and analyzed. The stone size was significantly different between two groups ($p=0.303$). Both groups had similar distribution of ureteric stones within ureter, more in the lower ureter followed by upper ureter and mid ureter. The side of the stone was significantly different between males and females ($p<0.05$).

Index Terms- X-ray Kidney, Ureter, Bladder (KUB), site of the stone, size of the stone, side of the stone

I. INTRODUCTION

Urolithiasis is a common clinical disorder. Its frequency has risen with human civilization and varies with in the country. It poses health problems in most countries. Urinary tract stones affect up to 2-5% of the Asian population⁽¹⁾ and up to 15 % of the population in the western countries.⁽²⁾ Although such data is not available for Sri Lanka, the fact that nearly 3000 patients are treated with extra-corporeal shock wave lithotripsy (ESWL) at the National Hospital of Sri Lanka alone every year is an indirect indicator of the size of the problem.⁽³⁾

Urolithiasis has some potential risk factors such as intrinsic and extrinsic epidemiological, metabolic, physical-chemistry of the urine, mechanics and urinary infection⁽⁴⁾. It was highly associated with diabetes mellitus, urinary tract infections and arterial hypertension. High calcium, protein, purine, carbohydrates and oxalic acid intake together with low fluid intake were closely associated with this disorder.⁽⁴⁾

The epidemiology of urolithiasis differs according to the geographical area in terms of prevalence, incidence, age and sex distribution, stone composition and stone location.⁽⁵⁾

According to one of the local literature, it identifies the relationship between the disease prevalence and the drinking water geochemistry. The prevalence of the kidney stone disease in the selected Padiyapelella-Hanguranketa area in Central Highlands of Sri Lanka is significantly higher compared with neighboring regions. Hydro geochemical data obtained from the two groups were compared using the Wilcoxon rank-sum test. It

showed that pH, total hardness, Na⁺, Ca²⁺ and Fe²⁺ had significant difference ($p < 0.005$) between water sources used by patients and non-patients. This study reveals a kind of association between stone formation and drinking water geochemistry as evident by the high hardness/calcium contents in spring water used by patients.⁽⁵⁾

The relative increased frequency of stones in the region indicates that nutritional, environmental and genetic factors play a role in the occurrence of stones.(such as age, gender, climate, Body Mass Index (BMI), weight, water intake, co-morbidities, occupation and diet).⁽⁶⁾ Research shows that formation of stones can be prevented by special diets. (Low in salt, spinach, fatty foods, animal proteins and high in vegetables, water, and fresh fruits).⁽⁶⁾

Usually the first episode of renal stone occurs commonly in young people (20-40 years)⁽⁸⁾ and peak incidence is reported in second or third decades of life. As it mostly affects working age group, it is a major socioeconomic burden for the society.⁽⁹⁾ Ureteric stones contribute 20% of all urinary tract stones and 70% of which are located in the distal ureter.⁽⁷⁾

Kidney stone disease is a common disorder with a lifetime prevalence of 10-12% in men and 5-6% in women⁽⁴⁾. It has a high recurrence rate: 14.0% after one year, 25.0%-31.5% after five years, 49.0%-52.0% after ten years and 72.0% after twenty years^(5, 6). The prevalence of the KSD and the type of stones varies in different countries. In Iceland the prevalence of nephrolithiasis is lower than reported elsewhere; 4.3% in men and 3.0% in women.⁽⁷⁾ In the United States of America (US) the distribution of KSD is 12.0% among men and 5.0% among women.⁽¹⁾ Adult men are more commonly affected by kidney stones than women; while among children the proportion of the disease is approximately the same in both genders (1%-3%)⁽⁸⁾

Different studies suggest that men are affected two to three times more frequently than women⁽¹⁾ There was a higher prevalence of males patients in the 6th and 7th decades of life, which is similar to the findings reported in other studies. Our objective was to compare the presentation of ureteric urolithiasis with respect to genders.

II. METHODOLOGY

This was a descriptive cross sectional design with an analytical component. A total of 154 patients were selected as study sample. The study population consisted of the patients referred to the genitourinary clinic, Teaching Hospital, Peradeniya. This study was conducted over one year period from 1st May 2013 to 31st April 2014.

Patients' demographic data, blood and urine investigations, X-ray Kidney, Ureter, Bladder (KUB) and ultra sound KUB data were recorded. Patients with metabolic etiologies such as hypocalcaemia, hyperparathyroidism and etc. were excluded. Ureteric stone site and size were collected and analyzed with independent sample t-test and chi-square test. Data were analyzed with descriptive statistics using statistical package for social sciences (SPSS) version 20.0

III. RESULTS

A total of 154 participants (aged 20-75 years) were included in this analysis. Mean age of men was 39.07 ± 11.82 and out of the sample 76% (n=117) were male. Mean age of women was 43.49 ± 14.97 and 24% (n=37) were female. (p=0.075).

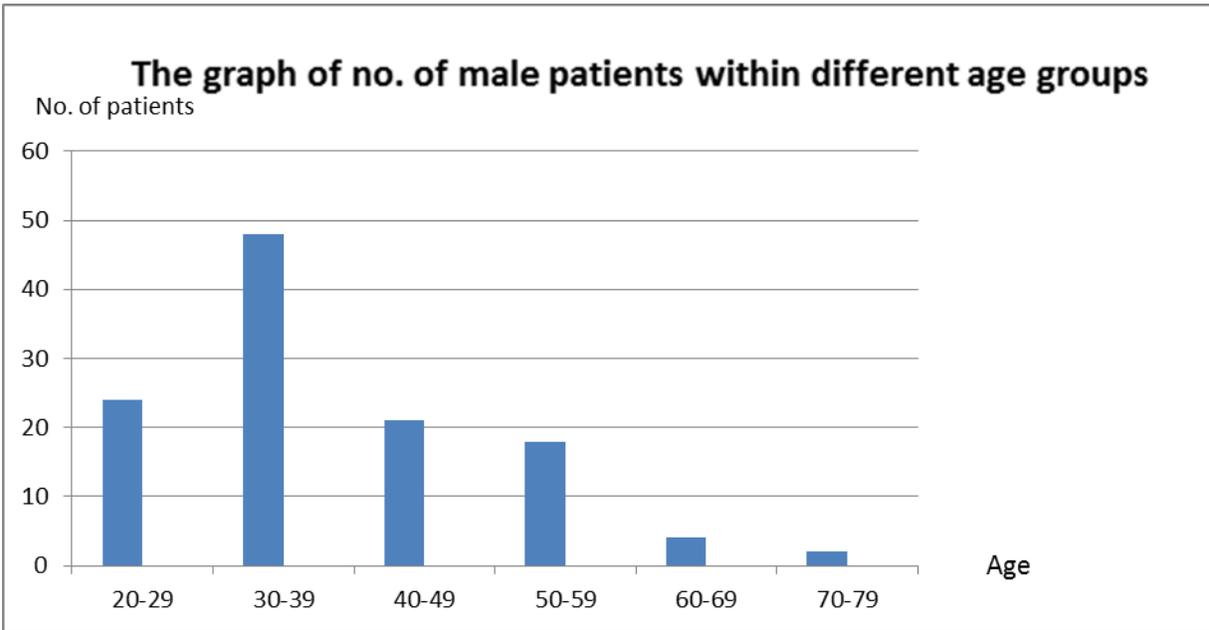


Figure 01- The description of the population by age and gender
The most affected age group of men is 30-39 years.

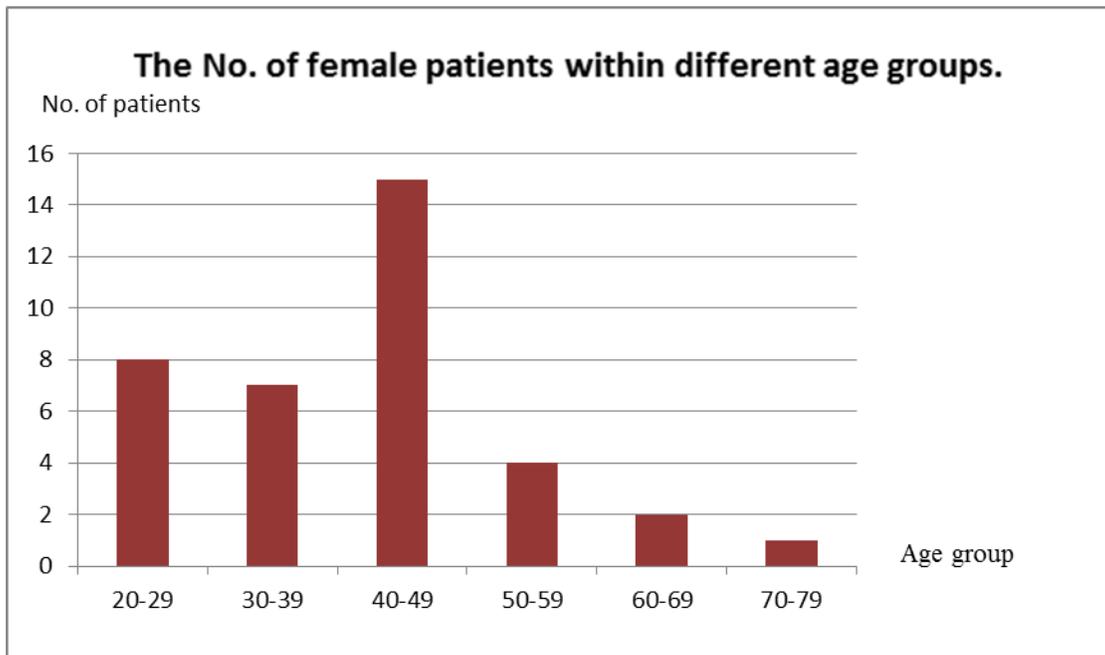


Figure 02- The description of the population by age and gender
The most affected age group of women is 40-49 years.

Mean stone size in males and females were 7.19 (± 3.05) mm and 8.04(± 4.86) mm respectively. The stone size was significantly different between two groups ($p=0.303$). Both groups had similar distribution of ureteric stones within the ureter. More in the lower ureter followed by upper ureter and mid ureter. Location of the calculi in Males and females was lower as follows. Upper ureter 83, 24 and mid ureters 10, 28 and lower ureter 7 and 2 respectively.

Out of 117 males 75 had left sided stones while remaining 42 had right sided. Out of 37 females 17 had left sided stones while the other 20 had right sided. The side of the stone was significantly different between males and females ($p<0.05$).

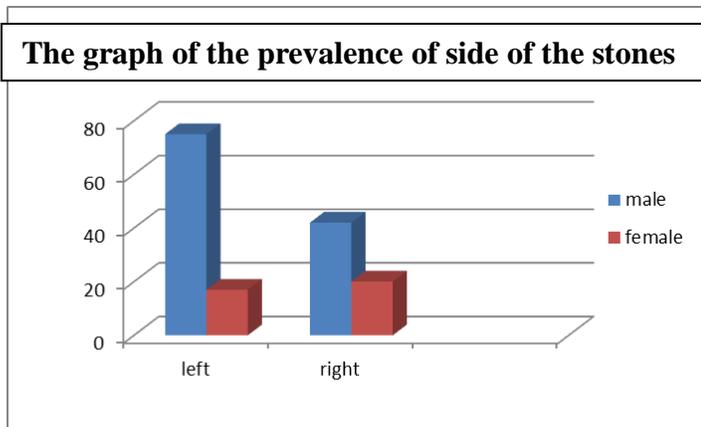


Figure 03 – Description of the population by side of stone occurrence.

According to the obtained data, the prevalence of urinary stones in males was 76% and 24 % was in females. Other investigators have noted the higher proportion of males: Twinem (1937), 5: 3; Grossman (1938), 4: 1; Winsbury-White (1946), 3: 2; while Sutherland (1954) found the sexes to be almost equally represented with a ratio of 6: 5.⁽¹¹⁾

The reason may be due to the differences of genetic factors, age, weight, water intake, occupation and diet between genders. Most of the male patients of this study were carpenters, farmers, drivers, labors and soldiers. All of these occupations are non-sedentary types. Hence they are hard workers and work outdoors. Due to less water consumption and sweating, urine gets concentrated in kidneys and urinary calculi can be formed.

As this study, the size of the stones was larger in females than males. Smaller the size, it is capable of passing spontaneously or entering and getting impacted in the ureter. Hence it is symptomatic. Most of the male patients admit into hospitals due to this reason. Therefore the proportion between male to female will increase.

According to the literature, males produced small calculi which were passed or at least were small enough to enter the ureter. Therefore higher incidence of ureterolithotomy can be seen in men.⁽¹¹⁾ While in women calculi were larger, it is difficult to pass and remain in kidneys Therefore high incidence of pyelolithotomy and can be identified among women.⁽¹¹⁾

This study reveals that the commonest age groups of stone disease of males were 20 to 29, 30 to 39 and 40-49 which included two-thirds of all patients. The average ages of stone disease of males were 30-39. For females stone disease was evenly spread from 20 to 49 years of age. The average age of onset was 40-49 and that was slightly later for women than men.

Side of the ureteric stone is significantly different between genders with males on left and females on right. However, according to the literature females have more stones on the left side than men. It is suggested that this was due to the proximity of the left urinary tract to the perivenous lymphatic draining genital tract infections. Female have more chance for infections. Infections may also a risk factor for genesis of stones.⁽¹¹⁾ However further research is needed to evaluate this statement and to understand the underling pathophysiology.

Comparison of the single and recurrent stone-forming patients showed that recurrent stone formation occurred more frequently in males, and that usually small calculi were formed, capable of passing spontaneously or entering and getting impacted in the ureter.⁽¹¹⁾

And also the literature says that the group of patients with a single stone had an equal sex ratio with males and female.⁽¹⁰⁾ Single and recurrent stone-forming patients differed in sex ratio, in the incidence of spontaneous passage and operation, and in their relationship to chronic infection. These factors suggest that different etiological factors may be involved in these groups.⁽¹⁰⁾

In this investigation the high proportion of males with recurrent calculi was related to the occupational liability of the male to severe stress. It is known that women have a higher incidence of hyperparathyroidism than men: this applied in the present survey but the numbers were too small for significance. The marked difference in sex ratio between the idiopathic patients with a single stone and those with recurrent stones has been discussed, the single stone-forming patients being equally distributed between the sexes while patients with recurrent stone had a male/female ratio of 2.8:1.⁽¹¹⁾

The sex distribution, the various operations might be expected to follow the overall sex ratio of two males to one female. However, this ratio applied only to partial nephrectomy. Nephrolithotomy had a higher incidence among women than was expected and Pyelolithotomy even more so. Ureterolithotomy was predominantly an operation of males especially among idiopathic recurrent stone-forming patients.⁽¹¹⁾

IV. CONCLUSION

Higher proportion of males have urinary tract stones than females. The size of the stones were larger in females than males. Both groups had similar distribution of ureteric stones within the ureter. With regard to location, there was more in the lower ureter followed by upper ureter and mid ureter. Side of the ureteric stone is significantly different between genders with males on left and females on right. Further research is needed to evaluate this statement and to understand the underling pathophysiology.

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Factors Affecting Career Track and Strand Choices of Grade 9 Students in the Division of Antipolo and Rizal, Philippines

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Abstract- The main purpose of the study was to craft a Senior High School program offerings of University of Rizal System. It made use of the Descriptive Survey Method. Findings showed that most of the Grade 9 students selected Career Tracks and Strands are Accountancy, Business and Management (ABM), and Technical Vocational Livelihood (TVL) track. Moreover, there is a significant association between the career track choices and profile of the students in terms of sex, average family income, occupation of the head of the family, school preference and average scholastic rating in Grade 8 and no significant association between the career track choices and the highest educational attainment of the head of the family and person influential in the choice of career track.

Index Terms- career tracks choices, factors affecting career track choices, grade 9 students

I. INTRODUCTION

One significant reform in Philippine Educational System is the implementation of K to 12 program. Its goal is for the “development of a holistically developed Filipino with the 21st century skills who are ready for employment, entrepreneurship, middle level skills development and higher education upon graduation from Grade 12” (The K to 12 Basic Education Program, 2012).

The structure of K to 12 implementation which provides addition of two (2) years level from the old system which are Grades 11 and 12 which the students will take core courses and career pathways. This will result to no enrollment in first year and second year college which will be a big challenge to colleges and universities during the School Year 2017-2018 and 2018-2019. The offering of Career Tracks in Grades 11 and 12 could be an avenue for colleges and universities to collaborate with the Department of Education (DepEd). In this way, resources of colleges and universities who have no enrollees can utilize their resources to the maximum level.

In view of the need to help colleges and universities in the province of Rizal address this challenging situation and come up with the necessary initiatives, this study on Factors Affecting Career Tracks Choices of Grade 9 students was conducted.

II. OBJECTIVES

The main purpose of the study was to craft a program for Senior High School program in the University of Rizal System.

Specifically, it sought determine the following:

1. The career tracks and strands selected by the Grade 9 students in public high school in the Division of Antipolo City and Rizal.
2. Variables associated with the career racks and strands selected by the students.

III. REVIEW OF RELATED LITERATURE

The literature sought develop a Senior High School program of the University of Rizal System through the determination of career track choices and its relationships to the profile of grade 9 students

Career Choice Tracks of Grade 9 Students

The choice of Career Tracks of the students play a great role in the preparations of the schedule for the Senior High School. These career tracks are associated with career preferences which were the bases in the conduct of the present study. Career preferences as defined by Martinez and Fuller (1999) pertains to the identification of one’s work schedules and activities in relation to individual’s abilities, skills, competencies and with the assistance of management in order that he can take greater job and personal responsibility for his future. In other words, this is a preferred career choice of an individual that should be decided ahead of time.

In an article on “What is Most Important to Students by Duffy and Sedlacek from 1995 to 2004 revealed that male preferred to select careers which will generate money and female would like to select career which will concentrate on working with people and those which can contribute to society.

Association of the Career Track Choices and Profile of the Respondents

Witko, Bernes, Magnusson and Bardick (2006) studies on senior high school students' occupational aspirations found out that interests, skill, personal meaning, challenges and parental support are variables contributory to the occupational aspirations of senior high school students. In like manner with the study of La (2009) on factors influencing the educational and career choices of senior high school students revealed that parent’ supports, school structure, gender and grade point average have considerable influence on the Vietnamese Senior high school students’ educational and career choice. In same year, Leonard (2009) study on high school students' course selection decisions in south Carolina found out that parents and teachers are highly

influential in the course selection decision. In addition, Heilbronner (2011) claimed that the greater number of the students manifested to proceed to STEM courses in college. This is brought about with the quality, adequacy of preparations and scholastic experiences of the students.

Eremie, (2014) study on comparative analysis of factors influencing career choices among senior secondary school students in Rivers State, Nigeria. The result showed that there were significant differences in the career preferences when grouped according to their sex, parity, and parental influence. In addition, socio-economic background were influential in participants' decisions to pursue a postsecondary degree. Cultural factors, especially English fluency, were also relevant.

Local communities and institutional factors had generally a negative impacts on career choice of the students.

IV. METHODOLOGY

The study made use of the descriptive method of research utilizing a the survey checklist developed to attain the objectives of the study.

The subjects of the study were the 761 students in public high schools in the Division of Antipolo and Rizal. The students were distributed to 383 and 378 randomly selected from public high schools in the Division of Antipolo and Rizal respectively. The data were treated using frequency and percentage distribution and Chi-Square test.

V. RESULTS

Career tracks choices of the Grade 9 students enrolled in public high schools in the Division of Antipolo and Rizal

Table I. Distribution of Career Track Choices of Grade 9 Students of the Division of Antipolo and Rizal

Career Tracks	Strands	Frequency	Percent	Rank
Academic	Science, Technology, Engineering and Mathematics (STEM)	79	10.38	6
	Humanities and Social Sciences (HumSS)	92	12.09	3
	Accountancy, Business and Management	164	21.55	1
	General Academic Strand (GAS)	40	5.26	7
Technical-Vocational Livelihood	Home Economics (HE)	152	19.97	2
	Information and Communication Technology (ICT)	91	11.96	4
	Agri-Fishery (AF)	27	3.55	8
	Industrial Arts (IA)	83	10.91	5
Arts		13	1.71	10
Sports		20	2.63	9
Total		761	100	

Table II. Chi-Square Value on the Association of the Profile and Career Track Choices of Grade 9 Students

Variables	Df	Critical X^2 Value	Computed X^2 Value	Verbal Interpretation
Sex	9	16.92	83.85	Significant
Highest Educational Attainment of the Head of the Family	72	90.53	4.0	Not Significant
Persons Influential in the Choice of Career Track	45	55.76	53.51	Not Significant
Average Monthly Family Income	36	55.76	498.30	Significant
School Preference	18	28.87	46.54	Significant
Occupation of the Head of the Family	45	55.76	97.11	Significant
Average Scholastic Rating in Grade 8	54	67.50	584.77	Significant

VI. DISCUSSIONS

As presented in Table 1, Academic track with a strand Accountancy, Business and Management (ABM) has the highest frequency of 164 or 21.55% which is the first rank followed by

Technical-Vocational Livelihood (TVL) track with a strand of Home Economics with frequency of 152 or 19.97% which is second in rank. On the other hand, Arts track has the lowest frequency of 13 or 1.71% which is tenth rank. The result indicates that majority of the Grade 9 students prefer to take

Accountancy, Business and Management; and Technical-Vocational Livelihood track with strand of Home Economics in the Senior High School.

As shown in Table 2, the computed Chi-Square value on the association between the career track and strand choices and the profile of the students in terms of sex, average family income, occupation of the head of the family and average scholastic rating in Grade 8 have greater computed Chi-Square values than the critical values considered to be significant. The data implies that the profile of the students in terms of sex, average family income, occupation of the head of the family and average scholastic rating in Grade 8 are associated to the career track choices of the students who will enroll in the Senior High School.

On the other hand, the Chi-square Computed value on the career track choices and profile of grade 9 students in terms of highest educational attainment of the head of the family and person influential in the choice of career track have the lowest computed Chi-Square values compared to Critical values. The result emphasizes that there is no significant association between the career choice and the profile of the students in terms of the highest educational attainment of the head of the family and person influential in the choice of career track.

VII. CONCLUSIONS

Most number of Grade 9 students are inclined to take Accountancy, Business and Accountancy (ABM) courses in Senior High School and in the college level.

The result implies that sex, average monthly family income, school preference, occupation of the head of the family and average scholastic ratings in the preceding years are factors associated to the career track choices of the students, while highest educational attainment of the head of the family and persons influential in the choice of career track are not associated with the Career Track Choices.

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Contemporary Bollywood Dance: Analyzing It through the Interplay of Social Forces

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Abstract- Bollywood, or the Hindi Film industry, embraces a truly enigmatic world of its own. The craze and euphoria surrounding it, not only in India but also in foreign lands, is something worth witnessing. One of the major attractions of Bollywood, which in fact distinguishes it from Hollywood, is its elaborate song-dance sequences which never fail to strike a chord with the audience. Its creation of sublime, emotional or foot-tapping escapism is simply unmatched anywhere in the world. A fact often overlooked is that, these songs and dances are intricately woven in our social fabric. It is interesting to take note of this and undertake an analysis of the same. In this article, I shall discuss about Bollywood, how the dances and songs are placed within movies, analyse the dance types, its forms in the context of social forces operating within it- 'globalization' and 'glocalization' and provide a sociological understanding of it and its changing form. Since it is not possible to discuss the entire array of dance in Bollywood, I have analysed the dances post the globalization era and after the onslaught of MTV in 1980s. I have focused mainly on those dance sequences which have won the *Filmfare Awards*¹, between year 1994 to 2013.

Index Terms- Bollywood, Dance, Culture industry, Globalization, Glocalization

I. INTRODUCTION

The Hindi film industry, or Bollywood, stands as one of the largest film industries of the world today. However, "Bollywood" as a description of popular Hindi cinema has been difficult to establish. This is because there have been intense scholarly debate on this. Although the origins of the terms are uncertain, yet some historians suggest that it was coined in the 1970s as a "parodic and cheeky echo of the North American film industry, a mimicry that is both a response and dismissal" (Gopal and Moorti: 2010). Following this line of argument, renowned actors like: Amitabh Bachchan, Ajay Devgan and directors like: Subhash Ghai view that the term "Bollywood" is demeaning and overlooks the contributions of the Indian film industry reducing it to a sub-continental clone of Hollywood. Arguing further, contemporary scholars increasingly use the term to describe that 'small slice of industry' that has gained international currency and are careful to differentiate it from the rest of the Hindi cinema. Soojata Moorti and Sangita Gopal (2010) draw on Madhav Prasad's insight that Bollywood is a name for this "new cinema coming from Bombay but also, lately, from London and Canada, which has over the ten years or so, produced a new self-image for the Indian middle classes".

However, the issue of whether the term 'Bollywood' is a pejorative or subversive description of Bombay (present Mumbai) remains unresolved.

Interestingly Bollywood is not simply about movies. In fact, movies on celluloid set the tone for events in popular Indian culture and shape the taste and ideals of beauty. Thus, in a way Hindi cinema is deeply intertwined within our social fabric. Indians adore their actors as icons so much so that their actions have a huge impact on the daily lives of Indian citizens. Therefore, it is highly significant as an Indian cultural phenomenon too. However, the features of Bollywood are not always comprehensible for everyone, especially for those who are not quite familiar with the cultures and traditions of Indian society. This is because the patterns shown are based on Indian traditions on one hand and extremely modern elements on the other.

A unique feature of our Hindi film industry is that the term "Bollywood" conjures up images of songs and dances, accompanying lithe movements of the actresses and also the actors irrespective of the genre of the movie- melodrama, action, thriller, comedy, horror and so on. In other words, it would be difficult for anyone to talk of any Hindi film without looking at or ignoring these dances or the songs incorporated in them. In fact this phenomenon has become so common and taken-for-granted that none of the Indian as well as Western scholars have ever questioned it. Along these lines, Ravi Vasudevan fundamentally defines popular Hindi films "as complex systems that include song-and-dance sequences and comedic plots" (Shresthova: 2011). Songs and dances need to be recognized as parts of an alternative narrative system that defines Hindi cinema, a "cinema of interruptions" (Shresthova: 2011). Unlike in Hollywood movies, Indian popular cinema features more narrative digressions emerged from the intermixing of Indian approaches to performance and film technology. Thus maintaining this perspective, song-and-dance sequences cannot be defined simply as haphazard digressions but are crucial for telling stories in Hindi films.

Arguing on another note, it can be said that the reason behind the popularity of songs and dances in Bollywood films is because, dance has been an integral part of Indian culture and tradition since time immemorial. While Bollywood dances have become so popular, they are gradually becoming a part of our culture, and the song-and-dance sequences depicted in the movies also heavily shape the societal structure in various ways. Therefore, Hindi films as dominant in Indian public culture or of Bollywood as a transnational phenomenon must grapple with the crucial role that song-and-dance sequence has played in such disseminations. In my article, I shall discuss Bollywood dance,

tracing its forms, evolution, changing patterns over time, identifying and situating it in the social forces, of globalization and glocalization, within which it operates (in the context of the Filmfare Award for best dance, between 1994-2013)

II. SITUATING BOLLYWOOD DANCE- ITS NATURE AND FORMS

It is very difficult to define Bollywood dance in a unilinear way. Simply put, Bollywood dance form is a special style of dance which is a mixture of numerous styles. In other words, it is a mixture of traditional Indian dance forms like: Kathak, Bharatnatyam, Bhangra, Odissi, as well as western popular dances like: bellydance, 'hip-hop', 'jazz' and even western erotic dancing.

The elaborate and often extravagant Bollywood song-dance sequences are intricately built into the theme of the films such that these sequences carry a special significance in themselves. Song-and-dance sequences are used heavily in order to connect to the audience and also used as a technique to represent various circumstances like: it can be used as a tool for story-telling; or to express love between the hero and heroine of the film and so on. Sangita Shresthova (2011) states that, technically speaking, dances in Hindi films serve certain important functions at various levels:

- They serve important narrative functions. They may give expression to otherwise concealed secrets and desires.
- They allow the heroines to undulate in wet saris in men's fantasy sequences without compromising their reputations.
- Dances enable the star-crossed lovers to waltz in dreamy duets in exotic locations far away from the public and at times difficult circumstances of their everyday lives.
- Bollywood dances also act as moments of celebration so as to escape the desperation of their everyday reality, through dances that are reminiscent of folk festivities.
- Dances may also stand in as a metaphor for sexual encounters otherwise restricted by India's norms of 'culture and decency' represented by Indian censorship policies.
- In some other cases, dancers perform a song that is only partially related to the film narrative- as a momentary boisterous release of narrative tension.

There has been much investigation about the evolution of Bollywood dance forms. Observations of Gopal and Moorti in their book "*Global Bollywood: Travels of Hindi Song and Dance*" (2010) are interesting to note. Firstly, V.A.K. Ranga Rao and Arundhati Subramaniam gave general overviews of the historical evolution of dances in Hindi films. Secondly, Ajay Gehlawat spoke about a comparison between Hollywood musicals and Hindi film sequences to illustrate the narrative and emotional complexity of Bollywood song-dance sequence. Thirdly, Ann R. David focused on the current popularity of Bollywood dance among South Asians in UK. Fourthly, Kai-Ti Kao and Rebecca-Anne Do Rozario investigated the implications

of the "*imagined space*"² created by Hindi song-and dance sequences for diasporic audiences. Fifthly, Pallabi Chakraborty talked about the links between the Indian classical dance form of Kathak and Bollywood dance. Sixthly, Anna Morcom's ethnography explored the Bollywood dance in Tibet as a form that complicates China's approaches to multiculturalism. Thus, these studies point to the historical impact, social relevance and cultural significance of song and dance. However, even as studies are being undertaken on Bollywood dance, its nature and forms, in academia, yet the fact remains that dances in popular Indian Hindi films are still to be systematically analyzed. Their content, history, cultural influences and migration which is rich in various aspects largely remains unexplored; and my article undertakes an analysis of some of the dances of contemporary Bollywood.

A look at the historical evolution of the dance forms in Bollywood shows that initially the classical Indian dances like: *Kathak* and *Bharatnatyam* were influential in designing Bollywood dance choreography. Dance scholar Purnima Shah explains that dances, especially those considered to be classical, played an important role in the larger political movement that valued tradition. In case of *Bharatnatyam*, a major controversy concentrated on approaches to *sringagara* (which means- erotic desire) and *bhakti* (or, devotion expressed through dance) and revealed how classical dance was appropriated into Hindi film dance. Rukmini Devi Arundale (a Brahmin dancer) played a significant role in reclaiming Indian dance as part of India's national anti-colonial awakening. She encouraged their socially conservative reform- exalting, the devotional aspects and downplaying the potentially secularly erotic elements of the dance. Dance scholar Uttara Asha Coorwala explains that during early post colonial India, most hip movements were strongly discouraged and effectively edited out from the dance styles altogether. The body was repositioned to express devotion rather than erotic sensuality (Shresthova: 2011). Thus, to be culturally and socially authentic, Indian film dances had to be 'respectable'; and this 'respectability' was linked to a normative understanding of a 'respectable Indian woman'. Therefore, in order to receive the respect of the public, the dancers had to conform to a contemporary middle-class ideal of a well behaved and sexually contained female.

The Bollywood dances are, as said earlier, are a fusion of traditional and classical Indian dances with some influence of *jazz*, *hip-hop* and modern dance. Timing and rhythm, energy and sharply controlled variations that are used in almost every Bollywood film in dance are as noted below. However, choreographers of Hindi films do not incorporate each dance form in its purest form. Rather, there is often a mixture of various dances. This is what makes Bollywood dance a "*hybrid*"³ one, which will be discussed in the subsequent sections of the article.

1. **Bhangra**: it is the most widespread of Indian folk dances (originally Punjabi) worldwide and has influenced many of the popular music and dance, including Bollywood styles, more than any other folk dance. In turn, Bhangra has also been influenced by fusion with genres like: hip-hop and then incorporated into Bollywood films. Originally, Bhangra was only performed by male dancers, but these days both men and women perform it in Hindi movies and other

Bollywood stage performances elsewhere. An example can be the famous song from “Kabhi Khushi Kabhi Gham” (2001) picturized on Amitabh Bachchan, Shahrukh Khan and Rani mukherjee- “*Say shava vhava*” where we find bhangra being performed on the same stage mixed with certain modes of contemporary styles.

2. **Chari**: It is a Rajasthani folk dance, performed by balancing a brass pot on the head and creating patterns with their hands. This is a graceful dance where women make beautiful formations. A form of this dance was performed by Madhuri Dixit in her famous song-dance sequence “*choli ke peeche kya hai*” from the 1993 movie “*Khalnayak*”.
3. **Garba**: this is primarily a female dance, although men also participate commonly. It is performed mainly at auspicious occasions and social events. Dancers usually accompany their movements with clapping and snapping their fingers, although they often carry small sticks called ‘*manjeera*’ that they strike. An instance of this can be seen in “*Dhol Baje*” from “*Hum Dil De Chuke Sanam*” where Salman Khan dances to the tunes of the song accompanied by other females of the movie. Similarly, in Sanjay Leela Bansali’s movie “*Ram-Leela*” (2014) Deepika Padukone is seen dancing in this style.
4. **Kathak**: it originated in the North Indian states amongst the nomadic bards of ancient North India, known as *Kathaks*, or storytellers. It’s history goes by the fact that in the ancient Indian Temples, the Brahmin priests (or pandits) used to narrate the stories of Gods and Goddesses through dance. The performers were known as ‘*Kathakar*’ (who told stories) and the dance came to be known as ‘*kathak*’. Today many Bollywood dances showcase these dance forms. However, at times we also find this form of dance often mixed with other dance styles and presented a unique hybridized form of dance on the screen. In recent times, Madhuri Dixit has performed graceful Kathak dance in movies like: “*Devadas*” in the sing-dance sequence- “*Kahe cher cher mohe*” and “*Mar Dala*”. Moreover, the title track of the 2007 movie “*Aaja Nachle*” is more contemporary form of Bollywood dance which has steps of Kathak mixed with other forms; and this discussion will be made briefly too in the following section.
5. **Bharatnatyam**: Dating back to 1000B.C., Bharatanatyam is a classical dance from the South Indian state of Tamil Nadu, practiced primarily by women. The dance is usually accompanied by Carnatic music and its inspiration comes from the sculptures of the ancient temple of Chidambaram. Many Bollywood movies showcase dances influenced by Bharatnatyam.
6. **Mujra**: is a form of dance originated by *tawaij*⁴ (courtesans) during the Mughal era which incorporated elements of the native classical Kathak dance into music such as *thumris*⁵ and *ghazals*⁶ or poems of those from other Mughal cultures such as Bahadur Shah Zafar. *Mujra* was traditionally performed at *mehfils*⁷ and in special houses called ‘*kothas*’⁸, where the performers

served as courtesans amongst Mughal royalty or wealthy patrons. *Mujra* has been depicted in Bollywood films like *Umrao Jaan* and *Devdas* or other films that show the past Mughal rule and its culture. Often *mujra* dances are used in Bollywood movies especially in the romantic scenes to express love and woman.

7. **Belly-dance**: it is a Western-coined name for "solo, improvised dances based on torso articulation. It originated in the Middle East, “*Raqs sharqi*”. It is something of a misnomer, as every part of the body is involved in the dance; the most featured body part is usually the hips. *Raqs sharqi* (literally "eastern/oriental dancing") is the style more familiar to Westerners, performed in restaurants and cabarets around the world. Belly dance takes many different forms depending on the country and region, both in costume and dance style, and new styles have evolved in the West as its popularity has spread globally. In Bollywood, belly-dance is often used in item numbers which are performed by women in scintillating postures and dresses. Like: “*Sheila ki Jawaani*” from “*Tees Maar Khan*”; “*Cheekni Chameli*” from “*Agneepath*”.
8. **Hip-hop dance**: refers to street dance styles primarily performed to hip-hop music or that have evolved as part of hip-hop culture. Bollywood movies like: *ABCD2* show western dance forms of different styles.
9. **Contemporary dance style**- is a popular form of dance which developed during the middle portion of the twentieth century and has become popular across the world now. This dance style is marked by an absence of ‘narrative art’ as seen in the classical forms, involves multiple and simultaneous actions, creative freedom and ‘independence’ in dance and unpredictable changes in rhythm, speed, and direction.
10. **Freestyle dancing**- Is the most common type of dance practiced today by the Bollywood choreographers. It is a form of dance improvisation which is understood as a constantly creating movement. The benefit of dance improvisation is that it creates new movement and also makes the body free from habitual movements. One of the greatest examples is that of popular dancer and singer Michael Jackson who combined improvisation in both of those definitions.

In the subsequent sections, we shall see how and in what ways choreographers of Hindi cinema incorporate the above mentioned dance forms and its consequent implication.

III. GLOBAL BOLLYWOOD DANCE

Indian economy has witnessed major policy changes in early 1990s. The new economic reform, popularly known as, *Liberalization, Privatization and Globalization* (LPG model) was aimed at making the Indian economy the fastest growing economy and globally competitive. Consequently, there were a series of reforms undertaken with respect to industrial sector, trade as well as financial sector to make the Indian economy more efficient. It also marks the advent of the real integration of the Indian economy into the global arena, in every way- socially, culturally, politically and economically. This period of economic

transition has had a tremendous impact on the overall economic development of almost all major sectors of the economy, and its effects over the last decade can hardly be overlooked. The entertainment industry is one of the areas where the change is very much evident. It is in this context that globalization of Bollywood dance needs to be looked at. In fact, the process in which Bollywood dances became globalized is an interesting feature to take note of. Globalization of Bollywood dances take place when dance companies go on tour, or students go abroad or travel, especially since the rise and spread of the Internet. It may also happen that dancers may adopt movements and gestures from foreign dances, may train themselves completely in various styles and some will even work to adopt the cultural behaviours associated with a dance style. Further, it also may be the case that some dancers might add some of their own styles to it in order to 'make it their own'. Thus, Bollywood dance today readily incorporate different forms such as: jazz, street dance and hip-hop phrases, blend them together with their melodramatic facial expressions and extensive use of mime to convey the meanings in the song. However an important point needs to be made here. The issue of whether the style can maintain its authenticity arises once the dance forms become globalized. This, in turn, raises the question of what it means to be 'culturally authentic' in the first place, as well as whether or not a style of dance can truly be possessed by a person or people. All of these questions become even more complex when looking at Bollywood dance, a form that in its "original" state was located in India and primarily based on the classical Indian dance forms like: Kathak, Bharatanatyam and so on and later on went on to become a hybrid of elements of both Eastern and Western dance.

Looking at the dance sequences, which have won the Best Filmfare Choreography award during 1994-2013, in "Tu Cheez Bari hai Mast Mast" from "Mohra" (1994); "Rangeela re" from the film "Rangeela" (1995); "Ek Pal Ka Jeena" from "Kaho Naa Pyaar Hai" (2000); "Idhar Chala Main Udhar Chala" from "Koi Mil gaya" (2003) "Main Aisa Kyoon Hoon" from "Lakshya" (2004); "Kaisi Paheli Hai Yeh" from "Parineeta" (2005); "Sheila Ki Jawani" from "Tees Mar Khan" (2010); "Senorita" from "Zinadgi Na Milegi Dobara" (2011); "Aunty Ji" from "Ek Main Hoon Aur Ek Tu" (2012); we clearly see that the dance forms noted are western. Moreover, it is also interesting to note that in the above mentioned songs, the choreographers did not just incorporate any one form of dance; rather, the dances like: "Senorita", "Ek Pal Ka Jeena", "Aunty Ji", "Main Aisa Kyoon Hoon", "Tu Cheez Bari Hai Mast Mast", involve dances that are a combination of all the western forms of dance like: hip-hop dance styles, freestyle dance, contemporary dance, belly dance and, often in some, a 'refined' form of cabaret dance. In case of the dance-song sequence "Kaisi Paheli hai yeh" from "Parineeta" (2005), a refined form of seductive cabaret dance, is pictured in the 19th century Bengal. Hence, the gestures, movements and postures of the dancer, Rekha, are typical of a cabaret dancer who dances in a provocative way to attract the male audience. Another special mention should be made about "Main Aisa Kyoon Hoon", performed by the Indian talented actor-dancer, Hrithik Roshan, which won both the Filmfare award as well as the National award for Best choreography in the year 2005. The gestures and movements of body and hand reflect the jazz-funk dance, combined with freestyle and contemporary

dance forms. It changed the future course of dance and further established the already renowned Hrithik Roshan as a versatile and brilliant dancer, who can learn and perform almost all the western styles in a prodigious manner. Prior to this, his dance styles were also excellent in "Ek Pal Ka Jeena", from his debut movie "Kaho Na Pyaar Hai" (2000) and later on "Idhar Chala Mein Udhar Chala" from "Koi Mil Gaya" (2003), which in fact established him as one of the best dancers of Bollywood, soon after his first film. This dance had crisp and stylish hip-hop and jazz-funk movements combined to produce a truly global dance.

IV. "GLOCALIZED" AND "HYBRID" NATURE OF BOLLYWOOD DANCE

The term 'glocalization' is a portmanteau of 'globalization' and 'localization'. According to Roland Robertson, glocalization is the outcome of local conditions towards global pressures. It refers to the simultaneity or the co-presence of both. Glocalization has been defined as adaptation of a product to international markets by modifying it to fit in the local culture (Khondker: 2004).

A look at the most popular dances between 1994 and 2013 show that although many are products of Western influence, yet there are many dances which are 'glocalized', i.e. they combine global nature and simultaneously incorporate Indian elements in order to make it indigeneous. This makes Bollywood dance styles even more appealing and acceptable to the Indian masses. Such instances can be found in: "Sheher ki ladki" from "Rakshak" (1996); "Woh Ladki Hai Kahaan" from "Dil Chahta Hai" (2001); "Beedi Jalaile" from "Omkaara" (2006); "Pappu Can't Dance" from "Jaane Tu ya Jaane Na" (2008). These dances incorporate elements of both the cultures and showcase a unique form of 'Bollywood dance'.

Another issue with Bollywood dance is the fact that, while its origins lie in hybridization it also tends to make some form of an exaggerated mockery of classical and traditional Indian dance forms. Along the same line, writer Drid Williams (2009) discusses his strong disgust toward the dance style in an article that connects Bollywood dance to post-modern dance:

"Bollywood's originator and managers are aware of the rules of Indian aesthetics... Indian dancing and the many traditions that over the centuries produced India's dance forms... Bollywood's pundits undoubtedly know- or at least know about- such things, but they have chosen rampant commercialism and consumerism with its inherent tastelessness instead."

The significant facets of Bollywood dances cannot be analyzed solely by looking at the dance moves. There are other related factors, which play vital role in the making of a dance-song sequence, which need to be taken account of. Clothing, lyrics, and place of performance are elements which cannot be ignored to have a holistic view of a particular dance. Therefore, in this light, I shall discuss about these factors. Let's look at how a Bollywood dance which portrays, simultaneously, the co-existence of both global and local cultures, also takes a 'hybridized' form. **Firstly**, if we consider glocalization of dance, then we find that "Pappu can't dance", "Tu Cheez Bari Hai Mast Mast" and "Beedi Jalaile" as having both Indian and Western styles together to strike a chord with the audience. For instance, the dance sequence, from the movie "Jaane Tu Ya Jaane Na"

“*Pappu can't dance*”, opens with two girls spreading their arms across and performing a Kathak style of dance with the background lyrics “*tirikiti dha na.. tiri kiti dha.. digi na na.. let's dance*” (the former being a variation of the *bol*⁹ of Kathak.) Soon after this we find the young boys and girls dancing in western styles like: freestyle and contemporary styles. Similarly, in “*Beedi Jalaile*” and “*Chor Bazari*” we find that local dances like: *ghoomar*, *bhangra* or other folk dances of India being performed side-by-side with freestyle and contemporary forms of western dance. For example, “*Beedi Jalaile*” is a famous ‘item number’¹⁰ where the choreographer Ganesh Acharya instructed the actress Bipasha Basu to dance in a provocative and western style of moving her hips and waist, showing off her midriff. At the same time, the choreographer also uses the western idea of a form of cabaret number. Hence, while some movements are of street dance, some are *Indianised* ones. Another note can be made of “*Tu cheez bari hai mast mast*” where we find that the heroine dancing in both western and Indian styles. The dance mainly showcases belly dancing, performed by the heroine Raveena Tandon and other forms of waist and muscular movements performed by the actor Akshay Kumar. Yet interestingly at times, the song is interspersed with the Indian classical *raag* lyrics “*pa ni sa pa ni sa... dha dha ni ni ni.. pa pa pa ga ga ga...*” We find the heroine dancing again in Kathak and Bharatnatyam in certain portions of the song. The same feature can be noted in “*Chor bazaari*” too where we see that *bhangra*, *ghoomar* and other forms of folk dances along with some forms of contemporary dances. Apart from the dance styles, we find that the costumes, lyrics and location also show the operation of the concept of glocalization. **Secondly**, another aspect of glocalization can be explored through an analysis of “*Kaisi Yeh Paheli*” from “*Parineeta*” and “*Ek Pal ka Jeena*” from “*Kal Ho Na Ho*”. In case of the former dance, we see that the concept and ambience reflecting western culture. For example: the former song-dance is set in a posh restaurant-cum-bar of Kolkata (India) where the lady (Rekha) sings intermittently in English “*la la la la.. zu zu zu..*” amidst Hindi lyrics. Such an idea of a woman singing in a restaurant is not something indigenous in nature, for India; rather this culture has been influenced by the western music. Moreover, simultaneously the attire worn by Rekha is ethnic (a *saree*); while the tune of the song has pop and Indian tone mixed. This is done strategically to meet the needs and suit to the taste of the Indian audience, especially the Bengali audience. Hence, an Indo-western atmosphere is intended to create in the 19th century Bengal, during which time the movie had been set. Similarly, in “*Ek Pal Ka Jeena*”, the form of dance performed by Raj (played by Hrithik Roshan) is a combination of hip-hop and *jazz funk*. The smart and fine hand, chest, and limb movement has been testimony to this fact. This dance sequence has been choreographed in a very crisp and stylish way by many times Filmfare award winner of choreography, Farah Khan. The song-dance sequence opens in a disco bar named ‘*Club Indiana*’ (in New Zealand), where some scantily clad blonde girls, in short skirt, short tops and so on, and dancing, moving their waist and hip. At the same time, the camera moves towards the entry of the disco, where we see a young ‘sober looking’ Indian girl, Sonia (the heroine, played by Indian actress, Ameesha Patel) wearing a cream-coloured *salwar kameez*¹¹, enters this bar or lounge along with her NRI cousin, who is in a western attire of jeans and top.

Sonia’s costume shows a parallel between tradition and modernity. It makes evident the touch of Indianness even in a distant disco theque of New Zealand. This touch of Indianness and the indigenous tradition is further reinforced by the fact that the name of the location is *Club Indiana*. Thus, a parallel is drawn between the two cultures in a subtle way. This can be called as a manifestation of glocalization.

While discussing about glocalization in Bollywood dance, a special mention needs to be mentioned of the the film “*Aaja Nachle*” (2007), a dance-drama starring renowned and graceful Bollywood heroine and trained *Kathak* dancer Madhuri Dixit. The movie is one of the best examples which incorporates both global and local elements. The movie starts with an English song with western dance, being performed by Madhuri (aka *Dia*). The song-dance sequence “*Dance with me*” is a catchy number with hip-hop and jazz-funk styles of dance, where she is wearing a grey leggings and skin-fit top with jacket. She dances in an energetic way with all moves and postures of jazz, hip-hop and contemporary styles. However, it is interesting to note that the other dance sequences in the movie, like: “*ore piya..*” “*Aaja Nachle*”, “*Show me ur jalwa*”, *Is Pal*” are based on completely Indian forms of dance. For instance, “*Ore Piya*” is based on Kathak and Bharatnatyam dance and then combines different forms of folk dances of India like: *ghoomar* and so on. “*Aaja Nachle*” begins with the Odissi and *natarajan* style of dance. The costumes (a black and blue *zardousi*¹² work *lehenga*¹³), gestures and body movements are all a reflection of Indian culture. Hence, we find that the same movie portrays a global culture as well as a local culture and thus making it an example of *glocalization*.

V. SOCIOLOGICALLY VIEWING CONTEMPORARY BOLLYWOOD DANCE

Studying Bollywood dance, its nature and forms, reveals that it is a part of *popular culture*. It is a product which conveys expressions and identity that are frequently encountered or widely accepted, commonly liked or approved, and characteristic of a particular society at a given time. Furthermore, situating it within a sociological context, Bollywood dance can be viewed within the framework of the theory of ‘culture industry’ of Adorno and Horkheimer, who belonged to the Frankfurt School. They have argued that popular culture is similar to a factory producing standardized cultural goods — films, radio programmes, magazines, etc. — that are used to manipulate mass society into passivity (Ritzer: 1988). Consumption of the easy pleasures of popular culture, made available by the mass communications media, makes people docile and content, no matter how difficult their economic circumstances. They argue that today culture is infecting everything with sameness. Film, studio and magazines form a system. Each branch of culture is unanimous within itself and all are unanimous together. These arguments can be applied to Bollywood dance, with respect to its globalizing tendencies, of recent times and its various related aspects. Drawing a parallel between “culture industry” and Bollywood dance, it can be said that the latter has also turned into a business which caters not just to one section of the population but operates on a global platform. This can be felt by the popularity of Bollywood dance in U.S. and U.K (Kao: 2008;

Shrestha:2011). It is possible because of the process of assimilation whereby Bollywood choreographers use dance styles of West and incorporate them in their own ways. This takes two forms. *Firstly*, a dance can be completely a Western type, with hip-hop or freestyle or contemporary dancing. *Secondly*, sometimes the choreographers may use dance forms of different styles, including use of some *desi* version and mixing it with Western dance, thereby and creating a 'hybridized' dance. This is beneficial and advantageous for the production houses of Bollywood. Again, this is also because of the emerging *consumer culture*¹⁴ not only in the new economy but also in the realm of 'culture'. The film directors, producers and the choreographers work together to create a 'culture' that will be appealing to the modern westernized Indian middle class. Therefore, the standardized forms of Bollywood dances are now derived from the needs of the consumers. There is the popularity, among millions, of both the forms and this leads to its consequent reproduction, which inevitably leads to the use of standard 'products' to meet the same needs at countless locations. This is felt by the choreographers too, when they have to formulate a dance sequence. They have to create a dance which will be 'acceptable' by the Indian audience, in accordance with their cultural traits of Indian society. It can be said that the media representation depicts India's shifting relation with the world economy, but simultaneously is bound to retain its 'Indianness' in moments of dynamic hybridity. Hence, we find that Bollywood film images have begun to show a productive hybrid relation between the local and global, and have begun to help rework a national identity within newly formed cultural parameters. Audiences read, and respond anxiously, ironically, acceptingly, resisting, or even with pleasure, to the signs of the global featured in Bollywood films. These signs include the new styles of clothing, music, dance, and cinematography, as well as the diverse, worldwide settings of the films.

This argument is well captured by Ann R. David in his article "*Beyond the silver screen: Bollywood and Filmi Dance in UK*" (2007). He points out a statement made by acclaimed choreographer Saroj Khan during an interview in a BBC World Documentary, about a shift in the form of dance being showed in movies- from the traditional classical styles towards a more entertaining, more sensual form of dance. She commented in an interview on 22 October 2003 in a BBC world documentary that: "*Film dances must entertain audiences of many thousands at a time. Film dances must please everyone. You cannot have a dancer standing stiffly and moving her neck, because audiences know nothing about classical dance forms- Kathak and Bharatnatyam.... They see Mohini's sexy dance number, 'Ek do tin' [Madhuri dixit dancing in Tezaab (1988)] and the film is a hit... people want this.. they want these tantalizing moments...*" [David: 2007]

VI. CONCLUSION

The globalization of Bollywood dance can be viewed as both a positive and negative phenomenon. On the positive side, incorporating dance into film is an effective method of both spreading the art of dance to the masses and inspiring people to participate in or become interested in the dance world. The exposure to "other" forms of dance not only provides

opportunities for individuals to learn more about dance, but may inspire people to learn about tradition, and develop a better understanding and respect for other cultures. Thus, today's choreographers will incorporate jazz, street dance and hip-hop phrases, blending them together with melodramatic facial expressions and extensive use of mime to convey the meanings in the song. In this regard, Arundhati Subhramaniam talking about the latest influence on the dance, writes that an '*upsurge of bhangra-pop, dandiya-jazz, disco-kathak, even kalari-breakdance combinations epitomize an ethos of cultural hybridization*' (Rozario, Kao: 2008). On the other hand, there are several negative aspects in the globalization of Bollywood dance. While it increases multiculturalism, it is essential to note that Bollywood dance is not and cannot be considered representative of Indian dance or India. Making these assumptions or being oblivious to these facts leads to the production of or continuation of stereotypes that are unhealthy in creating a respectful, multicultural setting.

Finally, in the conclusion it can be said that Bollywood films and dance are, and continue to become, globally recognized as major elements of the Indian culture. Indian films hold a charming place of its own because they are prime examples of globalization and simultaneously glocalization. They involve hybridization between the West and India, migration, and the global propagation of Bollywood with the growth of India as a world power. Through the means of technology and communication, migration, and India's increasing power and influence in the world, the dance style has been quickly dispersed throughout the world. As Bollywood films and dance become more popular, the dance form itself has taken on many forms and adaptations. This is evident in the fact that now the dance style can be used as an element for musical films, taught in classes, performed in competitions, or used as a form of exercise. As the already hybridized dance form continues to be altered and expanded upon, it becomes questionable as to whether or not globalization is a positive or negative phenomenon.

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NOTES

- (a) *Filmfare Award*¹: The *Filmfare Best Choreography Award* is given by the *Filmfare* magazine as part of its annual *Filmfare Awards* for Hindi (Bollywood) films. It is presented annually by *The Times Group* to honour both artistic and technical excellence of professionals in the Hindi language film industry of India. The reason why I have chosen this is because, in contrast to the *National Film Awards*, which are decided by a panel appointed by Indian Government, the *Filmfare Awards* are voted by both the public and a committee of experts. Hence, the *Filmfare* awards give a greater credibility and validity to judge the dance sequences in various Bollywood films.
- (b) *Imagined Space*²: The concept of "imagined space" is explained by Kai-Ti- Kao and Rebecca-Anne Do Rozario in their article "Imagined spaces: The implications of song and dance for Bollywood's diasporic communities". According to them, *imagined space* is that space which exists outside the parameters of realism, generating a completely new, unique space constructed from generic conventions and inventions in choreography, sound and cinematography. Such a space does not exist in the real world, nor is it designed to emulate it.
- (c) *Hybrid*³: Its origin is rooted in biology and subsequently used in linguistics and racial theory in nineteenth century. Hybrid is something that is mixed or is a

mixture of something. It is seen as an effect of cultural globalization.

- (d) *Tawaif*⁴: a tawaif is a courtesan who catered to the nobility, particularly during the Mughal era. Tawaifs excelled in dance and theatre.
- (e) *Thumris*⁵: it is a common style of light classical music in Indian culture.
- (f) *Ghazals*⁶: it is a lyric poem which has a fixed number of verses and repeated rhyme, set to tune and into a song.
- (g) *Mehfil*⁷: it is understood as a congregation of close and intimate people, observed particularly in Hindustani classical music. Dance is often performed in this occasion.
- (h) *Kotha*⁸: It is common parlance, it refers to a house. However, the term specifically refers to those houses where *tawaifs* stay.
- (i) *Bol*⁹: the term is derived from "bolna" which, means "to speak". The mnemonic syllable of the North Indian classical music is called *bol*.
- (j) *Item number*¹⁰: it is a dance performance along with music. Usually now-a-days, item numbers are shown in Bollywood movies, performed by women in provocative ways to increase the popularity of the films.
- (k) *Salwar Kameez*¹¹: It is a traditional outfit of India. It consists of long, loose and light trousers, usually tapering to a tight fit around the ankle along with a long top with sleeves.
- (l) *Zardozi*¹²: Zardozi embroidery is beautiful metal embroidery which was once used to embellish the attire of the Kings and Royals of India. This intricate style of design was said to have brought to India by the Mughals. The Indian city of Lucknow became a major centre of this form of art.
- (m) *Lehenga*¹³: it is a full ankle length skirt, woven with embroidery and or embossed design, worn by Indian women during special occasions or events.
- (n) *Consumer Culture*¹⁴: it is a culture, where social status, values and activities are centered on the consumption of goods and services. It is understood as that culture which is produced for the consumption of the masses in society.

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Manufacturing of Concrete Paving Block by Using Waste Glass Material

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Abstract- There is now a significant world-wide interest to solve the environmental problems caused by industrial waste and other materials by including such materials in the manufacture of concrete. This technology has been introduced in India in construction, a decade ago, for specific requirement namely footpaths, parking areas etc. but now being adopted extensively in different uses where the conventional construction of pavement using bituminous mix or cement concrete technology is not feasible or desirable. The characteristics of concrete containing fine crushed glass during its process, the best ratio of fine crushed glass which leads to higher strength of concrete in order to produce concrete blocks, and the effect of waste glass replacement on the expansion caused by Alkali-silica reaction (ASR). This study looked at the feasibility of waste glass inclusion as partial FA replacement systems. Properties of concrete incorporating waste glass as partial substitution for FA amounts of 15%, 30% and 45% were investigated. The waste glass material used was obtained waste collectors. The results obtained show clearly that glass enhances the compressive strength properties of the final concrete product. The study indicated that waste glass can effectively be used as fine aggregate replacement (up to 45%) without substantial change in strength.

Index Terms- Waste Glass, recycling, cement, concrete, construction field, fine aggregate.

I. INTRODUCTION

Concrete paving blocks has been extensively used in many countries for quite some time as a specialized problem-solving technique for providing pavement in areas where conventional types of construction are less durable due to many operational and environmental constraints. This technology has

been introduced in India in construction, a decade ago, for specific requirement namely footpaths, parking areas etc. but now being adopted extensively in different uses where the conventional construction of pavement using bituminous mix or cement concrete technology is not feasible or desirable. Concrete paver blocks were first introduced in Holland in the fifties as replacement of paver bricks which had become scarce due to the post-war building construction boom. These blocks were rectangular in shape and had more or less the same size as the bricks. During the past five decades, the block shape has steadily evolved from non-interlocking to partially interlocking to fully interlocking to multiply interlocking shapes.

The main challenge before the Indian concrete industry now is to meet the demand of economical and efficient construction materials required by large infrastructure needs due to rapid industrialization and urbanization. All these call for use of good quality concrete with use of minimum resources (eg. Limestone, energy & money) and achieving maximization of strength, durability and other intended concrete properties. In recent years there has been an increasing worldwide demand of concrete paving blocks for the footpaths, roads and airfields which has led to a local depletion of aggregates. In some urban areas, the enormous quantities of aggregate that have already been used means that local materials are no longer available and the deficit has to be made up by importing materials from other locations. Most cities have areas of land covered by spoil heaps which are unsightly and prevent large areas of land being used for anything else.

Concrete paving block is a versatile, aesthetically attractive, functional, and cost effective and requires little or no maintenance if correctly manufactured and placed. Paver blocks can be used for different traffic categories are as follows:

Table: 1. 1 Recommended Grades of Paver Blocks for Different Traffic Categories

Sr. No.	Grade. Designation of-Paver Blocks	Specified Compressive Category Strength of Paver Blocks at 28 Days N/mm	Traffic Category	Recommended Minimum Paver Block Thickness mm	Traffic Examples of Application
1.	M-30	30	Non- traffic	50	Building premises, monument premises, landscapes, public gsrdendparks,domestic

					drives, paths and patios, embankment slopes, sand stabilization area, etc.
2.	M35	35	Light-traffic	60	Pedestrian plazas, shopping complexes, ramps, car parks, driveways, farmhouses, beach sites, tourist resorts, local authority footways, residential roads, etc
3.	M40	40	Medium-traffic	80	City streets, small and medium market roads, low volume roads, utility cuts on arterial roads, etc
4.	M50	50	Heavy traffic	100	Bus terminals, industrial complexes, mandi houses, roads on expansive soils, factory floor, service stations, industrial pavements, etc
5.	M55	55	Very Heavy traffic	120	Container terminals, ports, docks yards, mine access roads, bulk cargo handling areas, airport pavements, etc.

II. SHAPES AND CLASSIFICATIONS

There are four generic shapes of paver blocks corresponding to the four types of blocks as below and figure 1.1 shows the different shapes of paving blocks:

- a. **Type A:** Paver blocks with plain vertical faces, which do not key into each other when paved in any pattern,
- b. **Type B:** Paver blocks with alternating plain and curved/corrugated vertical faces, which key into each other along the curve/corrugated faces, when paved in any pattern,
- c. **Type C:** Paver blocks having all faces curved or corrugated, which key into each other along all the vertical faces when paved in any pattern and
- d. **Type D:** 'L' and 'X' shaped paver blocks which have all faces curved or corrugated and which key into each other along all the vertical faces when paved in any pattern.

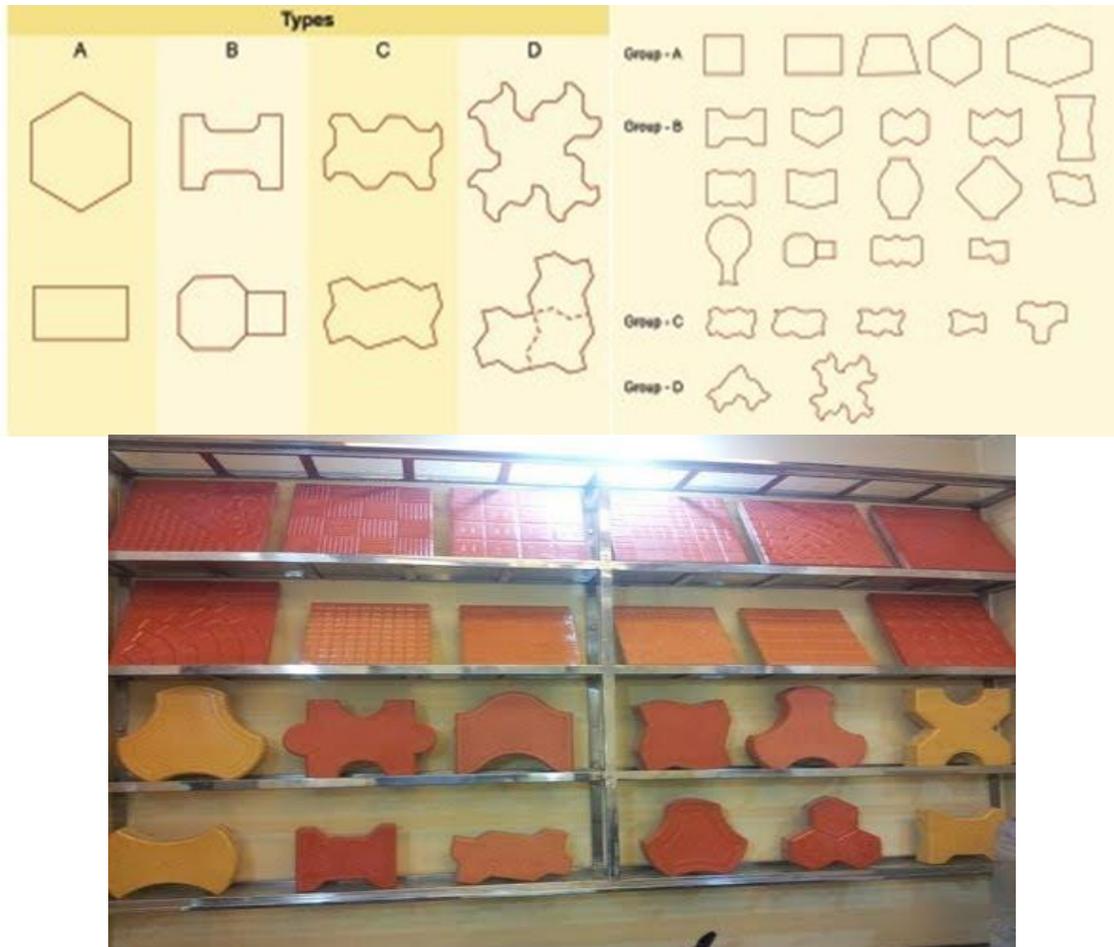


Figure: 1.1 Different Shapes Paving blocks

Concrete blocks are mass manufactured to standard sizes. This makes them interchangeable. Typical concrete paving blocks have one smooth face and one rough, although some paving blocks so come with reversible surfaces (can be used both sides). The performance characteristics of concrete paving blocks make it suitable for the heaviest duty applications, able to support substantial loads and resist shearing and braking forces. The concrete paving bricks are a porous form of brick formed by mixing small [stone](#) hardcore, dyes, cement and sand and other materials in various amounts:-

Various advantages of paving block

- Capability of being moulded in different sizes, shapes, and colours
- Good stability and durability, if properly manufactured and installed.
- Easy to produce ,Easy laying
- Good indoor climate (balanced humidity; cool)
- Various attractive patterns can be formed
- Equipment to produce tiles can be easily made by local workshop

Many block paving manufacturing methods are now allowing the use of recycled materials in the construction of the paving bricks such as crushed [glass](#) and crushed old building [rubble](#). Several researchers have studied the use of waste

materials in concrete such as coal, fly ash, plastic waste, Industrial waste fiber, rubber pads, marbles etc., for making the concrete products. The advantages of using such type of concrete products are these products having low cost as well as they conserve natural resources.

1.2 Waste Materials

Definition of waste: “Wastes materials are substance or objects, which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law”

Solid waste is the unwanted or useless solid materials generated from combined residential, industrial and commercial activities in a given area. It may be categorized according to its origin (domestic, industrial, commercial, construction or institutional); according to its contents (organic material, glass, metal, plastic paper etc. or according to hazard potential (toxic, non-toxin, flammable, radioactive, infectious etc.

Waste is any substance which is discarded after primary use, or it is worthless, defective and of no use. If the large amount of waste materials generated were used instead of natural materials in the construction industry there would be three benefits:

- Conserving natural resources.
- Disposing of waste materials (which are often unsightly).

- Freeing up valuable land for other uses.

1.2.1 Solid type waste

Solid Waste from our homes and Industries is generally collected by our local authorities through regular waste collection, or by special collections for recycling. Within hot climates such as that of the Caribbean the waste should be collected at least twice a week to control fly breeding, and the harboring of other pests in the community. Other factors to consider when deciding on frequency of collection are the odors caused by decomposition and the accumulated quantities. The following are the various waste materials used as ingredient in concrete are:-

➤ **Fly ash-**

- The beneficial use of fly ash in concrete is the preferable option for safe and economical utilization of millions tons of fly ash. There is a critical need to find new methods for using fly ash for its highest and best use. The major obstacle in use of bottom ash in a concrete is that the chemical properties of coal bottom ash are different from place to place and are depends upon the origin of the raw material.

➤ **Steel Aggregates and Rubber Pad-**

- Rubber products are everywhere to be found, though few people recognize rubber in all of its applications. Rubber is used in radio and T.V sets and in telephones. Electric wires are made safe by rubber insulation. Rubber forms a part of many mechanical devices in the kitchen. It helps to exclude draughts and to insulate against noise. Sofas and chairs may be upholstered with foam rubber cushions, and beds may have natural rubber pillows and mattresses.

➤ **Waste marble:-**

- Marble processing industry generates around 7 million tons of wastes mainly in the form of powder during sawing and polishing processes. These are dumped in the open which pollute and damage the environment

➤ **Plastic Waste:-**

- The distribution of plastic debris is highly variable as a result of certain factors such as wind and ocean currents, coastline geography, urban areas, and trade routes. Human population in certain areas also plays a large role in this. Plastics are more likely to be found in enclosed regions such as the Caribbean. Plastic pollution, more so in the forms of macro- and mega-plastics, potentially serves as a means of distribution of organisms to remote coasts that are not their native environments.

➤ **E- waste:-**

- E waste describes loosely discarded, surplus, obsolete, broken, electrical or electronic devices. Rapid technology change, low initial cost have resulted in a fast growing surplus of electronic waste around the globe. Generation of e-waste is a very serious issue in world. In year 2014 produce near about 650000MT of e-waste in India that includes all waste electronics and electrical equipment(TVs, computers, sound systems, refrigerators etc.) .This waste not dispose properly

finally they affect environment and human health and also create storage proble

➤ **Paper:-**

- Plantation timber, not native forests, is the source of most paper-making pulp. Stronger, better quality paper is made from hardwoods. Softwoods produce shorter fibres suitable for paper such as newsprint. Good quality paper is in demand with recyclers to produce a variety of recycled paper products such as printing and writing paper, office supplies such as envelopes, toilet paper and tissues. Lower grade paper is usually used to make products such as cardboard and insulation. Demand for old newspapers can fluctuate. The short fibres in newsprint make it unsuitable for recycling uses other than packaging material, insulation material or being recycled back into newsprint.

➤ **Glass waste:-**

- Glass makes up a large component of household and industrial waste due to its weight and density. The glass component in [municipal waste](#) is usually made up of [bottles](#), broken [glassware](#), [light bulbs](#) and other items. Adding to this waste is the fact that many manual methods of creating glass objects have a defect rate of around forty percent. Glass recycling uses less energy than manufacturing glass from sand, lime and soda.
- Glass makes up a large component of household and [industrial waste](#) due to its weight and density. The glass component in [municipal waste](#) is usually made up of bottles, broken [glassware](#), [light bulbs](#) and other items. In many cases it is not only easy to recycle, glass it can be recycled indefinitely with no loss in quality or purity. Making new glass from old glass saves energy because recycled glass is processed at a lower temperature than glass made from raw materials.
- In glass products all glass materials are not recyclable some glass products such as light bulbs, window panes, glassware and mirrors Ovenware (including Pyrex glass) Opaque white rum, black wine, and green beer bottles with ceramic tops , Pottery , Vases ,Crystal ,Dishes ,Drinking glasses etc. such type of glass waste Disposed in a landfill involves burying the waste and this remains a common practice in most countries. Landfills were often established in abandoned or unused [quarries](#), [mining](#) voids or [borrow pits](#). A properly designed and well-managed landfill can be a hygienic and relatively inexpensive method of disposing of waste materials. Older, poorly designed or poorly managed landfills and [open dumps](#) can create a number of adverse environmental impacts such as wind-blown [litter](#), attraction of [vermin](#), and generation of liquid leachate.
- For avoiding this use of the recycled glass as aggregate in [concrete](#) has become popular in modern times, with large scale research being carried out at Columbia University in New York as well as The use of waste glass as a substitute for fine aggregates in mortar mix is one option that can alleviate waste glass disposal problem and has been studied widely in recent years. Due to the limited landfill space available and stringent

environmental regulations, many waste glasses are attempting to develop efficient, economic and environmental sound alternatives for utilizing this waste glass. Therefore, the civil engineers have been challenged to convert this waste glass, in general, to useful building and construction materials. This greatly enhances the aesthetic appeal of the concrete. Recent research findings have shown that concrete made with recycled glass aggregates have shown better long term strength and better thermal insulation due to its better thermal properties of the glass aggregates.

Waste Glass in concrete offer several advantages:

1. It is one of the most durable materials known because it has basically zero water absorption.
2. The excellent hardness of glass may give the concrete improved abrasion resistance that can be reached only with few natural stone aggregates.
3. Glass aggregates may enhance the flow properties of fresh concrete so that very high strengths can be obtained even without the use of admixture (plasticizer's, superplasticisers etc.
4. The aesthetic potential of colour-sorted, post-consumer glass has barely been explored at all and offers numerous novel applications for architectural purposes.
5. Very finely ground glass has pozzolanic properties and therefore, can serve both as partial cement replacement and filler.

In this project we are using non-recyclable type waste i.e. Glass products (window panes) for replacing some percentage of fine aggregate in concrete paving blocks.

III. EXPERIMENTAL WORK

3.1 MATERIAL and TESTING

3.1.1 Cement-

- In this work, Ordinary Portland cement (OPC) of Altratech (53 grade) brand obtained from a single batches was used. The physical properties of OPC as determined are given in following Table. The cement satisfies the requirement of IS: 8112-1989. The specific gravity was 3.15 and fineness was 2800 cm²/g.
 - Following figure 3.1 shows 53 grade of Cement :-



Figure 3.1 53 grade OPC Cement

- This table shows typical composition of ordinary Portland cement and table no. is 3.1 is given below

Table 3.1 Typical composition of ordinary Portland cement.

Name of compound	Oxide composition	Abbreviation	Weight
Tricalcium Silicate	3CaOSiO ₂	C3S	55%
Dicalcium Silicate	2CaO. SiO ₂	C2S	18%
Tricalcium aluminate	3 CaO. A12O ₃	C3A	10%
Tetra-calcium alumino ferrite	4 CaO. A12O ₃ F 2O ₃	C4AF	8%
Calcium sulphatedehydrate	CaO.Na	CSH ₂	6%

- The cement grade 53 is known for its rich quality and is highly durable. Hence it is used for constructing bigger structures like building foundations, bridges, tall buildings, and structures designed to withstand heavy pressure. With a good distribution network this cement is available most abundantly. The chemical and physical properties of this material were shown in following Table.
- This table properties of ordinary Portland cement and table no. is 3.2 shows given below-

Table 3.2 Properties of Cement

Sr no.	Chemical Ingredients	Range %	Common Proportion
1	Lime	60-70	63
2	Silica	17-25	22
3	Alumina	3-8	6
4	Iron Oxide	0.5-6	3
5	Magnesium Oxide	0.4-4	2.5
6	Sulphur Trioxide	1-3	1.75
7	Alkalies such as soda & potash	0.2-1	0.25
8	Loss on ignition	1-2	1.5

- *Physical properties of Portland cement:-*
- The cement used should satisfy the IS specification before to be used as construction material. The important physical properties of cement and there is specification are as follows.

- Fineness -The residue of cement should not exceed 10% when sieved 90-micron I.S. sieve.
- Setting time-The time at which the cement paste loses its plasticity is termed as initial setting time. The initial setting time should not be less than 30 minutes.
- Soundness -The expansion carried out in the manner described in IS 269-1976 should not be more than 10 mm in the Leghatelievs test and 0.8% in Autoclave test.
- Compressive -For ordinary Portland cement the compound Strength -strength at 3 and 7 days curing should not be less than 16 N/mm² and 22N/mm² respectively. The graded standard sand used for preparing the cubes should conform to I.S. 650-1966.
- Heat of hydration- For low heat Portland cement should not be more than 66 and 75 cal/g for 7 and 28 days respectively. For OPC it varies from 37 cal/g at 50^o C – 80cal/g at 40^o C.

3.1.2 Aggregate –

Aggregate are the important constituents in concrete. They give body to the concrete, reduce shrinkage and affect economy. Aggregate occupy is to assist in producing workability and uniformity in mixture. The fine aggregate is also assists the cement paste to hold the coarse aggregate in suspension. This concrete 70-80% of the volume of concrete. To increase the density of resulting mix the aggregates are frequently used in two or more sizes. The most important function of the fine aggregate action promotes plasticity and segregation. The aggregate provides about 75% of body of. The size of aggregate bigger than 4.75 mm is considered as coarse aggregate and less as fine aggregate or sand. The nominal sizes of coarse aggregate are 10 mm, 20 mm and 25 mm etc. where have used. In our project we are using fine aggregate as well as coarse aggregate are as follows:-

3.1.2.1 Fine aggregate (Sand)-

In this project we are using (Natural Sand) Fine aggregate resulting from the natural disintegration of rock and which has been deposited by streams or glacial agencies. The river sand was used as natural river sand. It is distinguished from gravel only by the size of grain or particle, but is distinct from clays which contain organic minerals. Sands that have been sorted out and separated from the organic material by the action of currents of water or by winds across arid lands are generally quite uniform in size of grains. Usually commercial sand is obtained from river beds or from sand dunes originally formed by the action of winds. Much of the earth's surface is sandy, and the sand is usually quartz and other siliceous materials. Sand is used to make mortar and concrete and for making moulds in foundries. Size of sand used which passing from 4.75mm. The specific gravity of sand used was 2.605. Specific gravity of sand is found out by the Pycnometer test.

- Following figure no 3.2 shows River sand :-



Figure 3.2 River Sand

➤ Characteristics of aggregates –

- In general an aggregate to be used in concrete must be clean, hard, strong, properly shaped and well graded. The aggregate must possess chemical, resistance to abrasion, and to freezing and thawing. They should not contain deleterious material, which may cause physical or chemical changes such as cracking, stability swelling, softening or leaching.

➤ Strength of aggregate –

- IS 383-1970 prescribes a 45% limit for the crushing value determined as per IS 2386 (Part IV) – 1963 for the aggregate used for concrete other than for wearing surface such as runways, roads and pavements.

➤ Porosity, Absorption And Moisture Content Of Aggregate –

- The porosity, permeability and absorption of aggregate influence the resistance of a concrete freezing the thawing, its chemical stability, resistance to abrasion and the bond between the aggregate and the cement paste

3.1.2.2 Coarse Aggregates-

Coarse aggregate are the crushed stone used for making concrete. The commercial stone is quarried, crushed and graded. Much of the crushed stone used is granite, limestone and trap rock. Crushed angular granite material of 10 mm size from a local source was used as coarse aggregate. The specific gravity of 2.6 and fineness modulus 6.05 was used. Size of aggregates used Aggregates passing through 12.5 mm size sieve and retained on 10 mm size sieve are used. Specific Gravity of aggregates used were 2.884.

Following figure no 3.3 shows 10 mm coarse aggregate :-



Figure 3.3 10 mm Coarse Aggregate

3.1.3 Admixture-

Superplasticisers recommended by IS-9103

3.1.4 WATER

The water used for mixing and curing of concrete should be free from harmful materials and objectionable strain on surface. A part of mixing water is utilized in the hydration of cement and the remaining water serves as lubricant between the fine and course aggregates and make concrete workable. Generally minimum 0.3 to 0.8 w/c ratios are required for hydration. But for good workable concrete additional water is required to lubricant the mix. The extra water results in formation of bleeding effects of effective water in concrete are as below.

- ❖ Less effective bond formation
- ❖ Leakage through formwork
- ❖ Honey comb formation

3.1.5 Glass-

For this project the non-recyclable glass is used. Basically waste glass material that cannot be reused due to the high cost of manufacturing. Therefore the manufacture will disposed in the waste landfill. Due to environmental problem, researcher tries to use the waste glass in to concrete, to create a new material to use in construction field. Researcher found that, the main material composition of glass is silica that also contain in cement production and other compound that also similarly contain in cement production.

It is crushed by using los angles abrasion testing machine up to 4.75 mm passing and 90 micron retaining glass taking for project work.

- The following table no 3.3 shows Chemical composition of clear glass is as follows:

Table 3.3 Chemical Composition of Glass

Composition	Clear Glass
Sio ₂	72.42
Al ₂ O ₃	1.44
Tio ₂	0.35
Cr ₂ O ₃	0.002
Fe ₂ O ₃	0.07
CaO	11.50
MgO	0.32
Na ₂ O	13.64
K ₂ O	0.35
SO ₃	0.21

- Following figure no 3.4 and 3.5 shows crushed waste Glass material:-



Figure 3.4 Crushed Glass

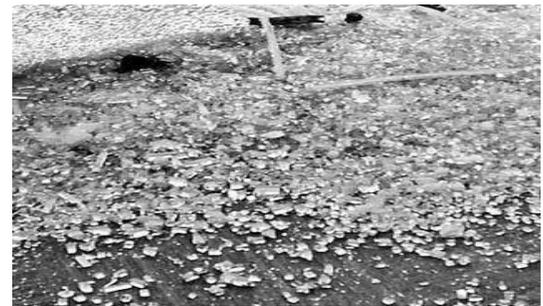


Figure 3.5 Crushed Glass

3.1.5.1 Test carried on crushed Glass

- A. Specific Gravity

Apparatus

- 1. A balance of capacity not less than 3kg, readable and accurate to 0.5 gm and of such a type as to permit the weighing of the vessel containing the aggregate and water.
- 2. A well ventilated oven to maintain a temperature of 100°C to 110°C
- 3. Pycnometer of about 1 Litre capacity having a metal conical screw top with a 6mm hole at its apex. The screw top shall be water tight.
- 4. A means supplying a current warm air.
- 5. A tray of area not less than 32cm².
- 6. An air tight container large enough to take the sample.
- 7. Filter papers and funnel.

Procedure

- (I) Take about 500g of sample and place it in the pycnometer.
- (II) Pour distilled water into it until it is full.
- (III) Eliminate the entrapped air by rotating the pycnometer on its side, the hole in the apex of the cone being covered with a finger.
- (IV) Wipe out the outer surface of pycnometer and weigh it (W)
- (V) Transfer the contents of the pycnometer into a tray, care being taken to ensure that all the aggregate is transferred.

- (VI) Refill the pycnometer with distilled water to the same level.
- (VII) Find out the weight (W1)
- (VIII) Drink water from the sample through a filter paper.
- (IX) Place the sample in oven in a tray at a temperature of 100°C to 110° C for 24±0.5 hours, during which period, it is stirred occasionally to facilitate drying.
- (X) Cool the sample and weigh it (W2).

The following table shows Specific gravity test Observation-

Table 3.4 Specific Gravity Test

Density bottle number	1	2	3
Mass of empty bottle W ₁ gm	680	702	685
Mass of bottle + crushed glass W ₂ gm	780	802	785
Mass of bottle + crushed glass + water W ₃ gm	1538	1650	1590
Mass of bottle full of water W ₄ gm	1480	1590	1535
Mass of soil (W ₂ – W ₁) gm	100	100	100
Mass of water in full bottle (W ₄ -W ₁) gm	800	888	850
Mass of water used (W ₃ – W ₂) gm	758	848	805
Volume of soil particle (W ₄ – W ₁) – (W ₃ - W ₂) gm	42	40	45
Average specific gravity	2.36		

Calculation:-

$$G = \frac{(W_2 - W_1)}{(W_4 - W_1) - (W_3 - W_2)} = 2.36$$

Result:-

Specific gravity of fine aggregate = 2.36

3.1.6 Moulds –

The rubber mould are used for casting paving block of Type C: Paver blocks having all faces curved or corrugated, which key into each other along all the vertical faces when paved in any pattern. They were made in such a manner as to facilitate the removal of the moulded specimen without damage.

- Following figure 3.6 shows C- type rubber mould :-



Figure 3.6 C-Type Rubber Mould.

Metal moulds are used for casting of concrete cube, preferably steel or cast iron of size 15 cm x 15 cm x 15 cm were used for practical analysis. They were made in such a manner as to facilitate the removal of the moulded specimen without damage. The joints between the sections of the mould are thinly coated with mould oil and a similar coating of mould oil is applied between the contact surface of the bottom of the mould and the base plate in order to ensure easy removal of specimen from mould. The mould nuts and bolts were tightened so that no water escapes during the filling.

- Following figure 3.7 shows concrete cube mould:-



Figure 3.7 Concrete Cube Mould

3.1.7 Weighing –

The proportions or the materials are taken by weight or by volume. The procedure we adopted was by weighting of the material this is more accurate method than volumetric method hence we preferred this method.

3.1.8 Mixing-

After taking weights of all the ingredients there was the next procedure of mixing. First take the coarse aggregate than fine aggregate sand and then cement with fly ash in hump manner. Then first mixing was carried out in dry mixing for 3 times. Then again the material hump was created. Then small pond was created and the calculated quantity or specified water was poured in the pond. Then the materials was wet mixed from out to in. The wet mixing was carried for 3 times. The mixing was done manually. To get good result the mixing can be done by small mechanical mixes.

3.1.9. Compacting-

Compacting of concrete was done after placing the mixed concrete in the mould of 15 cm x 15 cm x 15 cm as well as paving rubber mould. The compaction was carried out manually with tamping steel rods and vibrating concrete externally. The

concrete was filled in 3 layers. Each layer was tamped 25 times for cube casting and for the paving blocks 10 mm thickness of doramite and colour mixture after that concrete mixture. The filling of concrete in mould was done in such a way that the materials were equally distributed in the mould. The compaction by tamping rod for was done vertically for cube and table vibrator for paving block. The compaction must be carried very carefully so that no voids are left and concrete becomes denser.

3.2 CURING OF PAVING BLOCK AND CONCRETE CUBES-

Curing is the process in which the concrete is protected from loss of moisture and kept within a reasonable temperature range. This process results in concrete with increased strength and decreased permeability. Curing is also a key player in mitigating cracks. Traditionally, quality of concrete in construction works is calculated in terms of its 28 days compressive strength. . If after 28 days, the quality of concrete is found to be dubious, it would have considerably hardened by that time and also might have been buried by subsequent construction.

For paving blocks Air curing is used. Because of The necessity for curing arises from the fact that hydration of cement can take place only in water-filled capillaries. This is why loss water must be prevented. Furthermore, water lost internally by self-dedication has to be replaced by water from outside Thus, for complete and proper strength developments, the loss of water in concrete from evaporation should be prevented, and the water consumed in hydration should be replenished. This the concrete continues gaining strength with time provided sufficient moisture is available for the hydration of cement which can be assured only by creation of favorable conditions of temperature and humidity. This process of creation of an environment during a relatively short period immediately after the placing and compaction of the concrete, favorable to the setting and the hardening of concrete is termed curing (The paving blocks are kept under shadow for curing. The curing is done for 7 and 28 days.

Following figure 3.14 shows Air curing of paving block :



Figure: 3.14 Curing Of Paving Block

For paving blocks & concrete cubes of size 0.15X0.15X0.15 m Air curing method is used. The paving blocks and concrete cubes are kept under shadow for curing. The curing is done for 7 and 28 days. In case of dry-air curing, the specimens were weighed and exposed to dry air.

3.3 TESTING OF PAVING BLOCKS-

- The number of paving blocks tested is given in Table shows 3.3

Table 2.6 Samples tested as per IS: 15658:2006

Property	Reference Clause No.	Testing method	Number of paver blocks for each test
Compressive strength	6.2.5	Annex D	
Flexural strength	6.3.2	Annex F	

Compressive Strength:-

Paving block were tested for compressive strength. Compressive strength of paver blocks shall be specified in terms of 28 days compressive strength. The average 28 days compressive strength of paver blocks shall meet the specific requirement. Compression testing machine was used for the testing of paving blocks.

- Following Table no. 3.7 shows Compressive Testing for Result for Ordinary Paving Block respectively :-

Table 3.7 Compressive Testing Result for Ordinary Paving Blocks

PERIOD	LOAD (TN)	LOAD (N)	COMPRESSIVE STRENGTH (N/MM ²)	AVG. COMPRESSIVE STRENGTH(N/ MM ²)
AT 7 DAYS	185	1850X10 ³	44.39	43.51
	180	1800X10 ³	43.19	
	179	1790X10 ³	42.95	
AT 28 DAYS	246	2460X10 ³	59.04	58.40
	240	2400X10 ³	57.60	
	244	2440X10 ³	58.56	

Following Table no. 3.8,3.9 and 3.10 shows Compressive Testing for Result for 15%,30% and 45% replacement of glass Paving Block respectively :-

Table 3.8 Compressive Testing Result For 15% Replacement Paving Block

PERIOD	LOAD (TN)	LOAD (N)	COMPRESSIVE STRENGTH (N/MM ²)	AVG. COMPRESSIVE STRENGTH(N/ MM ²)
AT 7 DAYS	223	2230X10 ³	53.51	54.55
	232	2320X10 ³	55.67	
	227	2270X10 ³	54.47	
AT 28 DAYS	OVER 300	3000X10 ³	71.99	71.99
	OVER 300	3000X10 ³	71.99	
	OVER 300	3000X10 ³	71.99	

Table 3.9 Compressive Testing Result For 30% Replacement Paving Blocks

PERIOD	LOAD (TN)	LOAD (N)	COMPRESSIVE STRENGTH (N/MM ²)	AVG. COMPRESSIVE STRENGTH(N/ MM ²)
AT 7 DAYS	248	2480X10 ³	59.51	58.31
	242	2420X10 ³	58.07	
	239	2390X10 ³	57.35	
AT	OVER 300	3000X10 ³	71.99	

<ul style="list-style-type: none"> • 28 • D • A • Y • S 	300			<ul style="list-style-type: none"> • 71.99 • 71.99
	OVER 300	3000X10 ³	• 71.99	
	<ul style="list-style-type: none"> • OVE • R • 300 	<ul style="list-style-type: none"> • 3000X10³ 	• 71.99	

Table 3.10 Compressive Testing Results For 45% Replacement Paving Blocks

<ul style="list-style-type: none"> • PE • RI • O • D 	<ul style="list-style-type: none"> • LOA • D • (TN) 	<ul style="list-style-type: none"> • LOAD • (N) 	<ul style="list-style-type: none"> • COMPR • ESSIVE • STREN • GTH • (N/MM²) 	<ul style="list-style-type: none"> • AVG. • COMPRESSIVE • STRENGTH(N/ • MM²)
<ul style="list-style-type: none"> • A • T • 7 • D • A • Y • S 	• 227	• 2270X10 ³	• 54.57	<ul style="list-style-type: none"> • 53.99
	• 217	• 2170X10 ³	• 52.07	
	• 231	• 2310X10 ³	• 55.43	
<ul style="list-style-type: none"> • A • T • 28 • D • A • Y • S 	<ul style="list-style-type: none"> • OVE • R • 300 	<ul style="list-style-type: none"> • 3000X10³ 	• 71.99	<ul style="list-style-type: none"> • 71.99
	OVER 300	3000X10 ³	• 71.99	
	<ul style="list-style-type: none"> • OVE • R • 300 	<ul style="list-style-type: none"> • 3000X10³ 	• 71.99	

• Following figure 3.15 shows Compression Testing on paving block:-



Figure: 3.15 Compressions Testing On Paving Block

casting

Following figure 3.16 shows graph compressive strength v/s method of paving block :-

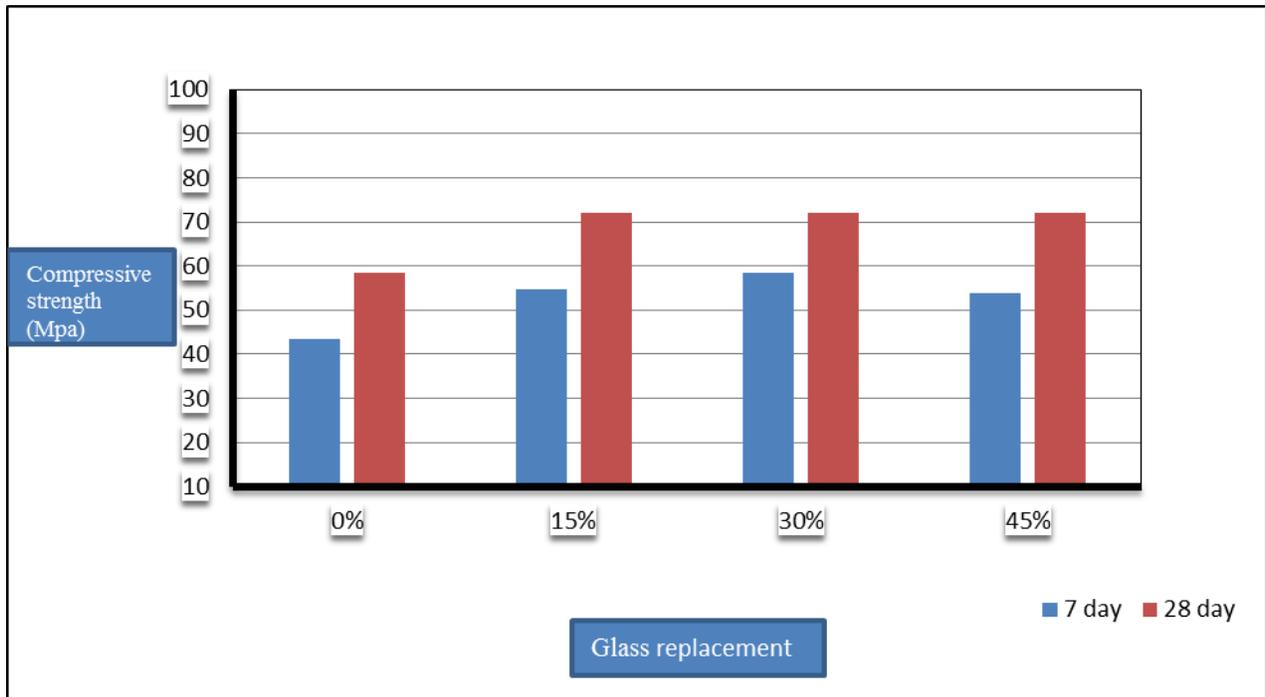


Figure: 3.16 Compressive strength vs % of glass replacement

Compressive strength on concrete cubes-

- Following Table no. 3.11 shows Compressive Testing for Result for Ordinary Concrete Block respectively :-Table 3.11 Compression test on concrete cubes (Ordinary)

• PE RI O D	• LOA D (TN)	• LOAD (N)	• COMPR ESSIVE STREN GTH (Mpa)	• AVG. COMPRESSIVE STRENGTH(Mp a)
• A T 7 D A Y S	• 43.9	• 439.0X10 ³	• 19.51	• 19.50
	• 43.0	• 430.0X10 ³	• 19.11	
	• 44.7	• 447.0X10 ³	• 19.87	
• A T 28 D A Y S	• 73.5	• 735.0X10 ³	• 32.67	• 32.55
	71.8	718X10 ³	• 31.91	
	• 74.4	• 744X10 ³	• 33.06	

Following Table no. 3.12,3.13 and 3.14 shows Compressive Testing for Result for 15%,30% and 45% replacement of glass Concrete Block respectively :-

Following Table no. 3.12,3.13 and 3.14 shows Compressive Testing for Result for 15%,30% and 45% replacement of glass Concrete Block respectively :-

Table3.12 Compression test on concrete cubes (15 % replacement)

PERIOD	LOAD (TN)	LOAD (N)	COMPRESSIVE STRENGTH (Mpa)	AVG. COMPRESSIVE STRENGTH(Mpa)
AT 7 DAYS	45.5	455X10 ³	20.22	20.63
	46.1	461X10 ³	20.48	
	47.7	477X10 ³	21.20	
AT 28 DAYS	76.1	761X10 ³	33.82	34.46
	76.9	769X10 ³	34.17	
	79.7	797X10 ³	35.38	

Table 3.13 Compression test on concrete cubes (30 % replacement)

PERIOD	LOAD (TN)	LOAD (N)	COMPRESSIVE STRENGTH (Mpa)	AVG. COMPRESSIVE STRENGTH(Mpa)
AT 7 DAYS	48.307	483.07X10 ³	21.47	21.86
	47.490	474.90X10 ³	21.11	
	46.9	469X10 ³	20.87	
AT 28 DAYS	80.257	802.57X10 ³	35.67	35.27
	78.6	786X10 ³	34.91	
	78.9	789X10 ³	35.06	

Table3.14 Compression test on concrete cubes (45 % replacement)

PERIOD	LOAD (TN)	LOAD (N)	COMPRESSIVE STRENGTH (Mpa)	AVG. COMPRESSIVE STRENGTH(Mpa)
AT 7 DAYS	43.9	439X10 ³	19.51	19.64
	42.7	427X10 ³	18.97	
	46.0	460X10 ³	20.44	
AT 28 DAYS	73.6	736X10 ³	32.67	33.11
	75.7	757X10 ³	33.60	
	74.4	744X10 ³	33.06	

- Followig figure 3.17 shows compressive strength v/s method of casting cube :-

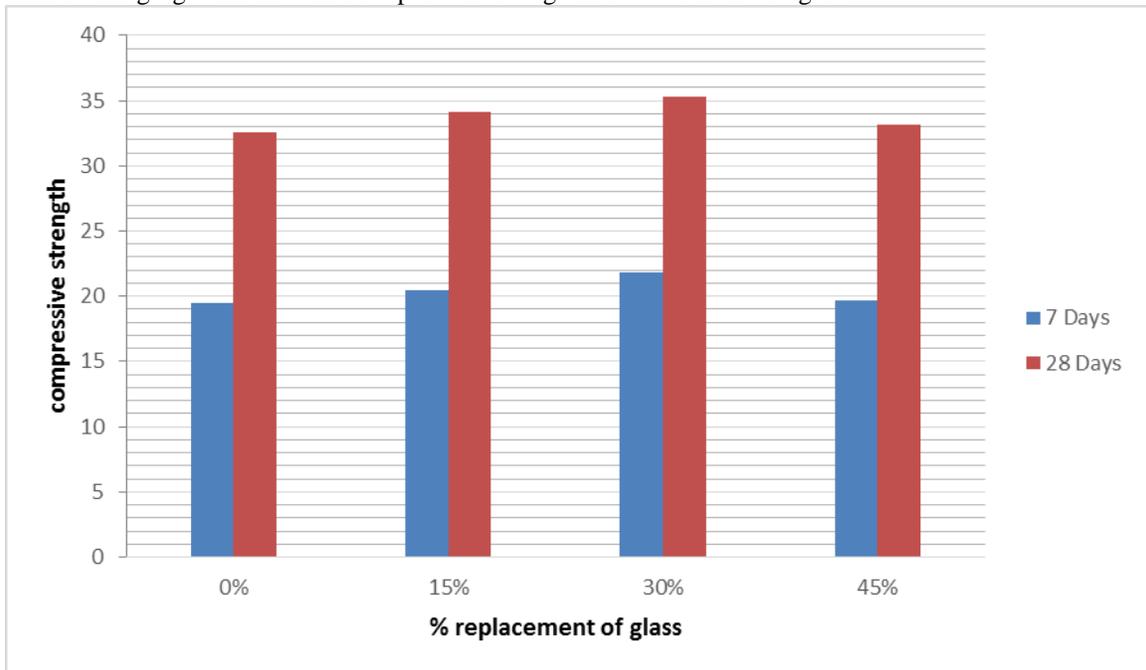


Figure 3.17 compression strength vs. % of glass replacement in cubes

FlexureTest:-

- The flexural strength of the paving block shall be calculated as follows;

$$F_b = \frac{3Pl}{2bd^2}$$

Following Table no. 3.15 Shows Flexure Test Result for Ordinary Paving Block respectively :-

Table 3.15 Flexure Test Result for Ordinary Paving Blocks

• PERIOD	• LOAD (KN)	• LOAD (N)	• COMPRESSIVE STRENGTH (N/MM ²)	• AVG. COMPRESSIVE STRENGTH(N/ MM ²)
• AT • 7 • DAYS	• 8.152	• 8.152X10 ³	• 2.36	• • 2.38 •
	• 7.958	• 7.958X10 ³	• 2.30	
	• 8.557	• 8.557X10 ³	• 2.48	
• AT • 28 • DAYS	• 9.532	• 9.532X10 ³	• 2.76	• • 2.76 •
	• 9.263	• 9.263X10 ³	• 2.68	
	• 9.897	• 9.897X10 ³	• 2.86	

Following Table no. 3.16 Shows Flexure Test Result for 15% Replacement of Paving Block respectively :-

Table 3.16 Flexure Testing Result for 15% Replacement of Paving Block

• PERIOD	• LOAD (TN)	• LOAD (N)	• COMPRESSIVE STRENGTH (N/MM ²)	• AVG. COMPRESSIVE STRENGTH(N/ MM ²)
• AT • 7 • DAYS	• 6.38	• 6.38X10 ³	• 1.84	• • 1.96 •
	• 6.89	• 6.89X10 ³	• 1.99	
	• 7.11	• 7.11X10 ³	• 2.06	
• AT • 28 • DAYS	• 8.12	• 8.12X10 ³	• 2.35	• • 2.40 •
	• 8.45	• 8.45X10 ³	• 2.45	
	• 8.27	• 8.27X10 ³	• 2.39	

Following figure 3.18 shows flexural Testing on paving block:-



Figure 3.18 Flexural Testing on Paving Block.

- Following figure 3.19 shows paving block Before tsetting:-



Figure 3.19 Paving block before flexure Testing

- Following figure 3.20 shows Paving Block After Testing:-



Figure 3.20 paving block after flexure testing

IV. RESULTS AND DISCUSSION

4.1 Result-

To observe the effect on compressive strength of paver blocks and concrete cube of waste glass used as replacement with fine aggregate at 15, 30 and 45% of replacement in paver blocks as well as concrete cube of 15* 15* 15 cm were used. Paver blocks and concrete cube are cast without glass also and the waste glass replacement paving block are compared with the paver blocks made without replacement of glass (Ordinary paving block).The results of compression test and flexure test are obtained that are shown below.

- Following Table no.4.1 shows result of compressive strength on paving block.

Table 4.1 Compressive strength on paving block

	After 7 days(Mpa)	After 28 days(Mpa)
Ordinary paving blocks	43.41	58.40
15% glass replaced paving blocks	54.55	71.99

30% glass replaced paving blocks	58.31	71.99
45% glass replaced paving blocks	53.99	71.99

- Following Table no.4.2 shows result of compressive strength on concrete block:-

Table 4.2 Compressive strength on concrete block

	After 7 days(Mpa)	After 28 days(Mpa)
Ordinary paving blocks	19.50	32.55
15% glass replaced paving blocks	20.46	34.12
30% glass replaced paving blocks	21.86	35.27
45% glass replaced paving blocks	19.64	33.11

- Following Table no.4.2 shows result of flexural strength on paving block:-

Table 3.3 Flexural strength on paving block

	After 7 days(Mpa)	After 28 days(Mpa)
Ordinary paving blocks	2.38	2.76
15% glass replaced paving blocks	1.96	2.40

- Following figure no.4.1 shows result of flexural strength on paving block:-

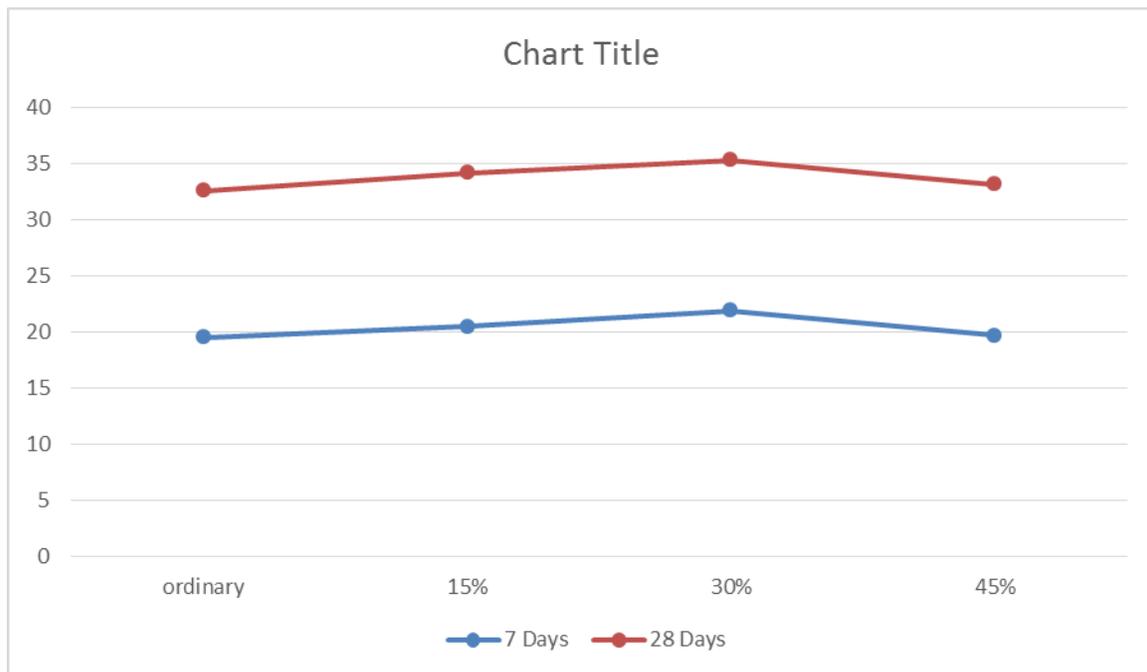


Figure 4.1 Compressive strength vs % of glass replacement in cube

An analysis made on strength characteristic by conducting test on non-recycled glass concrete. The 7 days and 28 days compressive strength result of M30 grade concrete shown in table and analysis by graphically shown in chart.

We replace waste glass as a fine aggregate in concrete with different percentage such as 15%, 30%, and 45%. The tests carried on the fine aggregate such as specific gravity, sieve analysis are also conducted on waste glass.

We casted overall 36 paving blocks and 12 cubes. In that we cast normal blocks (Ordinary paving block and cube) of M30 grade concrete and compressive test conducted on paving block as well as concrete cube and the flexural test are conducted on only the paving block that after curing of 7 days and 28 days. By

replacing waste glass to fine aggregate in different percentage 15%, 30%, and 45% casting is done. After curing of 7 days and 28 days the compressive test and flexural test are conducted on that. By observing results of waste glass blocks that is concrete cube the strength of block is increases from 15% to 30% replacement of glass and after 45% waste glass replacement and onwards the strength is decreases. Strength reduce because of internal voids of waste glass increases. We comparing strength of waste glass blocks with normal blocks. Upto 15% and 30% is comparatively more than normal block but upto 45% strength is nearly same to normal block. So from above chart we got the optimized value as 30% replacement of waste glass as well we

found that 45% replacement of waste glass is suitable for casting the paving block for light traffic.

V. CONCLUSION

The feasibility of concrete blocks with the Fine Glass was shown technically in the present study. Based on the experimental investigation, the following conclusions-

- Density of concrete decreased with increase in waste glass content thus making concrete light weight in nature.
- The use of waste glass as fine aggregate decreases the unit weight of concrete.
- With increase in waste glass content, percentage water absorption decreases.
- Workability of concrete mix increases as well as durability of concrete also increases with waste glass content.
- Flexural strength decreases with increase in waste glass content.
- Compressive strength increases with increasing the glass percentage from 15% to 30% replacement of glass and after 45% waste glass replacement onwards the strength is decreases. Strength reduce because of internal voids of waste glass increases.
- Cost of paving blocks is decreases with increase in glass content.
- Crushed waste glass aggregate have irregular shapes than river sand.
- Reduction in bleeding is observed by addition of glass in the concrete mixes.
- Fluidity of the fresh concrete is inhibited.

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Development and Validation of a Computer Aided Instructional Material in Selected Topics in Elementary Algebra

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Abstract- The study developed and validated a computer-aided instructional material in Elementary Algebra. It made use of Quasi - Experimental Research method utilizing one group pretest-posttest design. It also utilized the 100 items validated pretest/posttest developed for the purpose of attaining the objective of the study. The subjects of the study were the 15 randomly selected students in Elementary Algebra at Peter Pan Learning Center, Baras, Rizal, Philippines. Findings revealed that the performance pretest and posttest of the subjects in both Algebraic expressions and first degree equation and inequalities are satisfactory and very satisfactory respectively. It emphasizes that the computer-aided instructional materials in Elementary Algebra brought significant gain in knowledge and skills of the students upon its exposures.

Index Terms- Computer-aided instructional material, development and validation, elementary algebra.

I. INTRODUCTION

Basic Education is an important tool for the preparation of prospective college students who are aiming to finish degree courses. It provides foundation to students in various subjects essential to advance studies. One of these subjects is Mathematics. Mathematics has so many branches or field of study and to cite one is Elementary Algebra. This subject is considered as an indispensable subject because of its wide range of application in school particularly in various disciplines such as education, architecture and engineering and in most cases essential in the real world of life. In other words, if the foundation of students in elementary algebra is poor, the students are hard up in coping up with application of concepts as they move to higher levels of learning. Thus, teaching the subject should produce good quality products. The 1987 Constitution provides that “the state shall protect and promote the right of all citizens to quality education at all levels and shall take appropriate action to make education accessible to all.”

The constitutional provision mandates that the school should devise means in order to make teaching elementary algebra interesting to the students. The value of this fact lies in the sense that the students encountered difficulties in learning concepts and practical applications of the subject. Such difficulties is attributed to the techniques and strategies used by the teacher.

In recent years, the Government took the necessary steps that would make the subjects in the high school, specifically

Elementary Algebra responsive and realistic to the changing time. This idea is indicated in the revised Basic Education Curriculum through its features. One of the features is the new focus of Mathematics in the secondary level. The 2002 BEC Handbook stated that “In the secondary level, instead of the spiraling integrated approach in Mathematics, we will now offer Elementary Algebra in the First Year, Intermediate Algebra in Second Year and Geometry in Third Year.”

This feature emphasizes the necessity of Elementary Algebra in the high school. The teaching and learning process should be functional and more realistic so that it will meet the demand of the changing time. In the final analysis, teaching the subject must be interesting through the provision of a learning material which will enhance the mastery of the students. In other words, instructional materials should be developed to attain the aims of quality education. The development of instructional materials is not new to the people in the academic community. Sec. 5 of PD. No. 6-A states that “one of the best educated objectives is to design, utilize, and improve instructional technology and develop or produce textbooks and other instructional materials leading to quality education.

One of these materials is a Computer Aided Instructional Material. The material is interesting and will help facilitate individualize instruction. It also reinforces learning. Bauzon (1994) supports this contention when he stated that the theory of self activity is the basis of all learning. He commented that “the pupils or students learn by doing, experiencing and experimenting”. This comment implies that a computer aided instructional material is needed to strengthen learning of the students.

II. OBJECTIVES

The study aimed to develop and validate a Computer Aided Instructional Material of Selected Topics in Elementary Algebra for first year high school students during the School Year 2007-2008.

Specifically, it sought determine the following:

1. the mean performance of the students in pretest and posttest of the developed Computer Aided Instructional Material in Algebraic Expressions and first degree equation, and
2. find the significant difference between the mean performance of the students in pretest and posttest of the developed Computer Aided Instructional Material Elementary Algebra.

III. RESEARCH METHODOLOGY

The study made use of Quasi - Experimental Research method utilizing one group pretest-posttest design.

The study was conducted at Peter Pan Learning Center. Peter Pan Learning Center is a private school offering secondary and elementary level of education. The school believes on child's progress and advancement in his study, fulfilling the mission of Christ on earth through the development of man, thus providing a balance development of the child is ensured towards this end. Some of the important activities of the school is the development of the students through Mathematics Quiz Bee which is immensely contributed by the subject, Elementary Algebra.

The subjects of the study were the 15 first year high students enrolled during the school year 2007-2008. There were no equating factors considered in the selection of the subjects of the study, but it was made clear that no irregular first year students were included in the study.

The teacher made test which was used in determining the validity of the developed material consisting of 100-items. The

test was divided into two sets and each set was administered before and after the grading period. The test was developed based on the learning competencies provided by the Department of Education and the table of specification. The test was content validated by experts in test preparations. Suggestions provided by experts was considered in the revision. It was tried out to 10 second year high students enrolled at Peter Pan Learning Center, Baras, Rizal, Philippines during the school year 2007-2008. The result of the try out was analyzed through indices of difficulties and discrimination in order to improve the poor items and the test was finalized.

The mean score of the students in every learning area was interpreted using the following scale:

Range	Interpretation
41 - 50	Outstanding
31 - 40	Very Satisfactory
21 - 30	Satisfactory
11 - 20	Fair
1 - 10	Poor

IV. RESULTS

Performance of the Students in Pretest and Posttest of the Developed Computer Aided Instructional Material in Elementary Algebra

Table I. Computed Mean and Standard Deviation on the Performance of Students in Pretest and Posttest of the Developed Computer Aided Instructional Material in Elementary Algebra

Learning Areas	Pretest			Posttest		
	Mean	SD	VI	Mean	SD	VI
1. Algebraic Expressions	25.2	3.28	S	33.07	4.98	VS
2. First Degree Equation & Inequalities	24.47	3.29	S	33.13	4.14	VS
Over-all	24.84	3.29	S	33.1	4.56	VS

Legend:

SD - Standard Deviation VI- Verbal Interpretation S- Satisfactory

Significant Difference Between the Level of Performance of the Students in Elementary Algebra as revealed by the Pretest and Posttest With Respect to the Learning Areas

Table II. Computed t-value on the Performance of the Students in Pretest and Posttest of the Different Learning Areas of the Computer Aided Instructional Material of Selected Topics in Elementary Algebra

Learning Areas	Tc	Df	p-value	Ho	VI
1. Algebraic Expression	6.499	14	.000	R	S
2. Linear Equation and Inequalities	9.225	14	.000	R	S

Legend:

df - degrees of freedom R - Rejected S - Significant
t_c - Computed t-value Ho - Null Hypothesis

V. DISCUSSIONS

As indicated in the table 1, the mean score of the students in pretest Algebraic Expressions is 25.2 with a standard deviation of 3.28 verbally interpreted as satisfactory and the mean score in

posttest is 33.07 with a standard deviation of 4.98 verbally interpreted as very satisfactory. On the other hand, the mean score of the students in pretest in the First Degree Equation and Inequalities is 24.47 with standard deviation 3.29 verbally interpreted as satisfactory and the mean score of the students in

posttest is 33.13 with a standard deviation of 4.14 verbally interpreted as very satisfactory.

The overall mean score of students in pretest in the two learning areas is 24.84 with a standard deviation of 3.29 verbally interpreted as satisfactory and the over-all mean score in posttest is 33.1 with a standard deviation of 4.56 verbally interpreted as very satisfactory. These figures emphasize that there was an increase in the mean scores of students in posttest upon utilization of the computer aided instructional material. This statement is valid because the overall standard deviation of the mean scores in pretest and posttest are low. Pagoso et.al. (1978) stated that "if the standard deviation is small, there is a homogeneity in the intelligence of the students". It means that the performance of the students in pretest and posttest are reliable. Therefore, there is no doubt that the students acquire greater amount of knowledge and skills in different learning areas of the computer aided instruction.

This finding is strengthened by the study of Robles (2004) when she spelled out that the students acquired knowledge and skills after the students were exposed to the developed instructional modules. In addition Otto (2004) found out that there was a significant difference between the pretest-posttest of the students upon completing the developed programmed modules.

As shown in the Table 2, the p-value of computed t-test on the performance of the students in pretest and posttest in algebraic expressions is .000 which resulted to the rejection of the null hypothesis stating that "there is no significant difference between the performance of the students in posttest in algebraic expressions of the developed instructional materials". Similar is true in Linear Equation and Inequalities, the table revealed that the p-value of the computed t-test is .000 which has a decision to reject the null hypothesis paving the way to have the significant result.

The findings emphasize that there was a significant gain in terms of knowledge and skills of the students when exposed to the Computed Instructional Material in Elementary Algebra. In other words, the developed instructional material was valid as

manifested in the performance of the validated teacher pretest and posttest.

Abarro (2004) revealed that "the over-all mean performance of the students in pretest in the different learning areas of the material was 5.45 and the performance of the students in posttest was 10. The result pave the way to conclude that the developed worktext in Principles and Methods of Teaching is valid as evidenced by a significant difference in pretest and posttest scores.

VI. CONCLUSION

The performance of the students tend to increase when exposed to the computer-aided instructional material in Elementary Algebra. This implies that the computer-aided instructional material help students acquire more knowledge and skills in Elementary Algebra.

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A legitimate tax plan that minimizes a multinational technology company's taxes

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Abstract- The existence of different tax regimes and corporate rates of income tax between countries has given rise to international tax arbitrage and transfer pricing¹ schemes. The objective of these schemes has been to minimize income tax expense and tax liabilities of Multinational² Corporations (MNCs). This paper considers the activities undertaken by these MNCs and the issues presented by these activities. A high-level tax plan is outlined for the fictional; Multinational Technology Company called The Multinational Technology Company to consider in its quest to minimize the company's consolidated effective income tax expense.

Index Terms- Legitimate tax plan, Corporation Tax, Income tax expense, Multinational company's taxes

1. INTRODUCTION

Large, modern Multinational Corporations (MNCs) typically operate through a complex hierarchy of various legal entities that carry on business through operating, holding and financing companies in order to achieve their shareholders' profit maximization objectives (Smistad, 2011). For example, Hewlett-Packard Corporation (HP), a large multinational information technology company, markets its products and services globally and is subject to income tax in approximately eighty foreign countries (Hewlett-Packard Corporation, 2010). Corporations are continually in search of ways to decrease their operating costs and improve their operating and net income (Smistad, 2011). One way of improving firm consolidated net income is by reducing income taxes. As Paul Sweeney (2010) points out, U.S. companies generally view taxes as a cost of business and not so much as a payment for infrastructure, public services and good government.

Two approaches to reducing corporate income taxes involve international tax arbitrage (Genschel & Schwarz, 2011) and transfer pricing (Borkowski, 2010). A tax arbitrage opportunity presents itself when a MNC operates in two or more countries that have different tax laws. The tax arbitrage occurs when the MNC is in compliance with the tax laws in all jurisdictions it operates in but is liable for lower consolidated income tax than would have been the case if the MNC had been subject to the tax laws of only one jurisdiction (Rosenzweig, 2007). Transfer pricing schemes enable MNCs to shift income from a high-tax country to a low-tax country, by manipulating³ the amounts charged between company divisions, subsidiaries or parent companies for goods or services transferred within the consolidated entity (Azemar, 2007).

However, creating a tax plan is a very complicated process as incompatibilities between tax laws and the specifics that tax laws relate to; create administrative inefficiencies, give rise to unethicity and result in incomprehensibilities as well as unnecessary expense (Prebble, 1997). The situation is more pronounced where tax plans relating multinational business profits are concerned; due to the complexities of tax jurisdictions, the separation of income and capital for tax purposes, and transfer pricing issues (Prebble, 1997). There are also drawbacks to international tax governance as generally, countries tend to seek 'self-preservation' in all domestic tax systems as well as in the bilateral and multilateral agreements made between countries (Rixen, 2009). This is because, while governments prefer to avoid double taxation⁴ situations, they also do not wish to lose taxable revenue (Rixen, 2009). Consequently,

¹ A transfer price is the price that one company division pays or receives for goods or services received or supplied to another company division (Smullen, 2001, p. 3). This does not require the use of a tax haven and usually the profits are taken in the country with lower taxes (Warpole, 2001).

² A Multinational Corporation is an organisation that has a presence in global locations (Ajami & Goddard, 2006, p. 6).

³ Transfer price manipulations occur when a transfer price is significantly lower than market value for the purposes of tax avoidance (Smullen, 2001).

⁴When a company's tax profits are subject to tax from the country in which it is situated and tax from its source country; due to an overlap of jurisdiction (Rixen, 2009).

tax arbitration and harmful tax competition tend to find their way into the international multilevel governance tax system (Rixen, 2009). An example of the negative impact of harmful tax competition is that; Germany has had its financial services migrated to

London, its holding companies moved to the Netherlands, its savings migrated to Luxembourg and to make things even worse; Germany's manufacturing was relocated to competitive low-tax Ireland (Edwards & Mitchell, 2008, p.135, as cited in Obiri, 2011).

Consequently, Multinational Corporations are influenced by tax rates of foreign source income, when determining where to locate their headquarters for the reasons mentioned above (Barrios et al. 2008). This is generally not the case with technology companies as the use of Information and Communication Technology (ICT) has increased rapidly in both personal and business areas, and resulted in the creation of digital markets, internal organizational decentralisation⁵ and more collaboration of business activities (Schafer et al, 2002). Also, due to the nature of Intangible Assets and the fact that they tend to 'drive' all types of businesses; they are recognized in tax systems and taxed accordingly (Warpole, 2001). In addition, governments encourage Research and Development as this usually results in a valuable taxable asset (Warpole, 2001). However, Technology companies are making good legal use of the national tax system differences by relocating Intellectual Property (IP) - an Intangible Asset, to tax havens; away from the nation where it was created (Warpole, 2001; Wiederhold, 2011).

This paper therefore seeks to establish a legitimate tax plan for an imaginary company called The Multinational Technology Company, which will minimize its tax obligations; while taking ethics and Corporate Social Responsibility into account. The rest of the paper is outlined as follows: 1.1: A Look at the Past; 1.2 Recent Developments; 1.3: Corporate Social Responsibility⁶; 2. Discussion; 3: Analysis; 4: Conclusion; and 5: Recommendations.

1.1 A Look At The Past

Barrios et al., (2008) used panel data to analyze the structure of multinational firms in 33 European countries over the 1999-2003 period. The regression result shows that a one percentage point increase in the host country tax rate is estimated to reduce the probability of location by 0.274 percent. According to the Guardian, the European Union (EU) lost some GBP £191 billion in tax revenue between 2005 and 2007; due to transfer price manipulations carried out by Multinational Corporations that took advantage of their presence in non-EU and developing countries (Lawrence, 2009, para 2; as cited in Obiri, 2011). For example, at GBP 0.18pence; forty million fridge freezers were imported from China to the EU between 2005 and 2007 while in the US, expensive electronic resistors were imported from Malaysia at less at USD 1 cent each (Lawrence, 2009, para 1, as cited in Obiri, 2011). Consequently at least GBP £581.4 Billion escaped tax in the EU and the US between 2005 and 2007, due to transfer price manipulations (Lawrence, 2009, para 2, as cited in Obiri 2011). However on a global scale, holding companies or Multinational Corporations are beginning to relocate their headquarters to Ireland due to its corporate taxation attractiveness compared with other countries (Connell et al, 2008); as illustrated in Appendix 1. Azemar (2010) found the tax regime existing in the home country of a MNC significantly affects the amount of capital the MNC invests in foreign jurisdictions. This conclusion was based on the analysis of 5 years of Internal Revenue Service data for the years 1992, 1994, 1996, 1998 and 2000, which included financial information on 7,500 large foreign corporations more than fifty percent owned by U.S. MNCs. The sample firms had U.S. assets spread across fifty-seven countries. Azemar (2001) found a strong inverse relationship between the volume of U.S. capital invested in foreign countries and the tax rate in the foreign country. The lower the foreign, or host country's rate of tax, the more foreign investment by U.S. MNC in that foreign country and vice versa. In fact, "a one percentage point increase in host country taxes engendered a decrease of 1.43% in the amount of U.S. capital invested in the country" (p. 15).

1.2 Recent Development

Several recent papers in economics and accounting have focused on the tax-favored nature of investments in internally developed intangible assets⁷ (De Waegenaere, Sansing & Wielhouwer, 2010). Fullerton and Lyon (1988) argue that effective tax rate measures that exclude the taxation of intangible capital are misleading.

In Britain, some £1.8 billion in tax revenue eludes the government because the wealthiest companies with 32,216 subsidiaries between them in the country make use of tax havens abroad ("FTSE 100 Companies among Britain's..." 2011, para 1, as cited in Obiri, 2011). However, the British government has responded with a GBP £840 Million tax break for Multinational Corporations that use tax havens ("FTSE 100 Companies among Britain's...", 2011, para 4, as cited in Obiri, 2011). Companies such as the global Internet giant Google incorporated in the US in 1988 (Allen, 2011, p. 503) and the UK's advertising conglomerate WPP are examples of large Multinational Corporations with European headquarters situated in Ireland ("If Google is in Ireland for tax reasons...", 2011, para 1 as cited in Obiri, 2011,).

⁵A decentralized organisation is one that has fewer levels of hierarchical controls and consequently less bureaucracy (Robbins 2009, p. 484).

⁶Running a business without a negative impact on society (Waller et al, 2011)

⁷The International Accounting Standards (IASB) defines an Intangible Asset as a non-physical asset, which is nonfinancial and can be identified (Kocak, 2008).

According to Bloomberg, the global Internet giant channels its income from Intellectual Property⁸ registered in Bermuda; via Ireland ("If Google is in Ireland for tax reasons", 2011, para 8). As such, Google Ireland Limited's 2009 gross profit of Euro €5.5 Billion was subjected to an "administrative expense" of Euro €5.467 Billion paid to its Bermuda headquarters for the right to operate, which

reduced its operating profit to a measly Euro €45 Million (“If Google is in Ireland for tax reasons.....” 2011, para 6). However, Google’s tax practices are legal and “above board” as according to a company spokesperson, the global internet giant simply uses national tax differences to its advantage in the global tax system (“If Google is in Ireland for tax reasons.....”, 2011, para 17, as cited in Obiri, 2011).

1.3 Corporate Social Responsibility (CSR)

Earlier empirical study stated that stakeholder importance drives organisations to practice Corporate Social Responsibility (Bergstrom et al, 2011), However, this was challenged by a more recent study that found that corporate representatives formed networks to defend and promote their organization’s meaning of CSR (Bergstrom et al; 2011, Obiri, 2011). Additionally, the representatives signed up and rallied together a system of actors and made them loyal their company’s definition of CSR (Bergstrom et al, 2011).

Consequently, companies that did not practice CSR were accepted as being Socially Responsible (Bergstrom et al, 2011). An example of this is a Swedish Technology company that was accepted as being Socially Responsible even after it had terminated more than 10,000 employees (Bergstrom et al, 2011). On the other hand, some companies do not practice CSR because it is seen to increase production costs (Gongmin, 2011). Therefore, without government interaction, profit motivated companies will not practice CSR (Warpole, 2001; Gongmin, 2011). In general though, Multinational Corporations have ‘tentacles’ that reach a lot further than the ‘tentacles’ of governments. As such, it is necessary for such organisations to ensure that their actions, albeit legal, do not negatively impact the world we live in. For example, when technology companies sell their Intellectual Property to a ‘tax haven’ resident Controlled Foreign Holding Company (CFHC), the result is serious economic impairment (Wiederhold, 2011). This is because, both developed and emerging economies lose out on revenue and the governments of countries such as Ireland, as mentioned in the above Google discussion do not receive sufficient funding for significant public infrastructure (Wiederhold, 2011). Governments need adequate funds to inter alia; construct roads, provide health services and suitable education for tomorrow’s world leaders (Wiederhold, 2011). Additionally, according to information obtained at a G-20 meeting; developing countries lose USD\$ 125 Billion every year in tax revenue because Multinational Corporations use tax havens (Wiederhold, 2011).

2. DISCUSSION - A LEGITIMATE TAX PLAN FOR THE MULTINATIONAL TECHNOLOGY COMPANY

Intellectual Capital⁹ fuels the Information Technology (IT) business, which significantly contributes to the world’s Gross domestic Product (GDP) (Kavida et al, 2010, as cited in Obiri, 2011). As such, technology companies tend to protect their Intellectual Capital with patents to prevent competitors or individuals from copying them (Wiederhold, 2011). The patented¹⁰ Intellectual Capital is known as Intellectual Property (IP) (Wiederhold, 2011). Also, the technology behind the intellectual Capital of a technology company is usually software and in order realize maximum profits from the Intellectual Property, Multinational Corporations have to ‘offshore’ it to a tax haven (Wiederhold, 2011).

2.1 Assumptions

This paper assumes that:

1. The Multinational Technology Company is a large Multinational Corporation that was incorporated in the UK in the year 2000.
2. The company has a presence in the US and has global customers.
3. The company has a patented Intellectual Property (IP); created and registered in the UK that generates an annual turnover of £10 billion and profit before tax of £4 billion.
4. The company paid 24% tax at the end of the financial year which ended in April 2012 and this left a net profit of £2.96 billion. (Appendix 2 shows that UK Corporation tax has been reduced from 24% in 2012 to 23% in 2013 and an even lower 21% and 20% scheduled for 2014 and 2015 respectively. However, although, this will slightly reduce the technology company’s tax, there are still some legitimate methods mentioned above that can significantly reduce its tax obligations further).
5. The company has £11.8 billion Long Term Debts and Total Liabilities and Equity £113.5 billion for the financial year ending April 2012 (see Appendix 3).

⁸ Intellectual Property is a package of rights that safeguards the use of concepts, designs or philosophies –technical designs or software in Technology companies-, which has moneymaking value (Gowers et al, 2006).

⁹ Intellectual Capital is the knowledge that an organisation’s employees bring to it to increase its worth (Basile, 2009, p.1). This knowledge is used to develop inter alia; valuable software technology companies (Kavida et al, 2010).

¹⁰ A patent is a legal document that gives the recipient –or patentee-, exclusive rights (American Bar Association, 2010).

2.2 The Tax Plan

Using the Google tax reduction model with some modifications; consistent with Obiri (2011), this paper suggests that:

1. The company must consider both its shareholders and the environment.

2. The company's IP ownership should be relocated to Bermuda¹¹ or a zero tax country as a CFHC.
3. Furthermore, the company must also relocate its UK headquarters to Ireland; in order to take advantage of the 12.5% basic tax rate. However, the cost of using the IP i.e. the amount charged by its Bermuda CFHC must be half of its Profits before Tax.
4. Finally, the company must move its treasury functions¹² from UK to Ireland.

2.3 Justification of the Chosen Tax Minimization Plan

Prior to the tax plan above, the company was subject to the UK Corporation Tax Rate of 24% in 2012. The company paid corporation tax of £960 million (24% x £4 billion) and was left with a net profit after tax of £3.04 billion. However, under the current tax plan, the company would charge and pay £2 billion which is half of its Profit before Tax (£4 billion) as cost of using the IP; thus the amount charged by its Bermuda Controlled Foreign Holding Company (CFHC), and this £2 billion would attract a zero tax in Bermuda. The remaining £2 billion Profit before Tax would be subjected to 20% tax rate; thus total corporation tax rate in Ireland. The company would therefore pay total corporation tax of £400 million (20% x £2 billion)

The chosen tax plan will minimize the company's tax by £560 million (thus the difference between the £960 million paid in the UK and the £400 million that would have been paid in Ireland). This method provides the resident country with tax revenue of £400 Million, which is 10% of the company's Profit before Tax. This is consistent with Wiederhold (2011) assertion that Governments need adequate funds to inter alia; construct roads, provide health services and suitable education for tomorrow's world leaders. The tax payment to the resident country would also make the company socially responsible (Bergstrom et al, 2011). The company would therefore be left with £3.6 billion (£4 billion - £400 million) Profit after Tax. This is a fair amount and also provides the company's shareholder's with a reasonable return on their investment¹³.

Furthermore, the low corporate tax rate in Ireland should not be ignored even though there are risks of exit taxes on inversion (Voget, 2009). Even if management decides not to carry out the inversion at the present time, the company should consider moving its treasury operations to Ireland. One of the key responsibilities of the treasury function is to advance loans from one affiliate¹⁴ to another based on capital requirements (Stewart, 2008). Currently, the company's long-term liabilities are 10 percent of the company's total Liabilities and Equity (see Appendix 3). The industry average for companies in the telecommunications industry is 34% (BizMiner, 2010). Compared with its competitors, the company is underleveraged. With its treasury function located in Ireland, the company can take on additional debt there, allocate it to affiliates located in high-tax countries such USA, Japan, France etc. to reduce those entities taxable income and pay a low rate of tax in Ireland on the interest revenue.

3. ANALYSIS - A LEGITIMATE TAX PLAN FOR THE MULTINATIONAL TECHNOLOGY COMPANY

It is imperative for a business to make a profit and when there is a lot of money invested in the business; it must be as profitable as possible to provide a reasonable return on investment and an adequate contribution to the global economy (Obiri, 2011). However, it is as equally important for a business to be aware of its business environment and ensure that, its activities do not negatively impact it (Obiri, 2011). According to Carroll (1991), a significant expert in CSR; it is necessary for companies to firstly; always seek the highest level of profitability in order to be economically responsible (Waller et al, 2011). Also, the organisation must be compliant with all legal rules and regulations; in every community where it has an active business presence (Waller et al, 2011). However, a Socially Responsible company must venture outside the legal or regulatory framework to ensure that its activities, address the concerns of society as a whole (Waller et al, 2011). Additionally, in order to be ethically responsible, the Socially Responsible Company must be ready to align its activities with new values and concerns in society (Waller et al, 2011).

3.1 The Objective

The objective of the chosen tax minimization plan was to ensure there is adequate profitability for shareholders as well as ethical and Socially Responsible organizational practices (Obiri, 2011).

¹¹ Bermuda does not charge any taxes at all and it only costs companies a small annual registration fee to operate out of the country (Feetham, 2010)

¹² One of the key responsibilities of the treasury function is to advance loans from one affiliate to another based on capital requirements (Stewart, 2008).

¹³ Return on investment is a performance measure used to evaluate the efficiency of an investment or to compare the efficiency of a number of different investments

¹⁴ Two companies are affiliated when one owns less than a majority of the voting stock of the other, or when both are subsidiaries of a third.

3.2 The Assumptions

The assumptions in the previous section have been made based on the basic functioning of a Multinational Corporation Technology company, for the purposes of creating a legitimate tax plan (Obiri, 2011). It is a supposition on the current situation assumed to be

true in the absence of positive proof, necessary to enable the writer in the process of planning to complete an estimate of the situation and make a decision on the course of action.

3.3 The Tax Plan

Shareholders¹⁵ are just as important as the other company stakeholders because they benefit if the business is economically profitable (Stewart, 2002a). Also, while consumers determine whether the business will make a sale or not; this relies heavily upon the knowledge, capabilities and motivation of its employees, in terms of being able to attract and secure business for the company (Stewart, 2002b).

In response to these concerns, The Multinational Technology Company's Directors of International Taxation have developed the high-level plan to minimize the company's consolidated¹⁶ tax expense on a go forward basis. The Director's plan is simply to minimize the company's consolidated income tax expense. It is not a scheme to evade income taxes by illegal means, but a plan for the company to minimize its taxes through legal means.

3.4 Justification of the Chosen Tax Minimization Plan

Investors are influenced by an organization's level of participation in CSR, and while they react negatively to too much or too little participation (Obiri, 2011). An average amount of participation attracts a positive response from investors (Moabin et al, 2011). Also as investors tend to react after the CSR event; publicizing the fact that a Multinational Corporation pays 10% of its operating profit to its resident country, even with the use of a tax haven, will put it in a positive light where investors are concerned (Moabin et al, 2011). Therefore, a tax plan that ensures that a Multinational Corporation reduces its tax obligations¹⁷ while considering the environment can increase the business.

Bartelsman and Beetsma (2003) determined that a home country income tax increase results in 65% of each incremental dollar of additional home-based income tax revenue from the increase, is lost to the home country through the shifting of income from the domestic high-tax country to the low-tax foreign country. They point out this can be done by moving existing and future debt financing¹⁸ to the high-corporate tax country in order to increase domestic company interest expense and decrease their income subject to the high tax rate. This leads to a preference for debt over equity financing and the increase in financial risk that comes from increased debt and fixed interest payments. Dividends¹⁹ are distributed out of retained earnings and are not a deduction in arriving at income subject to tax. The debt financing to the affiliate in the high-tax country is made by an affiliate in a low-tax country so the interest revenue in the foreign country will be taxed at the low-rate.

4. CONCLUSION

It is necessary for a business to be profitable and in the case of a Multinational Technology company; the temptation to use a tax haven to 'hide' profits is extremely high (Obiri, 2011). However, in all fairness; tax havens such as Bermuda do not possess all the resources such as high-tech infrastructure and the right level of technical know-how- which a technology company such as Google or Apple requires to run its company successfully (Wiederhold, 2011; Obiri2011). As such, as most of the work that generates the business revenue is carried out in countries that are not tax havens; it is only fair that the Multinational Corporations 'give back' to either their relevant source or resident country. This will fund the governments in those countries and provide much needed infrastructure for smaller businesses and the 'talent pool' (Obiri, 2011).

5. RECOMMENDATION

This paper therefore recommends that, The Multinational Technology Company, 'go beyond the confines of legal and regulatory systems' (Waller et al, 2011); to make appropriate tax contributions to their relevant source or resident country (Wiederhold, 2011). This is because, adequate funding is needed for the governments that provide the infrastructure that 'drives' Multinational Technology companies (Wiederhold, 2011). However, for this tax plan to achieve its objective; it will take more than the socially responsible contribution of the company.

¹⁵Persons, groups or organizations that have interest or concern in an organization.

¹⁶Individual company tax expenses combined into one large tax expense

¹⁷The amount of tax the business or organisation owes

¹⁸The act of a business raising operating capital or other capital by borrowing (Obiri, 2011)

¹⁹A distribution of a portion of a company's earnings, decided by the board of directors, to a class of its shareholders

The Multinational Technology Company should consider acting promptly on plans to reduce the company's consolidated income tax expense and liability. The company should do so by:

- a. Incorporating a company in Ireland,
- b. Moving the company's treasury operations to Ireland,
- c. Moving the company's R&D and intellectual property assets to Ireland,
- d. Put in place transfer pricing arrangements to move taxable income to Ireland (low-tax country) and tax-deductible expenses to high-tax jurisdictions,
- e. Investigate other financing opportunities that support the reduction of consolidated income tax expense.
- f. Prior to finalizing any of these plans it is critical that company's external auditors be consulted and be in agreement with these plans or modify them as necessary. This is critical both for audit reasons as well as acknowledgement of their expertise in dealing with issues regarding international taxation and financial reporting. As noted by Stewart (2008) in analyzing financial strategies pursued by management of treasury firms located in Ireland, all firms were audited by one of the large audit firms. The large international audit firms have specialists who deal with global taxation issues.

APPENDIX

Appendix 1 – Corporate Tax Rates (%)

Ireland	12.50
Singapore	17.00
Russia	20.00
Switzerland	*21.00
China	25.00
Netherlands	25.00
UK	26.00
Luxembourg	28.80
Germany	**30.20
France	34.40
India	33.90
Belgium	33.90
Brazil	34.00
USA	*39.21
Japan	***40.69

Source: PricewaterhouseCoopers, 2011

* Regional corporation tax rates on top of federal/national corporation tax rates vary. We have therefore used a blended rate for these countries.

** Berlin rate used for illustrative purposes. Corporation tax rate varies depending on location.

*** Tokyo Metropolitan Area rate used for illustrative purposes. Corporation tax rate varies depending on location. Please note that the 2011 tax reform proposals for Japan include a 5% corporation tax reduction which is not reflected above.

Appendix 2 : UK Corporation Tax Rates

Rates for financial years starting on 1 April

Rate	2011	2012	2013	2014
Small profits rate*	20%*	20%*	20%*	
Small profits rate can be claimed by qualifying companies with profits at a rate not exceeding	£300,000	£300,000	£300,000	
Marginal Relief Lower Limit	£300,000	£300,000	£300,000	
Marginal Relief Upper Limit	£1,500,000	£1,500,000	£1,500,000	
Standard fraction	3/200	1/100	3/400	
Main rate of Corporation Tax*	26%*	24%*	23%*	21%*
Special rate for unit trusts and open-ended investment companies	20%	20%	20%*	

Main rate of Corporation Tax

The main rate of Corporation Tax applies when profits (including ring fence profits) are at a rate exceeding £1,500,000, or where there is no claim to another rate, or where another rate does not apply. In addition to the rates set out in the above table, the main rate of Corporation Tax for 2015 is set at 20 per cent. The small profits rate will be unified with the main rate, so from 1 April 2015 there will be only one Corporation Tax rate for non-ring fence profits - set at 20 per cent.

Source: HM Revenue & Customs (2011)

Appendix 3. The Multinational Technology Company's Balance Sheet as at April 4, 2012.

	In billion £
Current Assets	48.1
PP&E	14.1
Goodwill & Intangibles	28.6
Other Assets	<u>22.7</u>
Total Assets	<u>113.5</u>
Current Liabilities	40.6
Long Term Debts	11.8
Other Liabilities	27.9
Equity	<u>33.2</u>
Total Liabilities & Equity	<u>113.5</u>

Source: Assumed.

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Importance of Education in Religious Teachings and the Role of Religious Leaders in its Promotion for all

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DISCLAIMER: views, ideas and information in this article are of the author and he is solely responsible for them. UNICEF is not responsible for any views, ideas, information, expressions used in this article

Abstract- the paper discusses the main reasons for the social and economic deprivation of large sections of population in countries like India. It identifies low educational learning as one of the main reasons behind their deprivation; and one of the main reasons behind low educational learning, despite rapid increase in school admissions in the recent past, is the low retention and irregular school attendance. The paper argues that religious and spiritual teachings can play decisive role in changing the situation by mobilizing the parents and guardians for regular school attendance and sensitisation of school authorities for providing enabling environment for children to attend school regularly. It highlights certain religious teachings which strongly supporting education and knowledge for all. To substantiate this argument, the paper quotes a few important verses from the Holy Qur'an and Hadiths. The article provides evidence based methods for engaging with religious and spiritual leaders and institutions for sustainable mobilization for regular school attendance.

Index Terms- School education, religious and spiritual leaders, principles and methods of engagement in education

I. INTRODUCTION

One of the important conditions for achieving quality school education for all in several states of India is ensuring regular school attendance. Attendance is one of the precursors of quality education. It is a well-established fact that high attendance correlates with high levels of learning. As a result of irregular attendance, quality of school education remains a matter of concern for quite some time which needs to be urgently addressed. Out of box thinking and multipronged strategies are needed to address this concern; sensitization of religious and spiritual leaders and institutions about school education and their systematic involvement in its promotion can be highly useful.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

One of the key factors for low school attendance in certain areas is also the lack of interest and low perceived benefits among parents and guardians about school education for their children. While people are getting conscious and active about school enrollment, they are complacent about

irregular attendance. Owing to uncertainty in life due to their social and economic conditions and out migration in search of livelihood, many parents don't see much value in pursuing school education for their children. In some cases even if they admit their wards in school, after some time the wards' school attendance become irregular. Consequently, they drop out and join their parents and supplement the families' income by directly earning wages or by way of helping the household chores. Therefore, the demand for quality school education among such sections of parents and households is comparatively low.

The supply side has its own share of responsibility for low school attendance. In many cases the implementation of The Right of Children to Free and Compulsory Education (RTE) Act 2009 is very weak. Due to weak implementation of the RTE Act, the very environment in schools is unconducive to attract and retain children for regular attendance especially in areas which have specific social, cultural and economic characteristics. The school administration is incapable of understanding and addressing special learning needs of the children; inadequate teaching-learning materials in many schools and their use; inappropriate teachers-pupil ratio, teachers' apathy and lack of training for interaction and transaction of learning with children and parents are also responsible for such a state of affair.

Irregular school attendance leading to drop out and consequently poor education status especially among certain social groups are surrounded by complex issues, and can't be approached and addressed in simplistic manner. A well thought multipronged strategy is required to address this phenomenon effectively. Evidences reconfirm the fact that religious, spiritual and social leaders and institutions have profound influence over parents and their immediate social ecology and can influence opinions and decisions for issues such as health, education, nutrition, etc.

Many sections in socially and economically backward groups have certain barriers and bottlenecks for school

attendance and retention. Some of the barriers are common across all social and religious groups, while some factors including social norms and beliefs, are specific to each group. Evidences indicate that traditional, social, religious and spiritual leaders and institutions play significant role in reinforcing traditional norms. Experiences and evidences also show that, if engaged strategically, these very leaders and institutions can be extremely helpful in changing traditional norms and beliefs. Therefore, social, religious and spiritual leaders, institutions and platforms should be

III. WRITE DOWN YOUR STUDIES AND FINDINGS

Principles and methods of engaging with religious and social leaders and institutions

Experience on engaging with religious, spiritual and social leaders for advocacy and social mobilization for development programmes guide on certain principles. The main principles include make them think and feel that development programme which they are expected to get involved in aligns with their religious and spiritual thoughts and teachings, and that it is not different from them; the whole approach, in terms of gestures, body and oral language of those tasked with sensitization of religious leaders and institutions should not be challenging the participants with so called modern, rational and areligious arguments, at least not in ice-breaking and opening up phase of the sensitization process. All religious teachings unambiguously emphasize on the importance of *gyan, ilm, taleem* (knowledge and education). One should have preparation and practice of playing on the turf of religious and spiritual leaders and institutions i.e., knowledge of the teachings and the preaching of the scriptures and school of thoughts that they follow; pick up certain teachings, scriptures and verses which align with the specific development programme that they are expected to be sensitized about and support for social mobilization. For example, in the case of Muslim religious and spiritual leaders and institutions' sensitization for education and school attendance, one should know and articulate the emphasis that the Islamic teachings lay on the importance of reading, gaining knowledge, etc.

Ahammiatul-Maerifatul Wattaelimu Fil-Islam (Importance of Knowledge and Education in Islam)

The teachings of Islam place extremely high value on Education (reading and learning). The very first verse of the Holy Qur'an revealed to the Prophet Muhammed is *not* about the God or the Satan, the Hell or the Heaven, and not even about the Sin or the Virtue, this World or the other World; it is in fact: "*Iqra Bismirabbikal Lazee Khalaq¹ . . .*" (Read in the name of the Creator . . .). The Holy Qur'an

sensitized and involved in a sustainable promotion of the desired behaviours and norms for *regular school attendance*. The thrust of the sensitization should be to share facts and perspectives with such leaders highlighting the importance and benefits of school attendance for the population under their influence, and convincingly explain their role and responsibilities to change the situation, particularly in the areas where the attendance is low and dropout high.

further reads: *Wallazeena Útul Ilma Darajaat² . . .* (. . . and those who are given knowledge, are of higher status . . .); *Rabbi Habli Hukmawn Wa-alhiqni Bissaliheen³ . . .* (O' My Lord! Bless me with knowledge and wisdom, and let me be with the virtuous ones . . .); "*Waqur Rabbi ZidniIlma⁴ . . .*" (. . . and you (Prophet Muhammed) say: O' My Lord! Do bless enhancement in my knowledge . . .). The Holy Qur'an is *Zalikal Kitabu Lareybafeeh* (*this is the Book in which there is no scope for any doubt*).

In addition to the Holy Qur'an, there are several Hadiths which also emphasize on the value of education. For example, "*Útlubul Ilmi Walawbisseen, Talabul Ilmi Fareedatun Ala Kulli Muslimin⁵.*" (In quest of knowledge go even to China, gaining knowledge is a must for each and every Muslim including men, women, children and aged). There are quite a few more evidences in the Holy Book as well as in Hadiths directly and strongly emphasizing on the supreme importance of knowledge and education for all regardless of class, creed, colour and gender. It becomes here absolutely clear that religious teachings, including that of Islam, provide full freedom and encourage their believers to learn and seek knowledge wherever it may come from and wherever its seeker/s may have to go to get it. It can be sought in China, Iran, Indonesia, USA, Europe, Africa. Gaining knowledge through Arabic, Persian, Hindi, German, Urdu, Telegu, English, French Tamil, Bengali or Sanskrit does not disobey any religious principles; studying mathematics, physics, medicines, civil engineering and excelling in commuter science do not make believers any lesser believer. In fact, those who are given opportunity to gain knowledge and education are of *Darajaat . . .* (. . . of higher status . . .).

²Holy Qur'an Surah Almujaadilah, Aaya No. 11

³Holy Qur'an Surah Ash-shuaraa, Aaya No. 83

⁴Holy Qur'an Surah Ash-shuaraa, Aaya No.114

⁵Hadiths, Muslim Shareef

¹Holy Qur'an, Surah Al-Alaq, Aaya No. 1

IV. CONCLUSION

Hence, religion and spirituality are doubtlessly in favour of education and unambiguously support and promote acquiring knowledge and learning by all in any case and at any cost. Yet a large number of people including women and children are deprived of education. This is a situation which is against religious and spiritual teachings and preaching of all religions. The factors preventing and depriving people from gaining education and enjoying a dignified life are more in their relation with social and economic transactions and interactions rather than religion. However, as stated earlier that religious, spiritual and social leaders often have heavy influence over underprivileged people. Therefore, these leaders, institutions and platforms of influence have to be identified in society; they should be sensitized and informed about the decisive role that they can play for ensuring education for all. They should be systematically involved for changing the situation for those who are deprived of quality education and knowledge against religious teachings.

Religious and spiritual leaders, *Shankracharyas*, *Maths*, *Sufi Shrines*, *school*, *grukuls* and *madrasah* teachers and administrators and similar other stakeholders must get involved for the promotion of school attendance, particularly in the areas where school attendance is low and

dropout rate high. At the same time the concerned authorities in education and other relevant departments responsible for planning and implementation of the laws, special schemes and programmes for school education must be more creative and proactive in implementing and monitoring regular school attendance. A greater attention and emphasis on girls' education belonging to underprivileged communities living in hard-to-reach areas will produce greater results for social change and equity that all religions teach.

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LOW COST LINE FOLLOWER OBSTACLE DETECTOR AND DTMF TONE ROBOT

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Abstract- Classical mobile robot control systems are not suitable for use in industrial environments. The high cost of such systems, both to acquire and maintain them, prohibits their adoption. This thesis proposes a new mobile robot architecture and investigates the motion control subsystem of that architecture. This motion control subsystem is based on following a marked path using visual servoing techniques to reduce computational overhead. Two pieces of information are extracted from each frame: the horizontal position of the path, relative to the centre of the image, and the gradient of the path. These pieces of information are then passed into a proportional steering system, which uses them to steer towards the path. The use of marked paths rather than a model of the environment ensures that the downtime, caused by changes to the environment, is minimised. The lack of a model of the robot should allow the control system to easily be ported to different robot hardware.

Index Terms- Low cost line follower robot, obstacle avoidance robot, DTMF mode robot.

I. INTRODUCTION

A robot is a mechanical or virtual artificial agent, usually an electro-mechanical machine that is guided by a computer program or electronic circuitry. Robots can be autonomous or semi-autonomous and range from humanoids such as Honda's Advanced Step in Innovative Mobility (ASIMO) and TOSY's TOSY Ping Pong Playing Robot (TOPIO) to industrial robots, medical operating robots, patient assist robots, dog therapy robots, collectively programmed swarm robots, UAV drones such as General Atomics MQ-1 Predator, and even microscopic nano robots. By mimicking a lifelike appearance or automating movements, a robot may convey a sense of intelligence or thought of its own.

The branch of technology that deals with the design, construction, operation, and application of robots,[2] as well as computer systems for their control, sensory feedback, and information processing is robotics. These technologies deal with automated machines that can take the place of humans in dangerous environments or manufacturing processes, or resemble humans in appearance, behavior, and/or cognition. Many of today's robots are inspired by nature contributing to the field of bio-inspired robotics. These robots have also created a newer branch of robotics: soft robotics.

Robots have replaced humans in performing repetitive and dangerous tasks which humans prefer not to do, or are unable to do because of size limitations, or which take place in extreme environments such as outer space or the bottom of the sea.

There are concerns about the increasing use of robots and their role in society. Robots are blamed for rising unemployment as they replace workers in increasing numbers of functions. The use of robots in military combat raises ethical concerns. The possibilities of robot autonomy and potential repercussions have been addressed in fiction and may be a realistic concern in the future.

II. STUDIES AND FINDINGS

Line Follower:

In the industry carriers are required to carry products from one manufacturing plant to another which are usually in different buildings or separate blocks. Conventionally, carts or trucks were used with human drivers. Unreliability and inefficiency in this part of the assembly line formed the weakest link. The project is to automate this sector, using carts to follow a line instead of laying railway tracks which are both costly and an inconvenience.

The first idea was to use optical imaging (CCD cameras) to see the line. This was later given up due to various reasons including complexity and unavailability of components. Later a choice was made to use an array of sensors which solved most of the problems

pertaining to complexity. The resistor values used in the sensor array were experimentally determined rather than theoretical mathematical design calculations. This was done as the data sheets of the proximity sensor was not available anywhere and most of the parameters had to be determined experimentally. The L293D chip is used as it was a much better option than forming an H-Bridge out of discrete transistors, which would make the design unstable and prone to risk of damage. The PIC microcontroller was used as it is the only device I have a full practical knowledge about, and most of all a RISC processor which are better suited for realtime operations. Thus the midrange devices were chosen. The part 16F873 was used as it has 2 CCP modules which I could use in PWM mode thus simplifying the software routines which I'd otherwise had to write to generate the PWM control for the motors. A priority encoder was used to reduce the number of I/O lines used, which reduces it to 5 which otherwise would require 7 and a lot of additional complexity in software which only results in sluggish operation and inefficiency. Extra hardware was added to let the robot know if it is on a surface or not. This helps it from not running off a table or preserving battery if manually lifted off the floor.

Objectives Of The Study

- The robot must be capable of following a line.
- It should be capable of taking various degrees of turns
- It must be prepared of a situation that it runs into a territory which has no line to follow. (Barren land syndrome)
- The robot must also be capable of following a line even if it has breaks.
- The robot must be insensitive to environmental factors such as lighting and noise.
- It must allow calibration of the line's darkness threshold.
- The robot must be reliable
- Scalability must be a primary concern in the design.
- The color of the line must not be a factor as long as it is darker than the surroundings.

The robot can be further enhanced to let the user decide whether it is a dark line on a white background or a white line on a dark background. The robot can also be programmed to decide what kind of line it is, instead of a user interface. The motor control could be modified to steer a convectional vehicle, and not require a differential steering system. The robot could be modified to be a four wheel drive. Extra sensors could be attached to allow the robot to detect obstacles, and if possible bypass it and get back to the line. In other words, it must be capable predicting the line beyond the obstacle. Speed control could also be incorporated. Position and distance sensing devices could also be built in which can transmit information to a mother station, which would be useful in tracking a lost carrier.

Application:

- Industrial automated equipment carriers
- Entertainment and small household applications.
- Automated cars.
- Tour guides in museums and other similar applications.
- Second wave robotic reconnaissance operations.

Limitations:

- Choice of line is made in the hardware abstraction and cannot be changed by software.
- Calibration is difficult, and it is not easy to set a perfect value.
- The steering mechanism is not easily implemented in huge vehicles and impossible for non-electric vehicles (petrol powered).
- Few curves are not made efficiently, and must be avoided.
- Lack of a four wheel drive, makes it not suitable for a rough terrain.
- Use of IR even though solves a lot of problems pertaining to interference, makes it hard to debug a faulty sensor.
- Lack of speed control makes the robot unstable at times

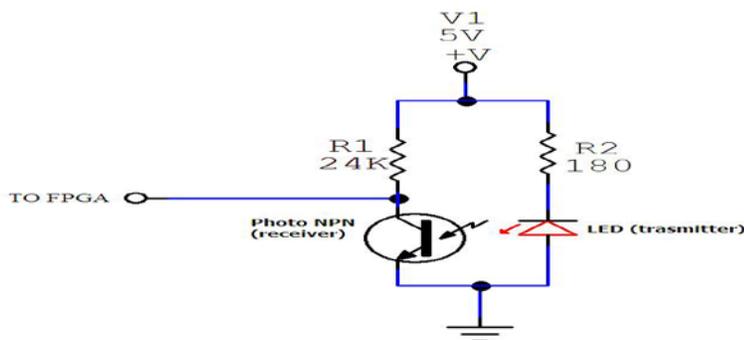
III. WORKING OF ROBOT

A. The Sensor Module :

We are providing sensor modules which has 3 pairs of the Transmitter -Receiver and 2modules with one pair each. These Sensors can be utilised and operated to recieve a non electrical data from the environment and to convert it to an electrical signal . This signal can thus further be processed by the brain of our robot . So this is how it works,

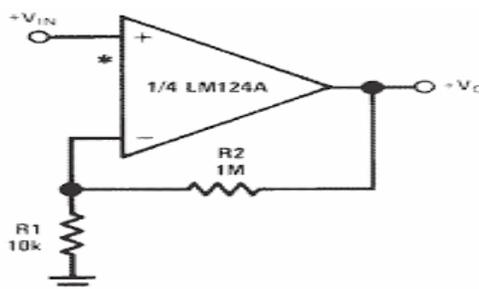
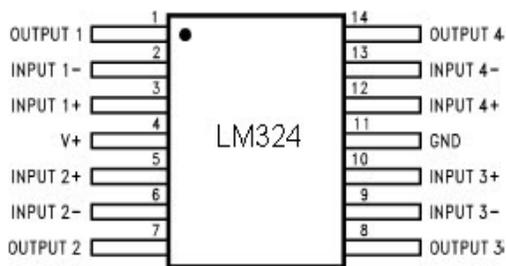
belowe diagram shows the schematic of one part of sensor module . Here the IR LED is connected in forward bias and the ir Reciever is connected in reverse bias.As pe the intensity of light falling on it ,it gives changes in the output .

When certain changes in the position of a robot thus there are the changes in the environment around our robot, the changed conditions gives changes in output. Like in obstacle detection mode, a considerable change in the output occurs when there is an obstacle in front of it, than when it is free from obstacles Similarly for tine tracing mode, a light reflecting back from the surfaces of different colors the sensor gives different outputs. All these properties of sensors are thus used and given to the comparator.



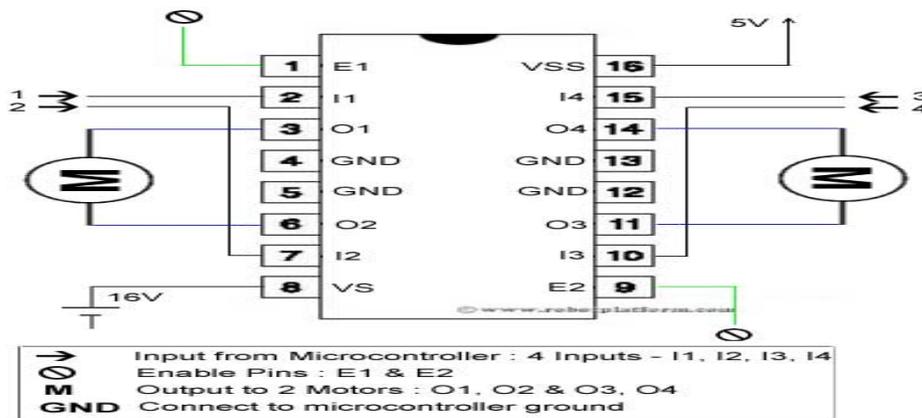
B. The Comparator

Sensors cannot itself provide output, which can solely be used as a reference to the con Also every IR Receiver provides a dilferent ouupun even for the same conditions and is Analog in nature Thus a fundamental signal conditioner is necessary to a into identifiable This job is done using a comparator IC LM124. IC LM 124 has a comparator init, so it can compare 4 sensor outputs at a time. As shown above, one input of the comparator has given to the variable pot connected to the supply voltage, which will provide the reference comparator input so the output of the sensor is compared with the reference voltage and the respective HIGH and Low output is given out.



C. The Motor Driver:

When driving the motor, motors draw large currents from the source, which is in Amperes Thus connecting the loads directly to the control circuitry is totally impractical Thus to control the motors from the robot driving loads are needed to be isolated from it. also the high current to drive the motors has to be provided from some other source. These needs can be fulfilled by a DRIVER CIRCUITRY.



In our Robot, we basics for driving the motors. he schematic diagram of a common motor L293D driver circuit above. Each Motor Drives as follows:

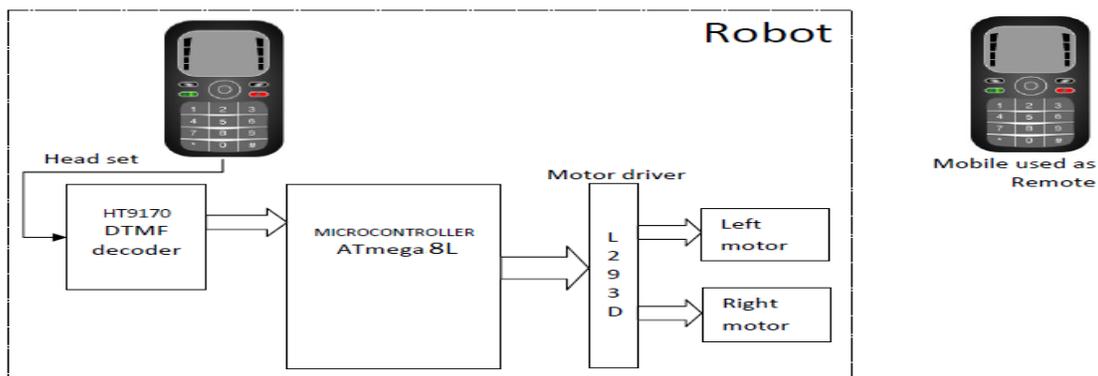
- When both i/p are HIGH-Motor Halts
- When both i/p are Low-Motor Halts
- When i/p 1 is HIGH and i/ p 2 is Low-Motor moves in forward direction
- When i/p1 is Low and i/p 2 is HIGH-Motor moves in reverse direction

In our Robot, we're using on Motor Driver IC for each motor by shorting out the terminals of both terminals ofics. This helps to provide high load current to the motors without the IC getting damaged.

D. The Mobile Control

To control the robot using a cell phone, we're using the DTMF (Dual Tone Multiple Frequencies) tones to do so. These are the irritating tones we hear in a call when some keys are pressed mistakenly. Each keys on dial pad produces different frequencies and are distinct from each of them.

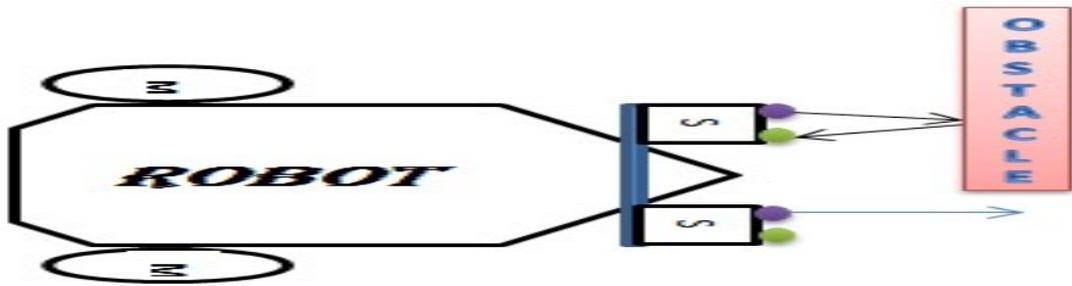
The robot, is controlled by a mobile phone that makes call to the mobile phone attached to the robot in the course of the call, if any button is pressed control corresponding to the button pressed is heard at the other end of the call. This tone is called dual tone multi frequency tone (DTMF) IC HT9170 receives this DTMF tone with the help of phone stacked in the Robot. The mobile that makes a call to the mobile phone stacked in the robot acts as a remote. So this simple robotic project does not require the construction of the receiver and transmitter unit. DTMF signaling is used for telephone signaling over the line in the voice frequency band to the call switching centre. The version of DTMF used for telephone dialing is known as touch tone. DTMF assigns a specific frequency (consisting of two separate tones) to each key that it can easily be identified by the electronic circuit. The signal generated by the DTMF encoder is the direct algebraic submission, in real time of the amplitudes of two sine (cosines) waves of different frequencies, i.e. pressing 5 will send a tone made by adding 1336Hz and 770Hz to the other end of the mobile.



E. Obstacle Detector:

This includes the hardware design of the robot that is motor & wheel placement, body setup. Robot uses two Robotics gear motor & wheel for the movement, Which will help it to move forward, left or right. Robot uses two motor & wheel in the back side and one

freewheeling ball is placed at the front which helps it to free movement. The sensor are placed in such a way that they can cover the maximum area in front of the robot and can be capable to detect an obstacle either obstacle is small or big.



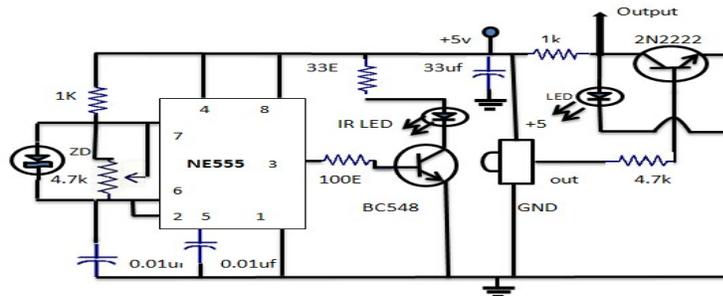
Circuit Design:

Circuit design mainly consists of two parts-

- a) Sensor part
- b) Control board part

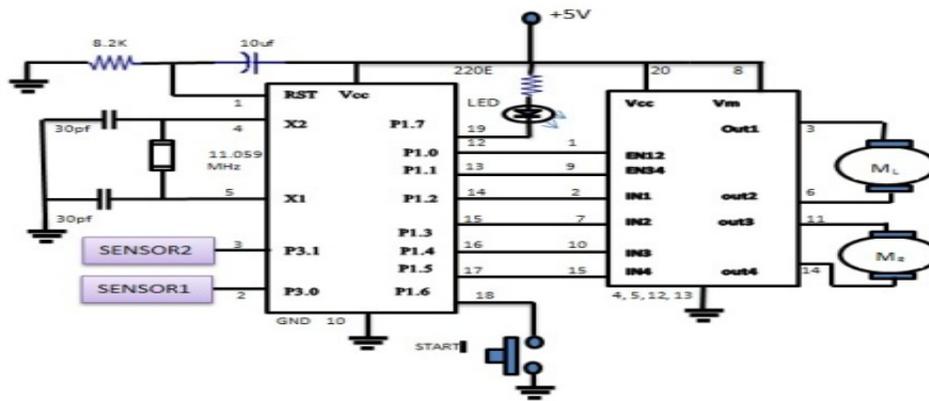
a) Sensor part:-The sensors used in this robot are Infrared sensor, consisting two part infrared signal generator and the IR receiver designed in single PCB. There are two sensors are used as left side sensor and right side sensor and two sensors are used to sense the obstacle on left and right side.

IR Generator :-This is a Monostable multivibrator using NE555 IC generating Infrared Signal of 38KHz frequency for better determination of the object. By using a variable resistance we can adjust the frequency of the IR signal, detector TSOP1738, gives a high output.



IR Detector :-IR detector circuit is a circuit which gives a low output in absence of IR signal When some obstacle come in path IR signal reflected back and fall onto the IR detector. In such a way that obstacle are detected.

Motor driver L293D, decide which motor will be in motion or stop in according to the incoming signal from the microcontroller AT89C2051.



Applications:

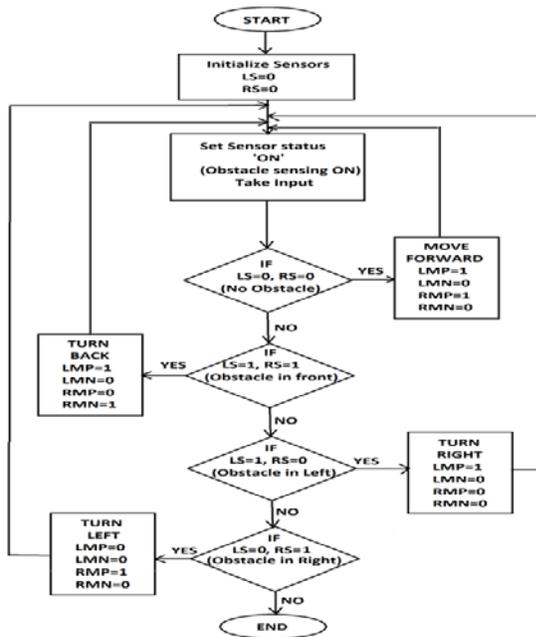
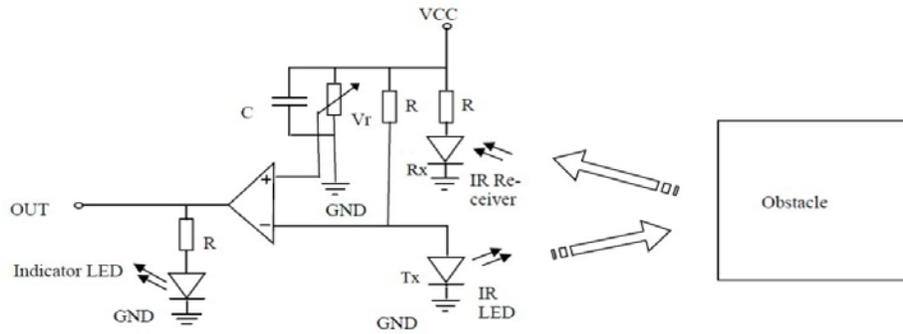
Obstacle avoiding technique is very useful in real life, this technique can also use as a vision belt of blind people by changing the IR sensor by a kinetic sensor ,which is on type of microwave sensor whose sensing range is very high and the output of this sensor vary in according to the object position changes. This technique makes a blind people able to navigate the obstacle easily by placing three vibrato in left, right and the centre of a belt named as VISION BELT and makes a blind people able to walk anywhere. On top of obstacle avoiding robot temperature/pressure sensors can be added to monitor the atmospheric conditions around. This is useful in places where the environment is not suitable for humans.

Same technology can be used in various application by modifying the microcontroller program for example

1. Line / Path finder Robot .
2. As automatic vacuum cleaner.
3. With proper programming we can use it as a weight lifter.
4. In Mines

IV. SENSORS AND WORKING OF OBSTACLE DETECTOR

There are varieties of sensor available those can be implemented for detection of obstacle. Some of the very popular sensors are: Infrared sensors, Cameras, which can be used as a part of Computer Vision, Sonar, LIDAR which can directly measure the distance of thousands to hundreds of thousands of points in its field of view [5]. Since reduction of cost is an important factor in the design of robot, we opted Infrared (IR) sensors for our low cost obstacle avoidance robot. IR sensors occupy lower ground in cost as compared other sensors. IR sensors provide the distance of objects directly in front of the sensor beam. This sensor can be used for most indoor applications where no important ambient Infrared light is present. The IR sensor used, basically is of 'always ON' type. The sensor can be divided into two parts: Transmitter and Receiver. Transmitter has an IR LED (Tx), constantly emitting light and hence this sensor is known as always ON type. The second part, Receiver consists of a photodiode (Rx). Transmitter keeps on emitting IR light, when there is any obstacle in the front of sensor, the emitted light get reflected back to the sensor. When reflected IR light beam falls on the photodiode, the voltage drop increases and the cathode's voltage of photodiode goes low depending on the intensity of reflected light beam. This voltage drop can be detected using an Op-Amp (operational Amplifier LM358). From the working principle of Op-Amps, we can notice that the output will go High when the volt at the cathode of diode drops under a certain voltage. So the output will be High when IR light is detected, which is the purpose of the receiver [6]. Detection range of the sensor can adjusted using potentiometer/variable resistor (Vr) present in the sensor. An LED is also mounted for the indication of detection of obstacle. The circuit diagram for an IR sensor is shown in Fig.3. Two IR Sensors were attached in front side of robot. Sensors were optimized in such a way that robot can detect the obstacle up to the range of 15cm.



Flow chart for obstacle avoidance

V. LIMITATIONS AND FURTHER USE

This robot has been successfully implemented for many obstacles like wall, chair, vessels, doors etc. but due to use of IR sensor it has certain limitation. We know that black and some other dark colours are good absorbent of light. IR light beams are also not reflected back from these coloured objects resulting into obstacle remaining undetected. Also efficient application of robot is limited only to indoor purposes. Performance of this robot can be improved with the help of Bump sensors, for slow moving robots, Ultrasonic range sensors for large range up to 6m or LASER range finders. One of the prevailing fields is the use of camera in robot, Computer vision can be implemented for better performance Differential Drive System: A mobile robot which uses differential drive has separate speed and direction control for the left and right sets of wheels. Such a system is very flexible for a mobile robot because it does not have a minimum turning radius, it can execute a turn around its own centre. Arc turning is achieved by driving the left and right wheels at different speeds. This ensures that the wheel speeds of the robot are lower while turning and faster when moving straight. Turning at high speeds can result in slipping and inaccurate turns, this prevents it from such happening. Further improvements are Certainty Grid and The Virtual Force Field (VFF) Method.

IMPLEMENTATION AND USE OF SOFTWARE

The implementation of obstacle avoidance strategy for robot involves the writing and compilation of program using software AVRStudio (version4). The compiled program from the PC has to be written on microcontroller on PCB or development board of the robot for which a serial communication has to be established. This is done by using a USB to RS232 (FRC) conversion cable, and RS232 port is then connected to the MAX232 present on PCB which converts TTL Logic to Binary Logic [7]. Software HID Boot Flash (version1.0.0.1) was used to write program on development board using USB cable. Hence the program through MAX232 is written in microcontroller. Once program has been loaded to the microcontroller the robot can now roam around. During the operation of robot, it continuously takes the input from photodiode of the IR Sensor. The input is compared in the LM358 comparator IC present in the IR Sensor. The output of the comparator is given to the microcontroller. Microcontroller based upon the program takes decision and provides output for controlling the direction of robot. The output has to be sent to the motors but the output signal from microcontroller is not capable to drive the motors hence IC L293D is used for driving motors, it is also known as driver IC. All inputs of it are TTL compatible.

VI. CONCLUSION

By creating the line-following robot, we learned the basics of energy flow and exactly what building a circuit entails. We found out how voltage is potential energy, and how wires can run in series or in parallel depending on how many points the wires share. We understood the purpose of resistors, to transform excess energy into heat, and we discovered the function of transistors, the comparator, variable resistors, photo resistors, headlights, diodes, motors, and light emitting diodes (LEDs). We came to the conclusion that because we used less power than the robot built by David Cook, we could use less resistance. Building the robot consisted of a heavy revision and modification process. For example, knowing that the inside of the robot would be crowded with our circuit and power source, we realized that if the gears were also placed inside the robot, they would be incapable of moving without constant adjustment. Consequentially, we decided to locate the gears outside of the robot, allowing a free range of motion with less friction. Another modification we were forced to make involved the headlight circuit. Because the robot was already crowded, we decided to #electrically glue# the headlights to another breadboard using a soldering iron. However, in the end, we disconnected the headlights from the second breadboard and simply added them to the initial circuit. In the future, if we were to adjust and make further modifications, we would make the wheel size larger and experiment with different gear ratios. After getting a working circuit, we were able to test different configurations and the extent of the the robot's ability to follow a course.

Almost all navigation robot demands the some sort of obstacle detection, hence obstacle avoidance strategy is of utter importance. Obstacle avoidance robot has a vast field of application. They can be used as services robots, for the purpose of household work and so many other indoor applications. Equally they have great importance in scientific exploration and emergency rescue, there may be places that are dangerous for humans or even impossible for humans to reach directly, then we should use robots to help us. In those

challenging environments, the robots need to gather information about their surroundings to avoid obstacles. Nowadays, even in ordinary environments, people also require that robots can detect and avoid obstacles. For example, an industrial robot in a factory is expected to avoid workers so that it won't hurt them. In conclusion, obstacle avoidance is widely researched and applied in the world, and it is probable that most robots in the future should have obstacle avoidance function.

The overall picture for the development of intelligent robotics is very positive but more evolutionary than revolutionary, with a steady penetration into the industrial and domestic worlds at affordable prices on the near horizon.

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We would like to express our sincere gratitude to the principal Prof. Dr. A.R. Bhalerao, head of department Prof. R.N. Patil, without whom the success of this project would have been highly impossible.

We would like to devote our vote of thanks to our guide Prof. P.D. Yadav, for his constant support and encouragement. He has great hand in the firm foundation of this project. We are deeply in debt for his valuable suggestion, scholarly guidance and constructive criticism along with constant encouragement at each hand every step for successful completion of this project. Last but not the least we would like to thank all those who assisted directly or indirectly for their valuable time and help.

Furthermore I would also like to acknowledge with much appreciation the crucial role of the staff of my production department, who gave the permission to use all required equipment and the necessary materials to complete the PROJECT ON INDUSTRIAL ROBOT. Special thanks goes to my team mates who help me to assemble the parts and gave suggestion about the task. I have to appreciate the guidance given by other supervisor as well as the panels especially in our project presentation that has improved our presentation skills thanks to their comment and advices.

Therefore, I consider myself a very lucky individual as I was provided with an opportunity to be a part of it. I am also grateful for having a chance to meet so many wonderful people and professionals who led me through this entire period.

I perceive this opportunity as a big milestone in my career development. I feel that the skills gained and the knowledge acquired, during the course of project making will help me in attaining further improvement in knowledge and attained desired career objectives.

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Pervaporation Separation of Water-Isopropanol mixtures using Halloysite nanoclay (HNC) incorporated in the Poly (Vinyl alcohol) Membranes

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Abstract- A solution casting technique was used to prepare Halloysite nanoclay (HNC) incorporated Poly (vinyl alcohol) (PVA) mixed matrix membranes (MMMs) and crosslinked with glutaraldehyde (GA). The prepared membranes were characterized by Fourier transform infrared spectroscopy, X-ray diffraction, Scanning electron microscopy, differential scanning calorimeter and thermo gravimetric analysis. Resulting membranes were tested for pervaporation (PV) separation of water-isopropanol mixture. The Degree of swelling of the membranes in various concentrations of water-isopropanol mixtures revealed an increase in the degree of swelling as the Halloysite nanoclay (HNC) loading was increased. The effect of clay loading and feed composition of water on pervaporation performance of the membranes was analyzed. The membrane containing 0.3wt. % of HNC loaded blend membrane (PVHNC-3) gave the highest selectivity of 2423 for 10 mass % of water containing feed mixture at 30 °C. Increase in water selectivity of the membrane was explained as due to a reduction in free volume by increasing clay content of the membrane. Selectivity and flux data are dependent on water composition of the feed mixture. The hindrance of water permeation at higher composition of water in feed mixture was explained as due to the formation of clusters of water molecules. These results showed that, when the water concentration of feed is increased, the selectivity decreased but flux increased. This Halloysite nanoclay (HNC) incorporated mixed matrix membranes (MMMs) are relatively hydrophilic, mechanically strong and thus suitable to be used for the pervaporation separation of isopropanol – water mixture.

Index Terms- Pervaporation, PVA membrane, Halloysite nanoclay, isopropanol-water mixtures.

I. INTRODUCTION

Pervaporation (PV) is an efficient membrane – based process and has gained acceptance by chemical industries over the years because of its favorable economics, easy maintenance, and simplicity of the process [1-3]. Over the last few decades, several commercial PV plants have been established all over the world especially for the dehydration of organic solvents. Therefore, much of the attention has now been focused toward the development of new membranes with better performance in the separation of azeotropic, isomeric and close boiling point systems.

The key for a successful PV dehydration separation process is preparation of membrane for achieving a simultaneous increase of both selectivity and permeation flux. However, most polymer membranes, including PVA, suffer from the inherent drawback of trade-off in aqueous solution between permeability and selectivity. To cross this trade-off hurdle, many modifying methods were carried out through chemical cross-linking, adding fillers [4], physical blending with other polymers [5], surface modification, copolymerization or hybridization. Among those methods, hybridization is of great interest owing to its applicability to improve both the stability and performance of membrane. In literature it is noticed that, researchers have prepared numerous organic – inorganic hybrid membranes, such as PVA/TEOS [6, 7], PVA / γ -aminopropyl triethoxy silane (APTEOS) [8], PVA / γ -glycidyloxy propyltrim ethoxysilane (GPTMS) [9], PVA / TEOS [10], PVA / AESP [11]. The hybridization effectively controls the swelling of hydrophilic polymer membrane in aqueous solution, but the permeation flux of membrane is usually depressed. Therefore, controlling the swelling degree and to retain the permeation flux simultaneously is the focus of modification for these membranes.

Many researchers are making continuous efforts to develop new polymeric membranes. Recently, several reports have been published in the literature using different types of hydrophilic polymers including poly (vinyl alcohol) (PVA), sodium alginate and chitosan as membranes in PV separation of aqueous-organic mixtures [12-16]. In view of the excellent film forming property and super hydrophilic nature, PVA is still attracting more interest for researchers and has been extensively studied as a membrane material.

PVA is one of the most important water soluble vinyl polymers, that exhibits excellent film forming, emulsifying and adhesive properties [17]. The hydroxyl groups in PVA can form strong hydrogen bonds between intra and intermolecular hydroxyl groups. This causes PVA to show high affinity towards water. Therefore, PVA is mainly used as a membrane material in PV for dehydration of solvents. PVA membranes usually give good permeation flux but low separation selectivity due to high swelling which limits the performance of these membranes in PV separations. To enhance the membrane performance, PVA needs modification to get good mechanical property and achieve better selectivity towards water [18-19]. Polymer – clay nanocomposite is a new class of composite materials consisting of a polymer matrix with dispersed clay nanoparticles. And these MMMs with

inorganic hybrid material with good hydrophilicity are chosen in the present study.

Nano-structured polymer-clay hybrid materials are currently the objects of intensive research because of their unique properties and low cost synthesis as clays is abundantly available in nature. The PVA reinforced with montmorillonite clay showed better thermal, mechanical, and water vapor transmission properties because of the nanoscale dispersion of the filler in the polymeric matrix [20]. The α – zirconium phosphate reinforced PVA matrix resulted in the increase in its storage modulus, tensile strength, and elongation at break with increase in the aspect ratio of the filler content[21].

Halloysite nanoclay (HNC) is naturally occurring silicate nanoclay ubiquitous in soils and weathered rocks. Halloysite nanoclay (HNC) deposits have been found in many geographic areas where they are present in a variety of particle shapes and hydration states. Halloysite is a unique nanoclay property [22], with a tubular morphology and low electrical and thermal conductivity. HNC have an empirical formula of $Al_2Si_2O_5(OH)_4 \cdot 2H_2O$, which is chemically similar to kaolin clay. Halloysite is a two-layer mineral, characterized by its affinity to the monovalent cations. Those cations can act as “anchor” for the inner-sphere and interlayer cation-water complexes. Because this Halloysite plates easily dispersed and delamination in water, much easier than montmorillonite does. This Halloysite nanoclay (HNC) has better surface properties and this can form a new kind of interlayer space which can be resistant to the multivalent cations activity. Halloysite has a Si-tetrahedral sheet on one side and an Al-octahedral sheet on the other side. In this oxygen atoms of halloysite tetrahedra form a regular 6-fold hexagonal structure. This structure remains intact even after dehydration which suggests that either the “hole” water remains within the structure or that the rotation is blocked by physical forces [23-24]. In halloysite they cause a unique change in the structure resulting in layer separation which in other minerals from the kaolinite group is strongly bound together.

However, the performance of PVA / Halloysite nanoclay (HNC) membranes was not well explored in this field. Isopropyl alcohol (IPA) is a widely used solvent in pharmaceutical and chemical industries. IPA forms an azeotrope with water at 87.5 wt. %, and most of its application needs high purity. In the industrial point of view, the dehydration of the azeotropic composition of IPA is an important one. The separation of the azeotropic composition of the isopropanol (IPA) – water system is too difficult to carry out by using conventional methods such as distillation [25]. The results of some of the previous work for water – isopropanol alcohol pervaporative are summarized in Table.2 together with the result obtained in this work. From this table, it is obvious that the performance like flux and selectivity of HNC incorporated PVA membrane is better than the performance which was obtained from the membranes of other researchers.

II. EXPERIMENTAL

2.1 Materials

Poly(vinyl alcohol) (PVA) having a viscosity average molecular weight of 70,000 and degree of Hydroxylation 86 – 89 % , Acetone and Hydrochloric acid were purchased from S.d.

fine chemicals, Mumbai, India. Halloysite nano clay (HNC) was purchased from Aldrich Chemical Company, Milwaukee, WI, USA. Iso-propanol was purchased from Qualigens finechemicals, Mumbai, India, and Gluteraldehyde was purchased from Merck chemicals, Mumbai, India. Deionized water having a conductivity of 20 μ S/cm was used for the preparation of feed solution, which was generated in the laboratory itself.

2.2. Preparation of PVA / Halloysite nano composite membranes

MMMs of Poly (vinyl alcohol) (PVA) incorporated with Halloysite nano clay (HNC) membranes were prepared by solution casting and solvent evaporation technique. In order to prepare pure PVA solution, here we use powder form of PVA. For every 5 gr of PVA powder weighed, 90 ml of distilled water as a solvent used to dissolve PVA powder. As the resultant solution was non – clear then, it was stirred and heated. When the temperature reached 70 $^{\circ}$ C, rate of dissolution of PVA increased and the solution became clear one. Heating continued for about 30 minutes to let the temperature rises up to 90 $^{\circ}$ C. At this temperature, all the PVA powder was miscible. In separate flasks, 0.2, 0.3g of HNC was dispersed in 10 mL of water, sonicated for 2h, added individually to the previously prepared 5 wt % PVA solution. The whole mixture was stirred for 24 h, filtered and poured onto a perfectly aligned clean glass plate in a dust free environment for casting the membranes using a doctor’s blade. The membranes after drying at ambient temperature (30 $^{\circ}$ C) were peeled off from the glass plate, immersed in a cross-linking solution bath containing water and acetone mixture (30:70) along with 2.5 mL of Con. HCl, 2.5 mL of gluteraldehyde (GA). After allowing for 12h, take out the membrane from the cross linking bath, and wash with deionized water repeatedly then dry in an oven at 40 $^{\circ}$ C for 48h to eliminate the presence of residual acid, if any. The dried MMMs were peeled off and designated as Pristine PVA, PVHNC-2 and PVHNC-3 respectively. Membrane thickness was measured by a micrometer screw gauge at different positions on the flat surface area of the membrane and the thicknesses of the membrane prepared were around 35-40 μ .

III. CHARACTERIZATION OF THE PVA/HALLOYSITE NANOCLAY NANOCOMPOSITE MEMBRANES

3.1. Fourier transform infrared spectroscopy (FT-IR)

FTIR Spectra measurements were recorded in the wavelength region of 4000-400 cm^{-1} under N_2 atmosphere at a scan rate of 21 cm^{-1} using Bomem MB – 3000 (Make : Canada) FTIR spectrometer, equipped with attenuated total reflectance (ATR). About 2mg of the sample was grinded thoroughly with KBr, and pellets were made under a hydraulic pressure of 600 kg/cm^2 .

3.2. Scanning electron microscopy (SEM)

SEM micrographs of the MMMs were obtained under high resolution (Mag: 300X, 5kv) using JOEL MODEL JSM 840A, Scanning electron microscope (SEM), equipped with phoenix energy dispersive. SEM micrographs were taken at Anna University, Chennai.

3.3. Thermo gravimetric analysis (TGA) and Differential Scanning Calorimetry (DSC)

TGA / DSC curves of MMMs at different compositions were recorded using TA instruments differential scanning calorimeter (Model – SDT Q600, USA). The analysis of the samples was performed at heating rate of 10 °C / min under N₂ atmosphere at a purge speed of 100 mL/min.

3.4. X-ray diffraction (XRD)

A Siemens D 5000 (Germany) powder X-ray diffractometer was used to study the solid –state morphology of the MMMs of Halloysite nano clay incorporated PVA membranes. The X-rays of 1.5406 Å wavelengths were generated by a Cu K α radiation source. The angle of diffraction (2 θ) was varied from 0° to 65° to identify any changes in crystal morphology and intermolecular distances between inter-segmental chains of the polymer.

3.5. Pervaporation experiments

Pervaporation (PV) apparatus consists of stirred stainless steel cell through which retentate is circulated to the feed tank. Effective surface area of the membrane in the cell is 28.27 cm² with a radius of 3.0 cm and volume capacity of the cell is about 250 cm³. Temperature of the feed mixture is maintained constant using a thermostatic water jacket. The Pervaporation (PV) cell is provided with an efficient three-blade stirrer powered by a DC current motor in the feed compartment. Turbulent flows were obtained even at low rotation of the stirrer, i.e., < 200 rpm speed. Mass transfer limitations due to concentration polarization are negligible. The permeate is collected in a glass container, cooled in a Dewar flask with liquid nitrogen. The vacuum is maintained by a two – stage vacuum pump.

The experimental procedure remained the same as reported elsewhere [26]. Weight of the permeate vapors collected in a Dewar flask with liquid nitrogen trap was measured and its composition was determined by measuring its refractive index by comparing it with the standard graph of refractive index Vs. mixture composition of the feed system. The Selectivity, α of a given membrane was estimated using the following equation [27].

$$\alpha = \left(\frac{Y_A}{1 - Y_A} \right) \left(\frac{1 - X_A}{X_A} \right) \quad \text{---(1)}$$

Where X_A is mole fraction of water in feed and Y_A is the mole fraction of water in permeate. Flux, J (Kg/m² h), was calculated from the weight of liquid permeated, W (Kg), effective membrane area, A (m²) and actual measurement time, t (h)

$$J = \frac{W}{At} \quad \text{---(2)}$$

3.6. Membrane Swelling

The swelling experiments on the circularly cut membranes were performed at 30 °C gravimetrically [28] in 10, 12.5 and 15 wt. % water-containing feed mixtures. MMMs samples with compositions ranging from 10 to 15 wt % water at 30 °C \pm 0.5 °C in an electronically controlled incubator (WTB Binder, model BD-53, Tuttlingen, Germany) as per procedures reported previously [29]. To do this, dry weight of the circularly cut

(diameter=2.5 cm) disc shaped MMMs were stored in a desiccators over anhydrous calcium chloride maintained at 30 °C for about 24 h before performing the swelling experiments. This dry weight of the circularly cut (diameter = 2.5cm) MMMs were taken, mass of the soaked samples were measured using a single-pan Adam digital microbalance (model AFP 210L) having a sensitivity of \pm 0.01mg. The swollen membranes were weighed immediately after careful blotting surface to remove the adhered water. The percent degree of swelling (DS) was calculated as

$$\text{Degree of swelling (S) (\%)} = \frac{(W_s - W_d)}{W_d} \times 100 \quad \text{(3)}$$

Where W_S and W_d are the mass of the swollen and dry membranes, respectively.

IV. RESULTS AND DISCUSSION

4.1. FT-IR analysis

The FTIR spectra of Pristine PVA and Halloysite nanoclay (HNC) incorporated membranes (PVHNC-2, PVHNC-3) are shown in the Fig.1. In this the FTIR spectra of Pristine PVA showed a characteristic broad peak at 3200-3400 cm⁻¹ indicating –OH stretching. The obtained FT-IR spectra of PVA are in good agreement with literature [30]. The bands around 2908 and 2858 cm⁻¹ correspond to the asymmetric and symmetric stretching of –CH₂ – groups, respectively. The peaks at 1420 cm⁻¹ can be attributed to C-H bending. From the FTIR spectra of clay loaded both the membranes it is noticed one broad characteristic peak at 3365 cm⁻¹ which is assigned to –OH stretching, at 2980 cm⁻¹ which is assigned to –CH₂ stretching. In these MMMs multiple bands are shown between 1050 and 1165 cm⁻¹ and are assigned Si-O stretching. By the incorporation of HNC content into pristine PVA, the intensity of these multiple bands was increased steadily. This is because of symmetric and asymmetric stretching bands of Si = O and Al =O which generally appear at the same frequency of C-O stretching. In this mixed matrix membranes, there was no absorption peak observed, suggesting that the Halloysite nanoclay (HNC) was physically blended within the polymer matrix. This also further ascertains the complete dispersion of nanoclay in the crosslinked PVA membranes.

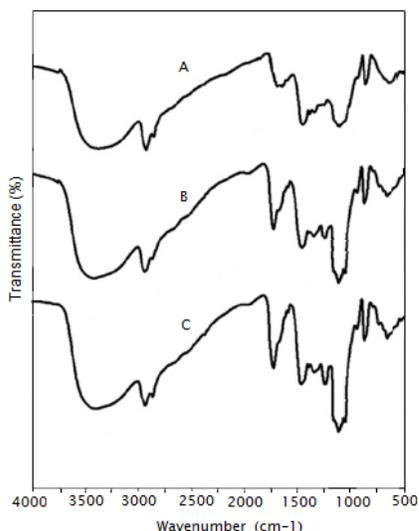


Fig.1: FTIR spectra of (A) Pristine PVA, and its HNC incorporated Composite membranes (B) PVHNC-2, (C) PVHNC-3.

4.2. Scanning electron microscopy (SEM)

Fig. 2 illustrates the Scanning electron microscopy (SEM) of cross linked HNC loaded membranes (PVHNC-2 and PVHNC-3). From these micrographs, it is observed that surface view of these membranes were uneven. This might be due to increased cross linking segments by the incorporation of HNC content in pure PVA membrane. It may be due to increased hydrophilic property of the membrane by the dominance of Si, Al and -OH groups over the crosslinking segments. From the SEM graphs it is also noticed that the homogeneous mixing of HNC is attributed to hydrophilic nature of nanoclay with a lower silica alumina ratio value and their presence is responsible to create channels between inter phase of the polymer and clay particle surfaces that are more selective to water than IPA. However, particle agglomeration is seen in case of PVHNC-3 due to its relative hydrophobic nature compared to nanoclay with a lower silica alumina ratio, where these channels are formed in the interphase they are less selective to water.

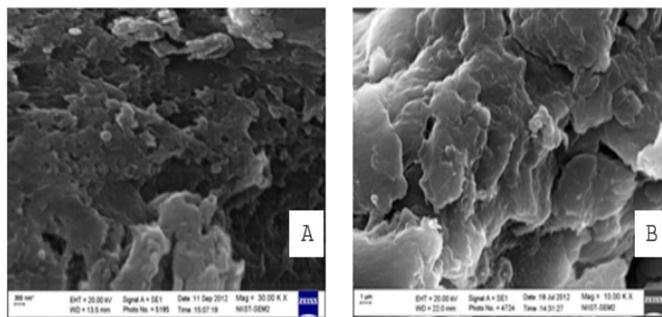


Fig. 2: SEM image of (A) MMMs of PVHNC-2 (B) MMMs of PVHNC-3.

4.3. Differential Scanning Calorimetry (DSC)

DSC is the technique used to determine the quantity of heat either absorbed or released when substances undergo physical or chemical changes. Differential scanning calorimetric measurements were carried out for PVHNC-2 and PVHNC-3 membranes and the resulting thermograms are presented in Fig.3. The change in physical properties in the polymer membranes due to crosslinking and incorporation of Halloysite nanoclay (HNC) can be reflected in their glass transition temperature (T_g) and melting point (T_m) values which have been confirmed by the DSC results. The DSC thermograms of PVHNC-2 and PVHNC-3 mixed matrix membranes show a value of T_g at 110°C and 130°C melting temperatures are around 325°C to 350°C respectively. From these it is evident that the increase in T_g & T_m values of these membranes was due to increase in the HNC content. This is due to decrease in free-volume of the PVA matrix which confirms the cross linking reaction between hydroxyl group of PVA and Al, Si and the carboxylic groups of HNC in the mixed matrix membranes. This is attributed due to the increased crystallinity of PVA by chemical crosslinking reaction with HNC molecule. This is attributed due to reduced crystallinity of PVA by the incorporating HNC then they form chemical cross linking in these MMMs, which breaks the molecular symmetry of PVA of mixed matrix membranes to some extent.

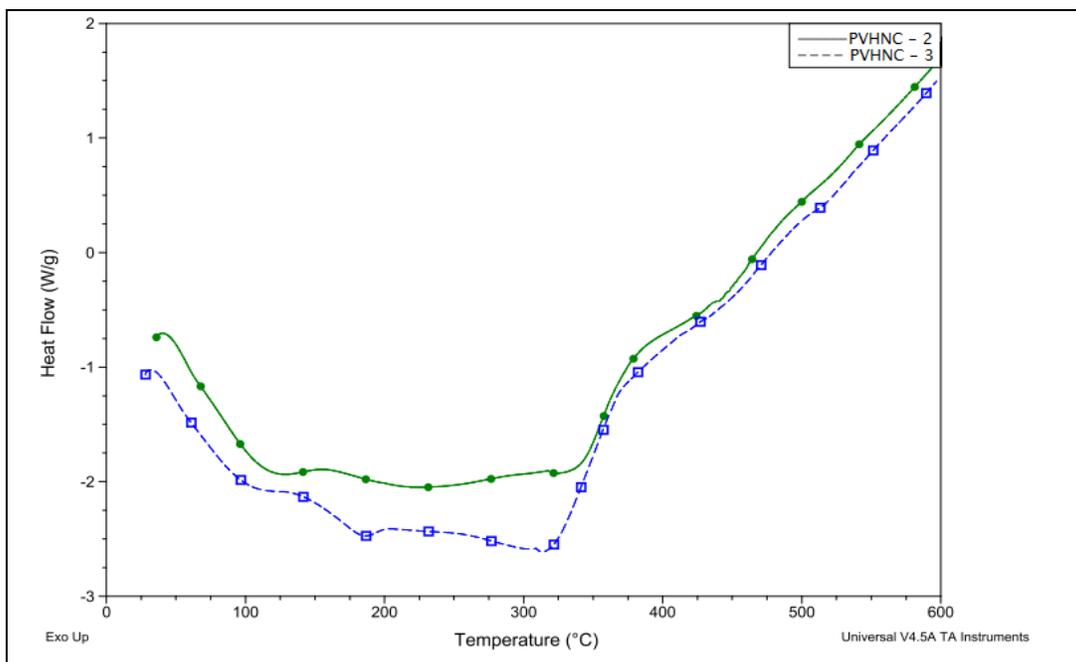


Fig. 3: DSC. Thermograms MMMs of the PVHNC-2 and PVHNC-3.

4.4. Thermo gravimetric analysis (TGA)

The TGA used to determine by monitoring the weight loss of the sample in a chosen atmosphere as a function of temperature. The thermal stability of the Halloysite nanoclay (HNC) incorporated MMMs of PVHNC-2 and PVHNC-3 were analyzed using thermo gravimetric analysis under nitrogen atmosphere and the resulting thermograms are shown in Fig.4. The two nano clay filled membranes (PVHNC-2 & PVHNC-3) exhibited there consecutive steps for weight loss. It can be seen that the first weight loss of about 10 % occurred around 80-150⁰ C which is due to desorption of physically absorbed water molecules in the membranes. The second weight loss was of about 75 % occurred between the temperature ranges of 200⁰ C to 375⁰ C which corresponds to the degradation of crosslinker [31]. The third weight loss occurred between 400⁰ C and 490⁰ C, which is presumably related to the degradation of main-chain

backbone of crosslinked membranes that could be attributed to thermal oxidation of PVA. From these TGA results, it is further justified that the residual amounts of membranes were increased with increasing the HNC content. This represents that thermal stability of membranes increased due to the increase in the HNC concentration. In the PVHNC-2, the major two weight loss stages took place from 250 to 360⁰ C and followed by a further smaller weight loss from 370 to 470⁰ C. On the PVHNC-3, the major weight loss took place from 320 to 460⁰ C. The increase in the thermal stability was due to permeability of volatile degradation product to the material and maximize the heat insulation. On addition of nanofillers HNC clay to the polymer matrix and its stability is enhanced. This TGA study indicates that the mixed matrix membranes can be effectively used in PV experiments at temperature up to 150⁰ C.

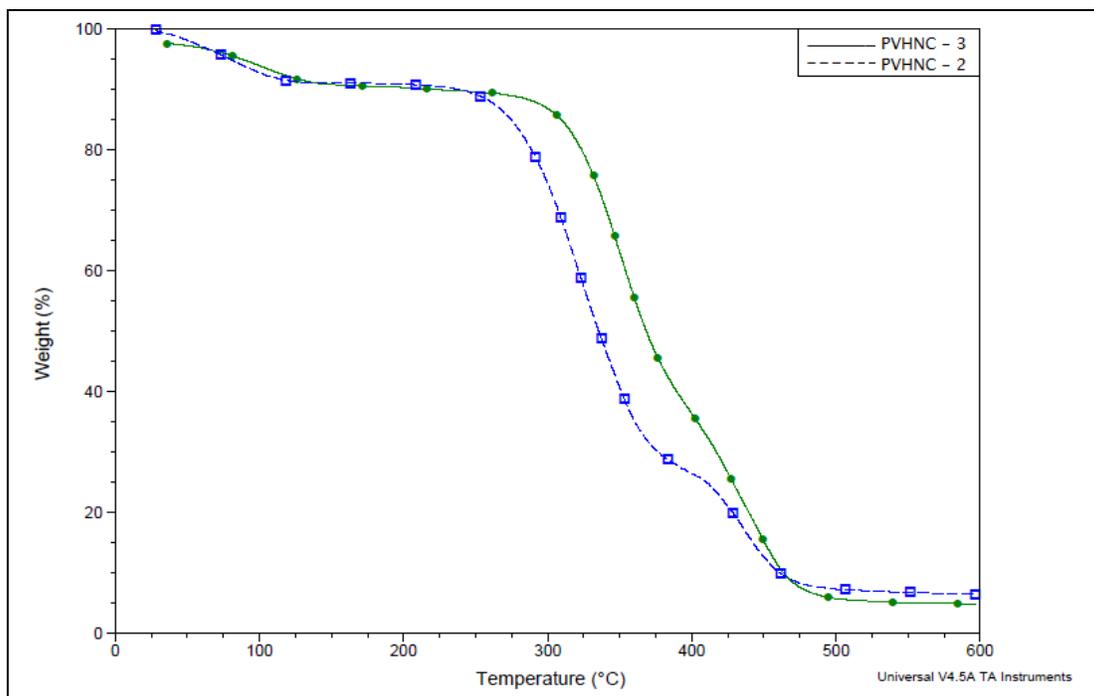


Fig. 4: TGA. thermograms of the MMMs of the PVHNC-2 and PVHNC-3.

4.5. X-ray diffraction (XRD)

The X-ray diffractogram of the pristine PVA, PCHNC-2 and PVHNC-3 mixed matrix membranes were shown in Fig.5. Generally, when the polymer contains crystalline domains the diffraction peaks are sharp and these intensities are high where as for amorphous polymer they are broad. In this the Pristine PVA showed broad peaks around 12° of 2θ , indicating the intermolecular distance of the amorphous part and a peak arising at the 22° of 2θ , due to sharp semi crystalline nature. In case of PVHNC-2 which showed the peaks at 8.9° and 19.6° of 2θ and PVHNC-3 which showed the peaks at 9.2° and 20.2° of 2θ . Here

the two mixed matrix membranes (PVHNC-2 and PVHNC-3) peak intensity is lesser than Pristine PVA membrane. As the content of HNC was increase in pure PVA, the intensity of this was decreased gradually as can be seen from the X-RD patterns. This is because of the increased amorphous domains in HNC incorporated PVA membranes. The crystallinity was high in case of pure PVA membranes due to the presence of hydroxyl groups in its side chain. However in HNC incorporated PVA membrane the hydroxyl group of PVA reacted with HNC molecules resulting in a decreased crystallinity.

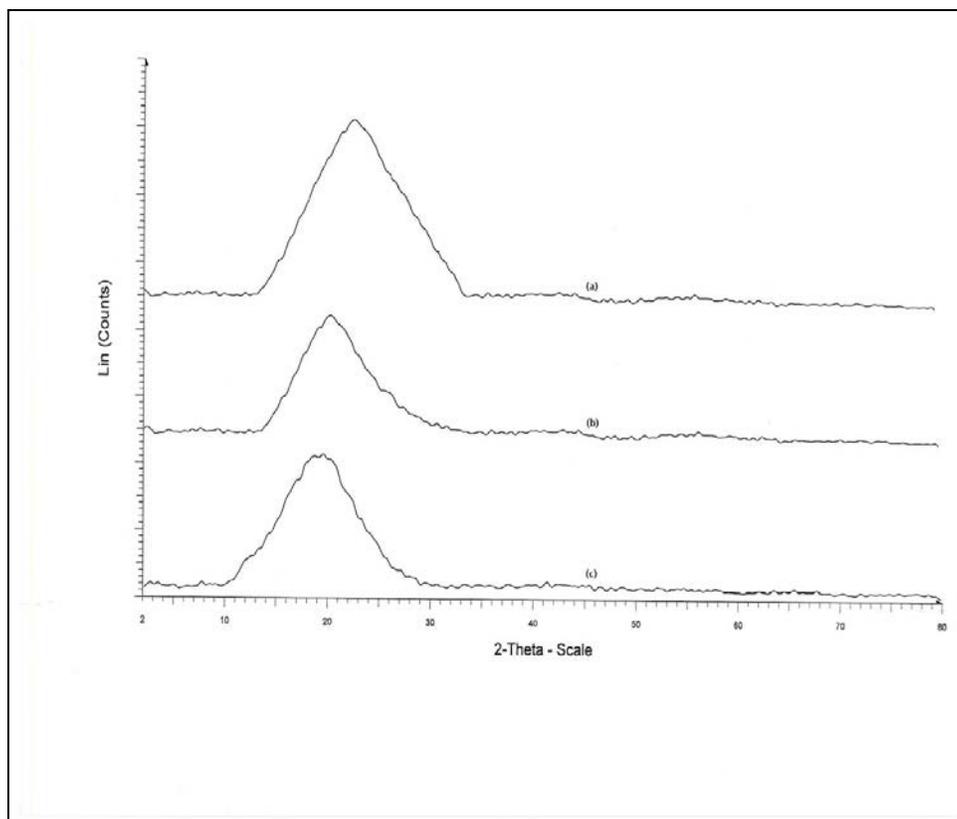


Fig. 5: XRD spectra of (a) Pristine PVA and MMMs of (b) PVHNC-2 (c) PVHNC-3

V. MEMBRANE PERFORMANCE

5.1. Swelling Experiments

In general, the hydrophilic membrane swells appreciably in aqueous solution. The swelling property of membrane is important for Pervaporation dehydration separation process since it affects the membrane perm selectivity. The polymer chains for swollen membrane would become more flexible and hence the permeates pass through the swollen membrane more easily.

The mechanism of degree of swelling depends on the microstructure of the membrane, affinity of the penetrates towards membrane and mutual interaction between them. Therefore, the degree of swelling of course plays an important role in PV process that controls the transport of permeating molecules under the influence of chemical potential gradient [32]. This study of the effects of feed composition and HNC content on membrane swelling, the percent degree of swelling of the Pristine PVA membrane, PVHNC-2 and PVHNC-3 mixed matrix membranes was plotted as a function of mass % of water in the feed at 30 °C as shown in Fig.6. It is clearly noticed that the degree of swelling was increased for all the membranes with increasing amount of the mass % of water in the feed. This is due to the interaction between water molecules and the membrane, owing to the presence of interactive hydrophilic groups (-OH and -COO) in the membrane matrix. This is expected since water is more polar than IPA, which preferentially interacts with membrane resulting in an increase in degree of swelling, which increased with increasing the clay content in the membranes at all feed compositions. This may be due to the presence of Al-OH, Si-OH groups in the clay and -OH groups in PVA which

dominates the hydrophilic properties of the mixed matrix membranes.

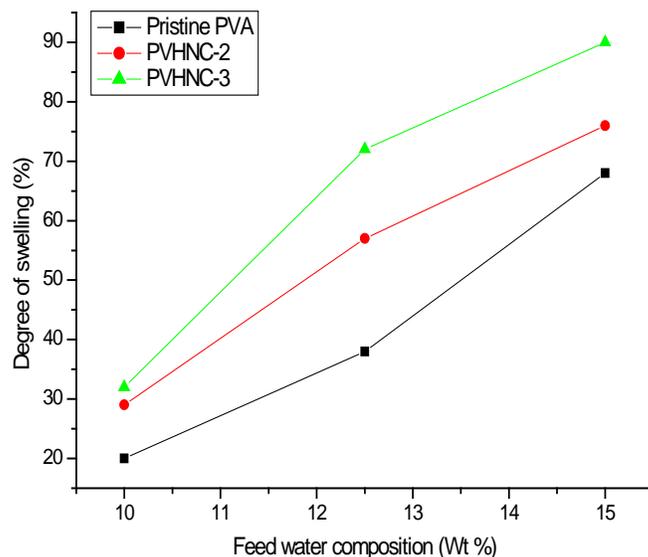


Fig. 6: Degree of swelling of Pristine PVA membrane and MMMs of PVHNC-2, PVHNC-3.

VI. PERVAPORATION STUDIES

6.1. Influence of HNC Loading on PV Performance

The Pervaporation performances of PVHNC-2, PVHNC-3 mixed matrix membranes have been evaluated by calculating flux and selectivity through the Pervaporation results. The PV performance of mixed matrix membranes (MMMs) is closely related to its structure and the incorporating nanoclay in an efficient way to modify the structure of PVA membrane. The effect of feed water concentration on PV performance was studied with the MMMs for various feed compositions ranging from 10-15 wt. % of water in feed at room temperature. The framed network and the more compact structure in HNC incorporated PVA results in the decrease of the free volume of membrane. This was because of incorporation of HNC into the membrane matrix which not only changed the membrane hydrophilicity but also its structure.

In PV process, the overall selectivity of a membrane is generally explained on the basis of interaction between membrane and the permeating molecules, molecular size of the permeating species and pore diameter of the membrane [33]. Fig. 7 displays the effect of water composition on the selectivity for all the membranes. It is observed that the selectivity of all the membranes was decreased with increasing the mass % of water in the feed. This is because of increased membrane swelling and plasticized upstream membrane layer, which allow some of IPA molecules to escape into the permeate side along with water molecules and this causes a negative impact on the membrane's selectivity. From Fig.7, it is also observed that selectivity was increased significantly from membrane PVHNC-2 to PVHNC-3 upon increasing the clay content. This is attributed to decreased crosslinking density that changed the membranes morphology. As a result, the mobility of polymeric chains apparently increased and the absolute free-volume diffused the permeates through the membrane also increased due to the hydrophilic nature of clay. Thus, water molecules having relatively small molecular size can diffuse through the crosslinked membranes easily rather than isopropanol molecules having large molecular size.

Generally in PV experiment, we are maintaining constant room temperature, flux values increase and selectivity values decrease due to thermal motion of polymer chain and formation of nanoclay micro clusters. However, the flux and selectivity get the better values of PVA mixed matrix membrane increased after incorporation of HNC particles, due to the presence of Halloysite nanoclay (HNC) particles into the continuous polymer phase is shown to be an attractive method of coupling an easy process ability of polymers with superior separation properties, Halloysite nanoclay-polymer mixed matrix membranes are quite useful in PV dehydration studies. In the present study, it shows that by adding 0.3wt % HNC into PVHNC-3 membrane, thus MMMs sorption capacity has increased, as PVHNC mixed matrix membrane and Halloysite nanoclay particles are hydrophilic in nature. So, the overall membrane performance can be explained clearly on the basis of solution-diffusion theory [34]. Then the PVA membrane incorporated with HNC the result of mixed matrix membrane can exhibit excellent potential to break the azeotropic balance, which shows the membrane

prepared in this work is useful for the separation of isopropanol-water mixtures by pervaporation (PV) experiment.

6.2. Effect of feed water composition on the PV performance

PV studies have shown that membrane performance is affected by the water content in the feed mixture. In PV, the effect of feed is also an important factor, and thus we have carried out a PV study at different mass % of water in the feed and resulting data is presented in Fig.7 & 8. It is observed that the flux was increased with increase of the water composition in the feed. This is mainly because of increased membrane swelling. This is expected due to an establishment of greater interaction between the membrane and the water molecules as membrane contains a large number of hydrophilic groups such as -OH, -COOH and -CH₂, which prefer water molecules rather than IPA. On the contrary, the selectivity was decreased exponentially with increasing the mass% of water in the feed. At a higher concentration of water in the feed, a small amount of water dissolves in the membrane, which in turn acts as a plasticizer for the membrane, leading to more flexible polymeric chains in the matrix. In addition, as water is more polar in nature its absorption in the membrane might have weakened the interaction between polymer and clay material, resulting in a somewhat loose structure, which becomes responsible for facilitating the diffusion of some of the IPA molecules in association with water molecules.

1: Pervaporation data of the Pristine PVA and MMMs of PVHNC-2, PVHNC-3 for feed mixture of water -IPA at 30 ° C.

Wt.% of water feed	Wt.% of water in permeate	Flux (J) (Kg/m ² h)	Selectivity (α)
Pristine PVA			
10.0	94.32	0.1600	151
12.5	92.32	0.1804	84
15.0	90.08	0.2681	50
PVHNC-2			
10.0	99.60	0.3643	2241
12.5	99.20	0.3878	868
15.0	98.84	0.4021	477
PVHNC-3			
10.0	99.63	0.3725	2423
12.5	99.30	0.3985	992
15.0	98.91	0.4096	508

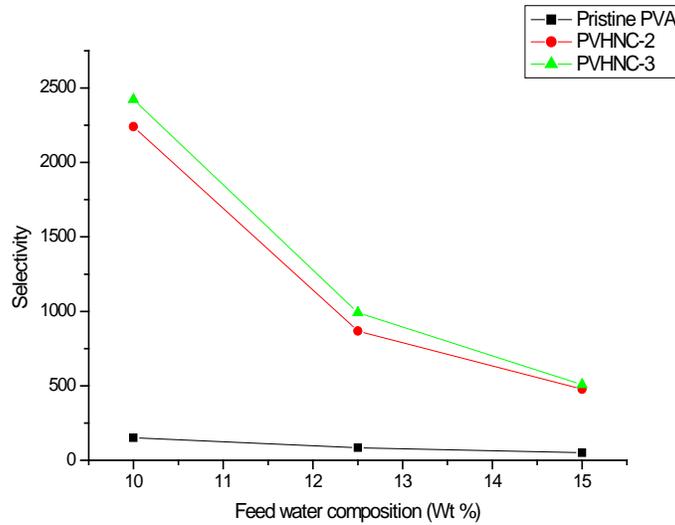


Fig. 7: Selectivity vs. wt. % of water in feed mixture for pristine PVA membrane and MMMs of PVHNC-2, PVHNC-3.

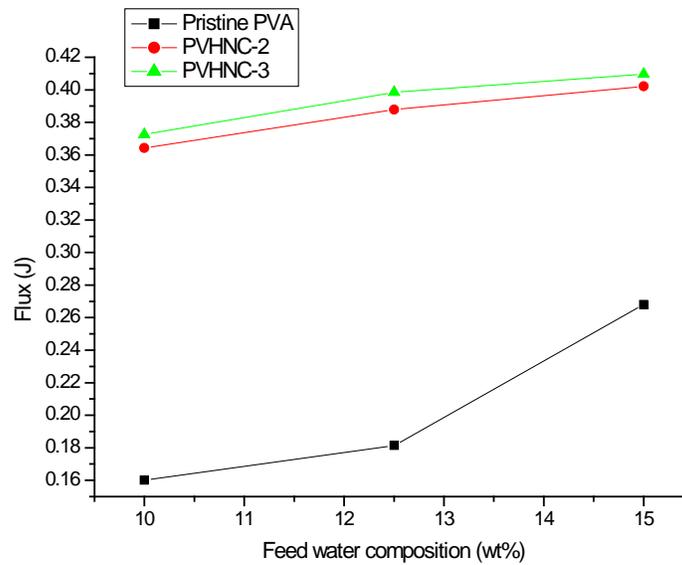


Fig. 8: Flux vs. wt. % of water in feed mixture for pristine PVA membrane and MMMs of PVHNC -2, PVHNC-3.

6.3. Comparison of PV results with literature

In the present study, we have demonstrated the variation of Halloysite nanoclay (HNC) in mixed matrix membrane (MMMs) of PVA to study the PV performance. As shown in Table.2, these HNC incorporated MMMs give better selectivity values compared to the other literature like, H-ZSM5 Zeolite with silica alumina ratio of 10 and 20 % when loaded into PVA membrane

[35] and PVA incorporating Sulfophthalic acid (SPTA) [36]. In this study the results obtained are almost comparable or even better than those of the previously discovered polymeric membranes. The 0.2 and 0.3wt % of Halloysite nanoclay (HNC) filled PVHNC mixed matrix membrane have the good separation values compared to the literature.

Table.2: Comparison of PV performance of the present MMMs with literature data for water-isopropanol separation.

Membrane	Temperature (°C)	Wt. % of water in feed	Flux (Kg/m ² h)	Selectivity (α)	Reference
PVA-H-ZSM5	30	10	144-138	568	[36]
PVA-SPTA(M4)	40	10	0.060	1991	[37]
PVHNC -2	30	10	0.3643	2241	Present work
PVHNC -3	30	10	0.3725	2423	

VII. CONCLUSIONS

The Pervaporation results of PVHNC-2 & PVHNC-3 membranes indicates that it is possible to enhance both flux and selectivity over that of pristine PVA membrane. The present experimental data indicated that due to the strong intercalated structure of PVA formed with Halloysite nanoclay (HNC) galleries, it is possible to obtain the layered crystalline structures in the PVA matrix. It was observed that the crystalline and hydrophilic nature of nanoclay particles could hinder the transport of organic components of the mixed aqueous media to offer an easy passage to water molecules through the membranes. An increase in flux and selectivity of the PVHNC-3 membrane can be attributed to the increase of membrane swelling as a result of more number of water selective sites available for such hydrophilic – hydrophilic interactions, but selectivity has decrease due to a decrease in crystallinity in addition to increased plasticization effect of the PVA membrane in the presence of a large amount of water during Pervaporation technique.

The effect of change in content of HNC particles and change in feed water concentration on flux and selectivity was investigated for the PV dehydration of IPA from the different water % of feed mixture. The results clearly show improved membrane performance due to the presence of hydrophilic nature of HNC particles and PVA. The 0.3 wt. % HNC incorporated mixed matrix membranes have shown the better selectivity of 2423. Pervaporation (PV) through HNC incorporated membranes provides the alternative to the industrial purification of aqueous organic liquid mixtures. These PV experimental results of the present study clearly explain the PV dehydration of IPA as influenced by the amount of HNC particles incorporated into the PVA mixed matrix membranes.

VIII. ACKNOWLEDGEMENT

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Soil Quality Indicators and Microbial Development in Organic and Conventionally Farmed Paddy Wetlands Ecosystem in Kerala – India

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Abstract- Increasing global concerns about impacts of toxic chemicals, energy crisis and environmental protection, it is becoming more important to rely on local abundant agricultural bio resources than on chemical fertilizer. Understanding the effects of organic farming on the soil quality parameters, such as microbial activity and soil nutrient content, is of central importance to concepts of sustainability. Investigation were done on the quantity, type and application of organic amendments on temporal dynamics of paddy soil organic carbon (SOC), soil total nitrogen (STN) and soil microbial biomass (SMB). The study was conducted in a paddy wetlands of Padayatti in Erumayur panchayat, Palakkad, Kerala as part of the “Agro-Biodiversity Enhancement Programme” by Kerala State Biodiversity Board, to promote organic farming in the state. The data collected on the soil chemical and microbial parameters from selected organic farming stations (St. 1-3) in comparison to chemical fertilizer applied conventional stations (St. 4) from July 2009 to October 2010 formed the basis of this paper. In the present study it was observed that soil in Padayetti under organic cultivation was able to maintain marginally increased concentration of total soil organic carbon (SOC), soil organic matter (SOM), total nitrogen (TN) and soil microbial biomass as compared to the conventional fertilizer systems. Even though considerable variation could be observed in the organic and conventional fields in the context of soil chemical and biological parameters, however they were not very much pronounced. The average soil organic carbon value ranged from 0.379 to 1.26% whereas soil total nitrogen was in the range of 0.739 to 0.85%. Study stations with organic amendments showed enriched microbial biomass and nutrient availability than fertilizer applied fields. The heterotrophic microbial count showed an average highest value of 20×10^6 cfu/g soils in organic station, whereas was 90×10^4 cfu/g soils in fertilizer applied station. Therefore this study recommends long term application of organic inputs for restoring the native soil properties and health.

Index Terms- Organic farming, Sustainable agriculture, Soil Organic Carbon (SOC), Soil Total Nitrogen (STN), Soil Microbial biomass (SMB).

I. INTRODUCTION

With increasing global concerns over impacts of toxic chemicals, energy crisis and environmental protection, it is becoming more alarming to rely on local abundant agricultural bio resources than on chemical fertilizers. Recent studies have focused on re-considering organic fertilization practices to enhance soil organic input, fostering agricultural sustainability by promoting soil microbial biomass and activity. Conventional agro ecosystems have been characterized by high input of chemical fertilizer, leading to deterioration of soil quality due to reductions in soil organic matter and nutrients (Wu, 2009). Organic agricultural system relies on traditional practices like crop rotation, green manure, compost, and biological pest control, excluding or strictly limiting the use of synthetic fertilizers and synthetic pesticides, plant growth regulators, livestock feed additives, and genetically modified organism to maintain soil productivity.

Studies in comparison with conventional agriculture systems reveals that organically farmed soils showed improved soil quality with higher microbiological activity, higher pH, organic C, N mineralization potential, soil micro-organisms (30-40 %), and higher biological activity (30-100 %). Nitrate leaching rates on organic farms were shown to be significantly lower (40-64 %) and energy use to be more efficient (30-50 %) on a per hectare basis (FAO, 2002). Studies conducted between 1988-2001, comparing conventional and organic agricultural practices in both the US and UK have repeatedly showed higher levels of wild biological diversity (birds, arthropods, weedy vegetation and soil organisms) in organically managed farms (Witter and Kanal, 1998; FAO, 2002).

Soil quality in paddy wetlands depends on a large number of physical, chemical and biological soil properties, and its characterization requires the selection of indicators most sensitive to changes in management practices (Elliott, 1994). A better understanding on temporal and spatial variability of SOC, STN, microbial biomass and related factors is important for improving sustainable land use management (McGrath and Zhang, 2003) and providing a valuable base against which subsequent and future measurements can be evaluated. The soil chemical characteristics also play an important factor that determines as well as contributes to the abundance of organisms and productivity of the system. Therefore this study is unique in the Indian context where investigation were done on comparing organic and conventional farming type on temporal dynamics of paddy SOC, STN and microbial biomass in the rice cropping system of Palakkad Kerala.

II. MATERIALS AND METHODS

Study Area

The study was carried out from July 2009 to October 2010 in a tropical paddy wetland ecosystem located in Padayatti Village, Palakkad Dist. (10°41'137" N, 76°32'839" E), Kerala, India (Fig.1) situated at an altitude of 86 m above msl and has a tropical wet and dry climate with seasonally excessive rainfall and hot summer. The annual farming system consisted of early rice (July to September), late rice (November to January) and followed by summer fallow. The seeds commonly employed for cultivation were Navara, Aishwarya, Jothi, JST, 1001.

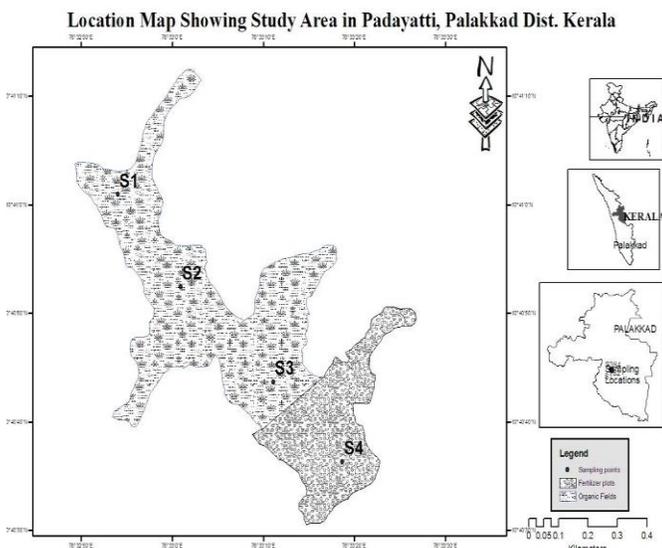


Fig. 1 Location map showing paddy wetlands of Padayatti, Palakkad

Organic and Conventional paddy Cultivation

Organic fertilization practices were introduced in the area as a part of a pilot project “Agro-Biodiversity Enhancement Programme” by the state government of Kerala –India, to promote organic farming. The total paddy wetland covers an area of 161.6 ha which was demarcated in to four stations. Station1 to 3 was under organic paddy cultivation, whereas station 4 was under cultivation using chemical fertilizers (Table 1).The organic farming was based on vermicomposting, leaf decoctions, and “Panchagavaya (Kumar et al., 2011). The vermicompost was applied at rate of 1tonne/acre, indigenously developed by the farmers of Padayatti, Palakkad. Whereas conventional farmers in Padayatti area were cultivating paddy making use of chemical fertilizers which was followed for decades.

Physio-Chemical Analysis of Soil

The soil samples were collected using a standard corer of 5 cm diameter and 40 cm in length. The sediment pH was measured using a Systronics make pH meter, NO.MK VI, whereas Eh was measured using Systronics make Eh meter, No.318. Total nitrogen was estimated by automated Kjeldahl digestion method (Jackson, 1973). Soil organic carbon (SOC) is determined using multi N/C 2100S Analytikjena TOC analyser. The organic matter

was derived from organic carbon values (El-Wakeel and Riley, 1957), whereas the energy content was obtained from organic matter using an equivalent of 21.6 J/mg dry weights (Barnes, 1959). The microbial biomass, mainly the heterotrophic and total counts were also determined (Brown, 2001; APHA, 2005). The univariate & multivariate analysis were done by statistical software’s SPSS version 16.

Table 1 Details on study stations in Padayatti wetland, Palakkad

Station	Coordinates	Manure applications	Area (in acres)
1. Organic	10° 41'057" N 76° 32'829" E	Vermicompost, Panchagavaya, Organic pest repellents etc	0.60
2. Organic	10° 41'085" N 76° 32' 856" E	Vermicompost, Panchagavaya, Organic pest repellents etc.	1.30
3. Organic	10° 41'127" N 76° 32'882" E	Vermicompost, Panchagavaya, Organic pest repellents etc	1.30
4. Chemical fertilizer	10° 40' 902" N 76° 32'777" E	Chemical manures like factomphose,Urea, ammonium sulphate, sulphur-phosphate & Chemical pesticides	0.40

III. RESULTS AND DISCUSSION

Soil temperature

Significant difference in soil temperature was not observed between organic and conventional stations where highest temperature was observed in March 2010 with an average value of 34°C and lowest temperature of 21.6°C in December 2009 (Fig.2).

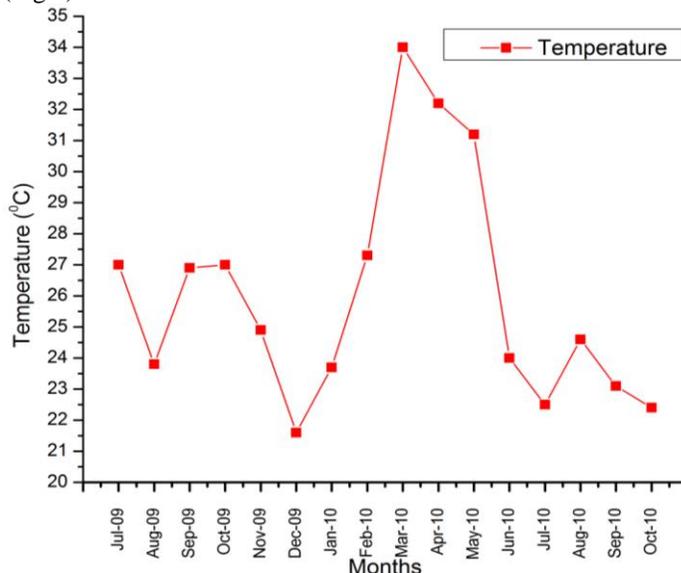


Fig.2 Monthly variation of temperature (°c) in selected stations of Padayatti wetland, Palakkad 2009-2010.

Soil pH and Oxidation Reduction Potential (Eh)

In the present study, the average pH values were found marginally higher in organic amended stations as compared to conventional fertilizer stations. In St.1 an average pH value of 6.22 ± 0.55 was observed. pH showed a lowest value of 5.25 in March 2010 and a highest value of 7.1 in February 2010, with a coefficient of variation (CV %) of 8.67%. The characteristic pH values showed that, pH was acidic to neutral in St.1. In St.2 soil pH showed an acidic nature, with an average value of 5.94 ± 0.61 with a highest value of 6.8 in February 2010 and a lowest value of 3.81 in September 2009, having a coefficient of variation of 7.84%. In St. 3, pH values showed an average value of 6.11 ± 0.59 , with a lowest value of 5.29 in November 2009 and a highest value of 7.3 in February 2010, with a coefficient of variation of 8.13%. St.4 showed an average value of 6.02 ± 0.38 with highest value of 6.9 in February 2010 and an acidic value of 5.51 in March 2010 (CV = 8.84%).

Seasonally, wide variation in pH was observed in the four stations. An average value of 5.91 ± 0.51 was observed in monsoon 2009, 6.44 ± 0.51 in pre monsoon, 6.036 ± 0.49 during post monsoon 2009 and 6.12 ± 0.54 in monsoon 2010 respectively. The ANOVA of soil pH showed an overall significance at 1% level ($F = 9.873$). The pH values were mostly acidic in nature during March, May, July and August 2010 in both organic as well as fertilizer farming stations. The rise in pH could be attributed to long-term changes in soil pH that occur as a result of displacing cations or adding sources of acidity such as H^+ and Al^{3+} on the cation exchange complex of soils as reported by Tisdale et al., (1993).

Seasonally the Eh values showed a similar trend in all stations. During the study period a reducing trend in Eh was observed in all seasons except pre monsoon (Fig.4). Dynamic changes in hydrological pattern greatly influenced the oxidation reduction conditions in the system. Oxidation-reduction potential is the measure of electron activity of the soil and is one of the most important electrochemical properties of the soil affected by the dynamic changes, when wetlands are subjected to hydrological fluctuations. Station wise analysis of Eh showed a similar trend in all stations depending on the hydrological pattern. During the study a reducing trend was observed during the water logged months in July, August, September, and October 2010 whereas an oxidative nature was observed during the dry months of November, December, January, and February 2010. The oxidation reduction potential showed a negative trend in st.1 having an average of -92.46 ± 129 mv with a lowest value of -336 mv in September 2010 and -102 mv in April 2010. St.2 also showed an average value of -92.62 ± 148 mv with the lowest value of -339 in the month of September 2010 and a highest value of 105 in May 2010. Average Eh value of -59.9 ± 123.9 mv was observed in st.3 with a minimum value of -298 mv in August 2010 and maximum value of 126 in May 2010. St.4 also showed a negative trend in Eh with an average value of -85 ± 101.3 mv, having a lowest value of -227mv and a highest value of 64 mv in April 2010.

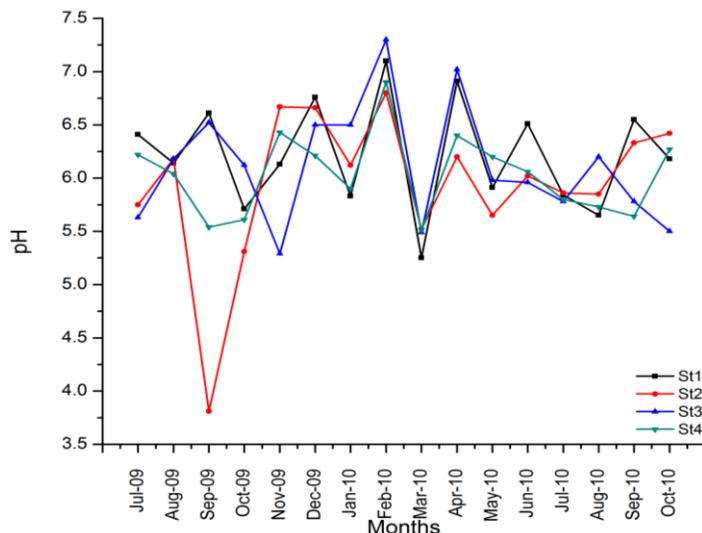


Fig.3 Monthly variation of pH in selected stations of Padayatti wetland, Palakkad during 2009-2010.

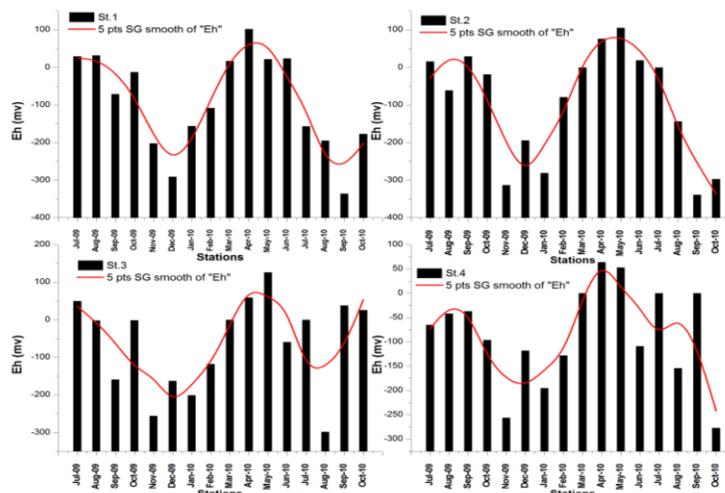


Fig.4 Monthly distribution of Eh (MV) in selected stations of Padayatti wetland, Palakkad, during 2009- 2010

Soil Organic Carbon, Organic Matter and Energy Content

Soil organic carbon is one of the most important terrestrial pools for carbon storage. It is estimated that the paddy wetland ecosystems on the earth have a total carbon stock of about 20–25% of the total stock in terrestrial soils and are considered to play an important role in global carbon cycling (Lal, 2002). Seasonally wide variation in organic carbon was observed in the four stations. An annual increasing trend in organic carbon (%) was observed in St.1 and 3 whereas St.2 and St.4 showed a decline in its concentration. In st.1 and st.3 maximum concentration of organic carbon were observed during the monsoon 2010, st.2 its highest concentration in pre monsoon whereas st.4 it was highest concentration in monsoon 2009. During the present study organic carbon showed an average of 0.714 % in the four stations. Station wise analysis showed an average value of 0.7196% in st.1 having a CV value of 34.04%, with a maximum value of 1.1% in June 2010 and a lowest value of 0.379% in February 2010. In st.2, organic carbon showed an average value of 0.786% with a maximum value of 1.26% in

December 2010 and a lowest value of 0.408 % in January 2010 having a CV value of 34.1%. In st.3 organic carbon depicted an average value of 0.69 % (CV = 44.22%) with a peak value of 1.2% in November 2010 and a lowest of 0.83% in January 2010. St. 4 showed an average value of 0.663 % with a maximum value of 1.29% in January 2009 and 0.419 % in April 2010 (CV = 31.84%) (Fig.5). Soil organic carbon showed an increased availability in soil during the months of April 2010 to August 2010. Mean results showed that st.3 had the highest organic matter with 0.769%. Studies comparing soils of organic and conventionally managed farming systems it was reported that, higher soil organic matter was reported in organic farming regions as compared to conventional methods (Reganold et al., 1987; Drinkwater et al., 1998). Seasonally the ANOVA of soil organic carbon showed that it was significant at 1% level (F = 12.187). Season wise, Duncan test was grouped into 3 subsets with a significant level of 1%.

Organic matter (Fig.6) and energy content (Fig.7) are reflective of organic carbon present in the system. During the study organic matter showed an average value of $1.613 \pm 0.52\%$ in st.1, $1.76 \pm 0.62\%$ in St.2, $0.688 \pm 0.67\%$ in st.3 and $1.486 \pm 0.49\%$ in st.4 respectively. Seasonally wide variation in organic carbon was observed in the four stations. The ANOVA of soil organic matter showed a seasonal significance of 1% level (F = 0.871). Energy content also varied from 17.36 ± 13.19 j/g in st.1, 18.16 ± 11.25 j/g in st.2, 19.77 ± 12.78 j/g in st.3 and 16.25 ± 9.82 j/g in st.4.

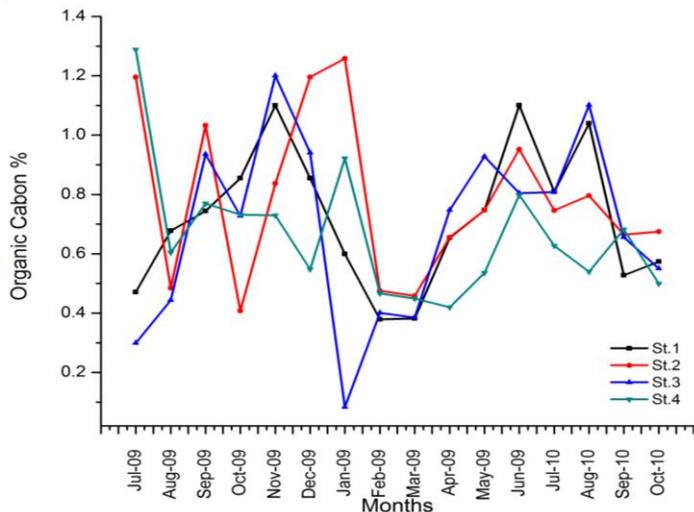


Fig.5 Monthly variation Soil organic carbon (%) among four stations in selected wetlands in Padayati, Palakkad during 2009-2010

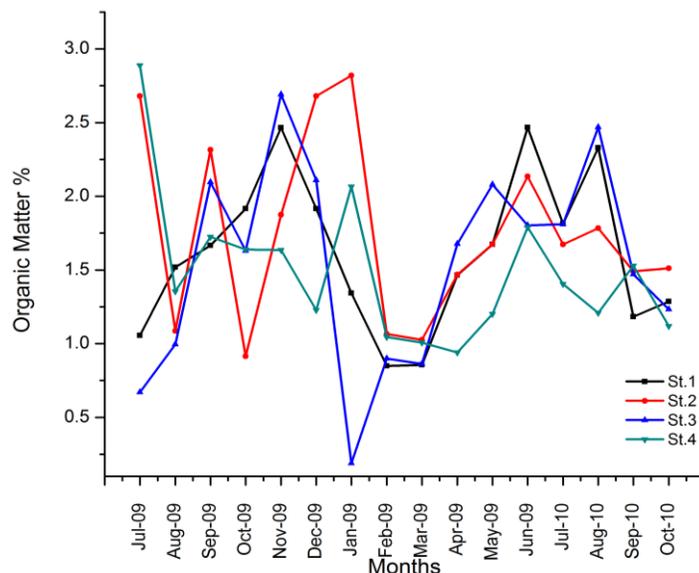


Fig.6 Variations of organic matter % in selected stations of padayati wetland Palakkad.

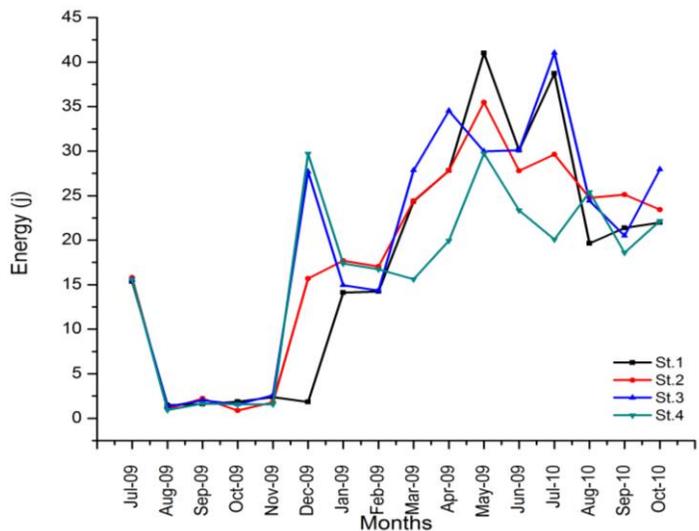


Fig.7 Distribution of energy content (J/g) in selected stations of Padayati wetland, Palakkad

Soil Total Nitrogen (STN)

Seasonally, in all the four stations monsoon and pre monsoon, periods showed highest concentrations of total nitrogen. The organic farming stations represented by st.1 to st.3 showed comparatively higher total nitrogen values as compared to the fertilizer amended station (St.4). However the overall examination of the data could not evolve any remarkable variability among the fertilizer or organic amended zones. Studies conducted by Gosling and Shepherd (2004) observed that the higher nitrogen content was related to organic fertilizer application. Total nitrogen has a significant correlation with soil organic matter and an enhancement in the total nitrogen content under organic fertilizer application were reported by Nguyen (1995) due to high loading of organic C and N in the organic materials. In an agricultural ecosystems soil total nitrogen (STN)

is a major determinant and indicators of soil fertility (Reeves, 1997). Thus a reduction in total nitrogen levels will result in decrease in soil fertility, soil nutrient supply and thus soil productivity (Gray and Morant, 2003). The station wise analysis of total nitrogen in the paddy wetlands of Padayatti depicted an average value of 0.739% in st.1, 0.768% in st.2, 0.85% in st.3 and 0.769% in st.4 respectively (Fig. 8). In st.1 an average value of $0.739 \pm 0.508\%$ was observed. Total Nitrogen showed a lowest value of 0.265% in the month of January 2010 and a highest value of 1.825% in December 2009, with a coefficient of variation of 68.3%. In station 2 variations in soil total nitrogen showed an average value of $0.768 \pm 0.779\%$, with a lowest value of 0.096% in the month September 2010 and a highest value of 2.934% in November 2009, having a coefficient of variation of 101.41%. An average percentage value of 0.849 ± 0.779 in total nitrogen were observed in st.3, with a lowest reported value of 0.222% in January 2010 and a highest observed value of 2.78% in November 2009 (CV=91.38). St.4 the chemical fertilizer zone, showed an average value of $0.77 \pm 0.556\%$ in STN, with a lowest observed value of 0.236% in the month May 2010 and a highest value of 2.01% in November 2009, with a coefficient of variation of 72.24%.

Seasonally wide variation in total nitrogen was observed in the four stations. A mean total nitrogen value of 1.02% was observed in monsoon 2009, 1.2% in pre monsoon 2009, 0.46% during post monsoon 2009 and 0.46% in monsoon 2010 in organic applied st.1 to 3. Whereas an average value of 0.895% in monsoon 2009, 1.15 in post monsoon 2009, 0.44 during post monsoon 2009 and 0.59 in monsoon 2010 was observed in chemical fertilizer applied st.4. During the monsoon, st.1 showed a highest average value of 1.0569% in 2009, whereas highest value of 1.4% was observed in st.2 during post monsoon. In the pre monsoon highest mean value of 0.503% was reported in st.3 and 0.59% in st.4 during monsoon. In all the stations the percentage variation of STN was low in both pre monsoon and monsoon whereas elevated concentrations were observed during post monsoon period. The ANOVA of soil total nitrogen showed an overall significance at 1% level ($F = 14.182$). In posthoc analysis, the 3 seasons were grouped into 3 subsets and were significance at 1% level. The correlation coefficient analysis of soil total nitrogen showed a positive correlation between organic carbon, organic matter significant at 1% level.

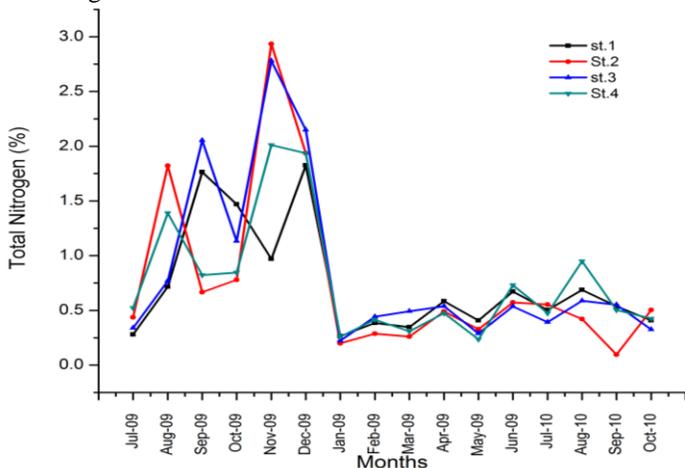


Fig.8 Monthly variation of soil total nitrogen(%) in selected stations of Padayatti wetland, Palakkad during 2009-2010.

Microbial Biomass

Comparative analysis of heterotrophic bacterial counts in organic and fertilizer fields revealed that heterotrophic count was significantly low in fertilizer stations as compared to the organic stations. Determination of soil microbial biomass is generally used as a rapid indicator of change in soil management which in turn affects the turnover of organic matter (Nannipieri et al., 1990). A relatively rapid response to organic amendments has been reported for microbial biomass carbon by several workers which suggest it could be a useful indicator in identifying positive effects of soil management (Fauci and Dick, 1994). Danish Bichel Committee, (Axelsen and Elmholt, 1998) reported that a transition to 100% organic farming in Denmark has increased the microbial biomass by 77% as a national average. Conversion to organic farming therefore provides opportunities for significantly increase the biological activity of the soil.

During the present study, station wise analysis of microbial biomass showed an average value of 17.52×10^5 in st.1, 12.95×10^5 in st.2, 16.76×10^5 in st.3 and 11.25×10^5 in st.4 respectively (Fig.9). In 2010 average highest value of 2413636 cfu/g soil was observed in st.1 whereas colony forming units of 1602727 cfu/g soil was observed in fertilizer stations. Monthly observation of the data showed that microbial count varied from 50000 cfu/g in March 2010 to 5350000 cfu/g in st.1; that from 9700 cfu/g in February 2010 to 6310000 cfu/g in September 2010 in st.2; that from 12000 cfu/g in February 2010 to 7410000 in st.3 and 0 in February 2010 to 2010000 in November 2010 in st.4.

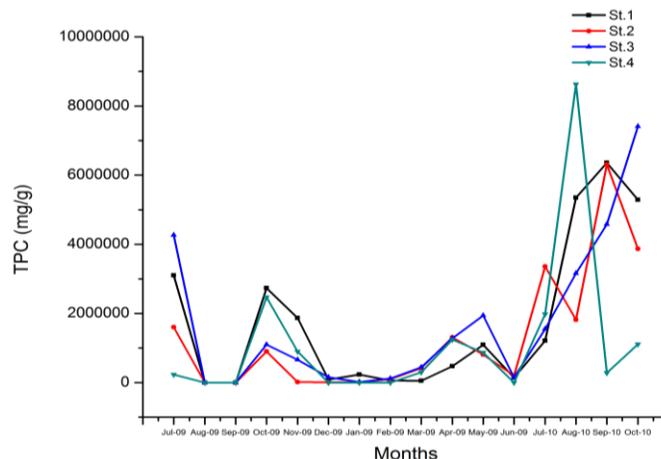


Fig.9 Monthly Variation heterotrophic bacterial count (cfu/g) among four station in selected wetlands in Padayetti, Palakkad during 2009-2010.

IV. CONCLUSION

The salient observations during the present study from February 2009 to October 2010 indicate that soil in Padayetti under organic cultivation was able to maintain marginally increased concentration of total soil organic carbon (SOC), soil organic matter (SOM), total nitrogen (TN) and soil microbial biomass compared to the conventional fertilizer systems. Even though considerable variation could be observed in the organic

and conventional fields in the context of soil chemical and biological parameters, however they were not very much pronounced. It may take considerable time for the organic elements mainly the microflora to become effective for regulating the quality of the soil. So this time delay could also be a factor for the low variability of different parameters in certain months of the study in different stations. Therefore, it is expected that, more pronounced variability of different parameters would be evolved through long term application of organic inputs by restoring the soil quality and health.

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Estimate some of the aerodynamic characteristics of urban areas by using wind tunnel

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Abstract- The aim of this study was to calculate the drag coefficient (Cd) , surface roughness (Zo) and friction velocity (U*) these characteristics are very imported in (urban planning, pollutants diffusion, Wind Energy) these characteristics are calculated depended on a series of wind tunnel Experiments to different obstacles type, We has used eight type of obstacles Such as Staggered arrays and Regular arrays and with different geometric shapes like a Diamond and cubic. several of empirical equations has been estimated, these equations can be used in urban areas under neutral weather conditions .

Index Terms- friction velocity – drag coefficient – surface roughness – wind tunnel .

I. INTRODUCTION

The aim of this work is to try to study and analyze the Aerodynamics characteristics of urban surface to conclusion equations to calculate the each of the surface roughness (Zo) and the drag coefficient (Cd) by depends on different obstacles(in height, Homogeneity height and distribution of the various models) By using wind tunnel device. The aerodynamic characteristics are very important in the study of the environment, estimating evapotranspiration values, estimating the efficiency of wind power, transport of pollutants and weather modifications in cities.

There have been many attempts to study the aerodynamic characteristics of urban arrays , for example Sheikh Ahmed Zaki et al.(2014) Where they tried to estimate the drag force and effective pressure on the walls of buildings by using wind tunnel[1]. and Wieringa (1992) where he study the surface roughness and its transactions in a homogeneous area, and he estimation the value of the length of the displacement length (Zd) as well as distance affecting wind flow (Fetch) has estimated the researcher roughness over different surfaces[2].and Grimmond et al. (1998) Who has studied the nature of the effect of roughness on the movement of air near the ground surface in urban areas [3]. Macdonald et al.[4],Lettau [5] , Counihan [6] , Raubach [7] and Rotach [8] introduced simple mathematical expressions to determent(Zo)and (Zd)based on the frontal area density λf and plan area density λp.

II. Theory

Consider that you are putting your hand or plate flat surface out of the car window as it moves, so that the flow of air perpendicular to the plate, the total force acting on the plate as possible be given in terms of the following definition where the force acting based on body shape and characteristics of the fluid flow (turbulent and / or laminar flow) and these effects are imposed by the presence of known factor (aerodynamic coefficient) or called drag coefficient (Cd). In general, the drag force (f) is given as follows [7].

$$f = qACd \dots \dots \dots (1)$$

$$f = \frac{1}{2} CdAPu^2 \dots \dots \dots (2)$$

So equation (1) = equation (2)

When (A) is the Frontal space of obstacles in front of the wind direction, (u) is the wind speed, and (P) is the air density. The shear stress (T) has a clear relationship with the drag coefficient shown in the following equation [9]:

$$T = \frac{f}{A} = \frac{1}{2} CD\mathcal{P}u_{20l}^2 \dots \dots \dots (3)$$

If (L) is the average height of obstacles, u20l is the wind speed on twenty times more than height (L).

On the other hand, the shear stress (T) can be written as the following equation :

$$T = \mathcal{P}u_*^2 \dots \dots \dots (4)$$

Then from equation (3) and equation (4), we will Obtains the following equation:

$$Cd = \frac{2u_*^2}{u_{20l}^2} \dots \dots \dots (5)$$

For friction velocity, it is defined as a function of the average of wind speed fluctuation in horizontal and vertical component (u' and w') It can be measured by the following equation [10]:

$$u_* = \sqrt{\overline{|u' w'|}} \dots \dots \dots (6)$$

The surface roughness length (Z_0) A very important factors affecting on the movement of winds in the surface boundary layer, we can measure (Z_0) by the Logarithmic equation as follow [11]:

$$\ln(z) = \frac{K}{u_*} u(z) + \ln z_0 \dots \dots \dots (7)$$

If we drew the relationship between $u(z)$ on x - axis and $\ln(z)$ on y – axis then from linear regression (especially in the neutral weather conditions) the Slope of the regression line will equal to $\frac{k}{u_*}$.

In the other hand the intersection of linear regression line with the y-axis will equal to $\ln(z_0)$, so Z_0 and U_* can be estimated from previous relationships.

III. Experimental set – up

1- Roughness surfaces

There were eight types of arrays involved in this study with different horizontal arrangement patterns, height variation, and element angles; we name it as in the following table

Table (1) the number and names of the types of arrays used in work and the concept of each one type

N	Name of type	concept of type
1	Ca1	Parallel arrays of cubic shape obstacles with homogeneous height
2	Ca4	Parallel arrays of cubic shape obstacles with In homogeneities height
3	Da1	Parallel arrays of cubic diamond shape obstacles with homogeneous height
4	Da4	Parallel arrays of cubic diamond shape obstacles with In homogeneities height
5	Cs1	Staggered arrays of cubic shape obstacles with homogeneous height
6	Cs4	Staggered arrays of cubic shape obstacles with In homogeneities height
7	Ds1	Staggered arrays of cubic diamond shape obstacles with homogeneous height
8	Ds4	Staggered arrays of cubic diamond shape obstacles with In homogeneities height

2-Instrumentation

The experiments were performed in a low speed open wind tunnel at the laboratory of the Mustansiriya University \College of Sciences \ Department of Atmospheric Sciences.the wind tunnel has consists of three parts ((contraction part 1m long ,1m high ,0.5m wide)(test part 2m long ,0.6 high , 0.5 wide)and (Diffuser part 1m long , 0.8 m high ,0.5 m wide)) . The Area which are covered with roughness Amounted to (3×0.5) m. the wind speed has been measured by using Hot-weir anemometer.

IV. Results and discussion

1- Drag coefficient C_d

The Figure {1-1} shows the highest value of coefficient drag (Cd) when type Ds1, the lowest value was recorded at type Da1.

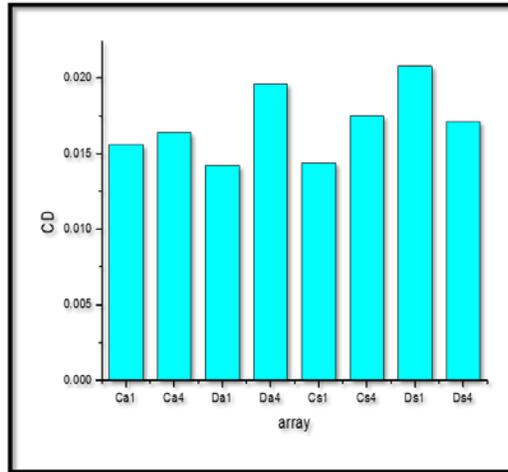


Figure {1-1}. Value of drag coefficient to different types of obstacles.

Results has shown(As shown in Fig {1-2}) that the relationship between surface roughness and the drag coefficient It has strong relationship and type of relationship is a linear direct proportion , The value of the correlation coefficient for this relationship was(R=0.8244),we can obtained empirical equation from this relationship as follow:

$$CD = 0.0103 + (1.8713 \times Z_0) \dots \dots (8)$$

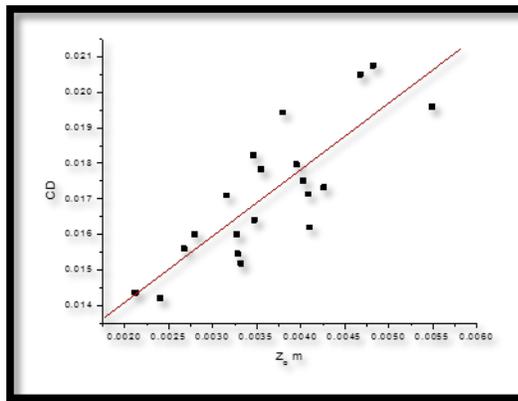


Figure {1-2}. The relationship between surface roughness and the drag coefficient

The relationship between drag coefficient (Cd) and friction velocity (U_*) (as shown in Fig {3}) indicated a strong correlation coefficient (R= 0.781) so we can obtained empirical equation from this relationship as follow:

$$CD = -0.0111 + (0.0385 \times u_*) \dots \dots \dots (9)$$

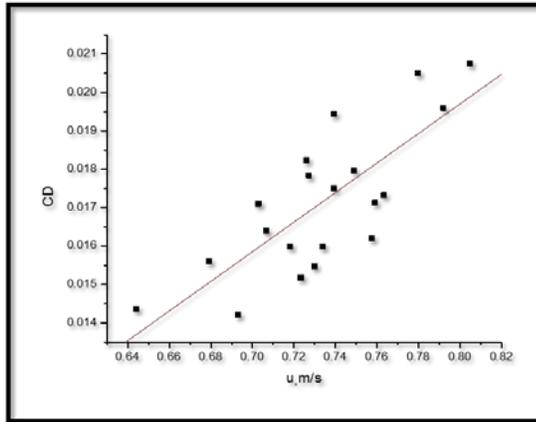


Figure {1-3}. The relationship between friction velocity (U_*) and the drag coefficient (C_d).

The empirical equation to calculate drag coefficient (C_d) depending on the value surface roughness (Z_o) and friction velocity (U_*) as follows:

$$C_d = \frac{(0.0004 + 0.9356 \times Z_o + 0.01925 \times u_*) - 0.00687}{0.6445} \dots \dots \dots (10)$$

2 -Friction velocity (U_*)

The Friction velocity (U_*) has been measured and The Figure {2-1} shows the highest value of Friction velocity (U_*) when type Da4, the lowest value was recorded at type Cs1

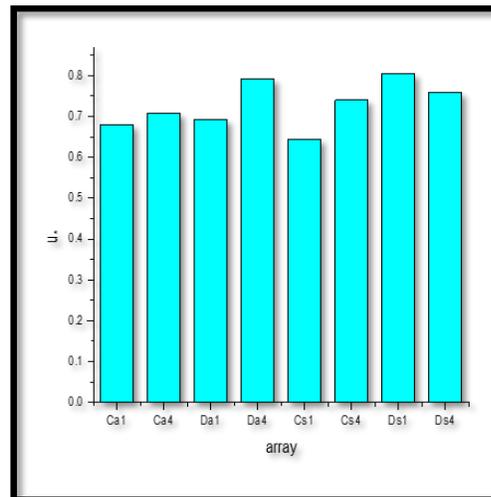


Figure {2-1}. Value of friction velocity (U_*) to different types of obstacles.

3 -Roughness length

The surface Roughness length (Z_0) has measured and the Figure {5} shows the highest value of roughness length (Z_0) when type Da4, the lowest value at type Cs1.

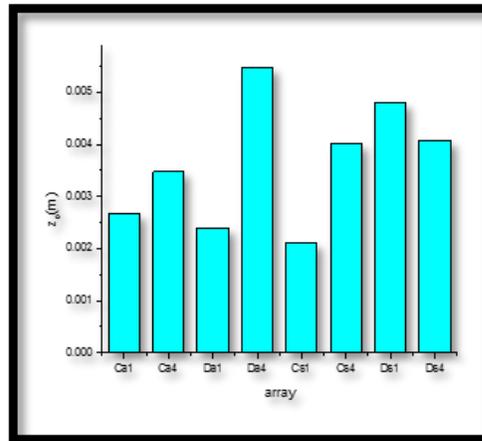


Figure {3-1}. Value of surface roughness (Z_0) to different types of obstacles.

By estimating the surface roughness values of different patterns from the relationship between $\ln(Z/Z_0)$ and $U(z)/U^*$ (as shown in table {3-1}) , we concluded the table (3-2), which includes empirical equations to calculate the surface roughness values (Z_0) for different types of obstacles depending on the value of U^* , $\ln z$ and $U(z)$. The correlation coefficients of these equations are very strong (close to $R=1$)

Table {3-1}. The relationship between $\ln(Z/Z_0)$ and $U(z)/U_*$ to different types of obstacles.

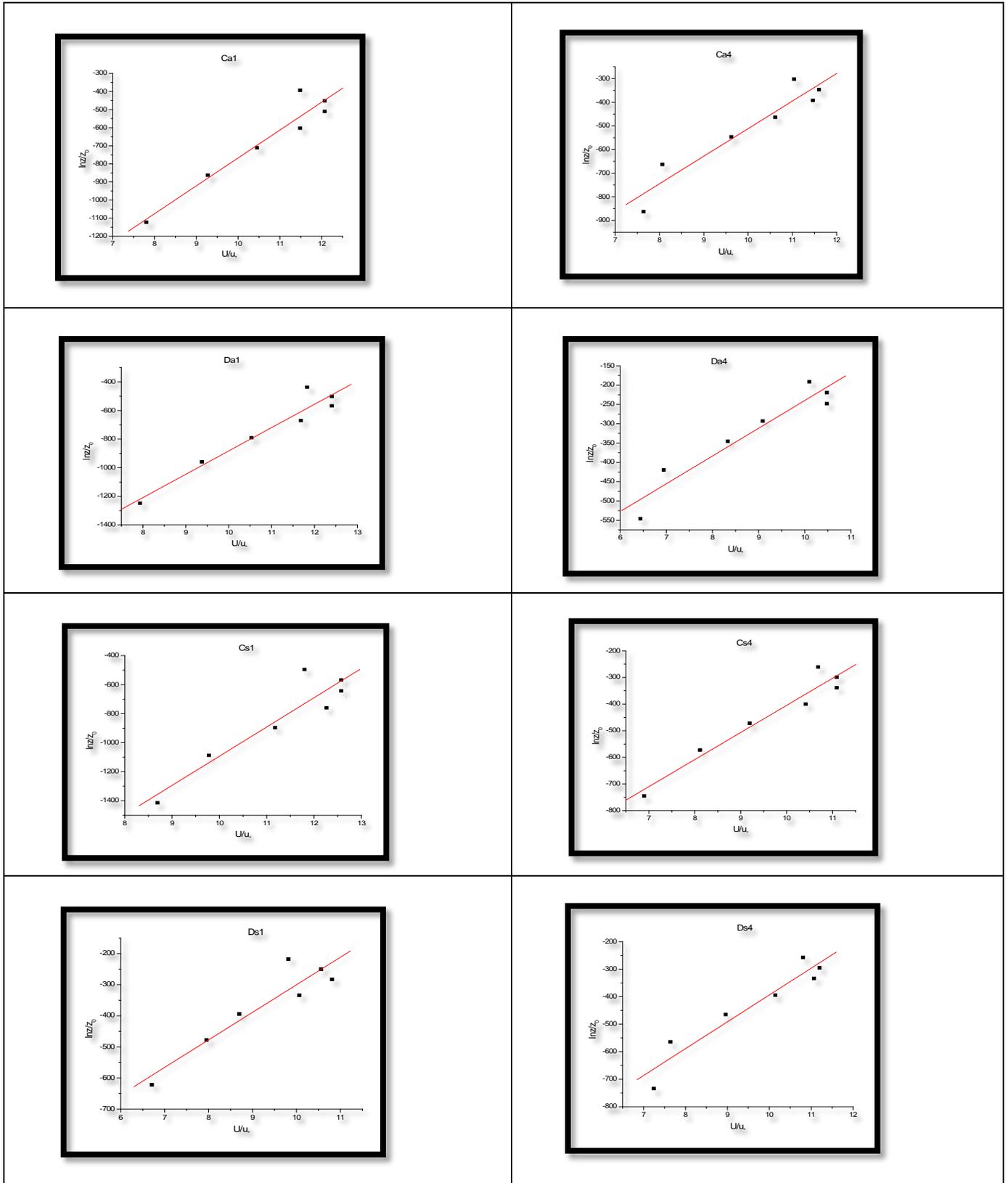


Table {3-2}. The empirical equations to calculate the surface roughness values (Z₀) for different types of obstacles and its correlation coefficients value.

N	Name of type	correlation coefficients R	The empirical equations to calculate the surface roughness values (Z ₀)
1	Ca1	0.9617	$Z_0 = \frac{\ln Z}{\left(154.1829 \times \frac{u(z)}{u^*}\right) - 2309.1948} \dots \dots \dots (11)$
2	Ca4	0.9502	$Z_0 = \frac{\ln Z}{\left(116.6191 \times \frac{u(z)}{u^*}\right) - 1677.9492} \dots \dots \dots (12)$
3	Da1	0.9658	$Z_0 = \frac{\ln Z}{\left(163.01573 \times \frac{u(z)}{u^*}\right) - 2513.094} \dots \dots \dots (13)$
4	Da4	0.9555	$Z_0 = \frac{\ln Z}{\left(71.828 \times \frac{u(z)}{u^*}\right) - 958.091} \dots \dots \dots (14)$
5	Cs1	0.9323	$Z_0 = \frac{\ln Z}{\left(201.3737 \times \frac{u(z)}{u^*}\right) - 3106.6164} \dots \dots \dots (15)$
6	Cs4	0.9701	$Z_0 = \frac{\ln Z}{\left(101.6813 \times \frac{u(z)}{u^*}\right) - 1421.6009} \dots \dots \dots (16)$
7	Ds1	0.9338	$Z_0 = \frac{\ln Z}{\left(88.5966 \times \frac{u(z)}{u^*}\right) - 1186.2681} \dots \dots \dots (17)$
8	Ds4	0.9534	$Z_0 = \frac{\ln Z}{\left(97.5659 \times \frac{u(z)}{u^*}\right) - 1369.3696} \dots \dots \dots (18)$

V. Conclusions

The surface roughness length (z_0) be affected by in homogeneities height (ZH) of obstacles in urban areas Larger than the effect of other morphometric variables (i.e. Larger In homogeneities height (ZH) means increase in Z_0 value)

The drag coefficient (Cd) value depends on the horizontal dimension of obstacles, which is facing the wind in urban areas.

There is a strong relationship between the drag coefficient (CD) and surface roughness Z_0 (correlation coefficient for this relationship $R = 0.8244$) so we obtained an empirical equation Describe this relationship.

There is a strong relationship between the drag coefficient (CD) and friction velocity (U^*) (correlation coefficient for this relationship $R = 0.781$) so we obtained an empirical equation Describe this relationship.

Empirical equations has been obtained to calculate surface roughness (z_0) with a very strong correlation coefficients, these equations can be used under neutral condition.

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II. CONCLUSION

A conclusion section is not required. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

APPENDIX

Appendixes, if needed, appear before the acknowledgment.

ACKNOWLEDGMENT

The preferred spelling of the word “acknowledgment” in American English is without an “e” after the “g.” Use the singular heading even if you have many acknowledgments.

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Antecedents to Employee Engagement: A Qualitative Study of 28 Senior Secondary School Teachers in Nigeria

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Abstract- This study explores the antecedents of employee engagement among civil servants. Participants included 28 teachers from 8 government owned senior secondary schools in Lagos State, Nigeria. The teachers cut across all levels in terms of experience, grade level, and gender. Teachers were interviewed about factors that get them engaged at work. The results revealed six main themes: passion for the job, availability of materials for the job, work environment, relationship and support between employees, training and retraining, and pay and remuneration. The findings are discussed in relation to best practice in engaging employees to work within the public sector.

Index Terms- Employee Engagement, Antecedents, Teachers, Public Sector, Secondary Schools

I. INTRODUCTION

Between 1990 and now, employee engagement has emerged as a concept that has captured the attention of academics and practitioners. Due to its structural relationship between antecedents and consequences, employee engagement has received great attention from both academics and practitioners in the fields of human resource management, organisation development, psychology and business (Kim, Kolb, and Kim, 2013). While there is evidence of increasing theoretical consolidation and growth, the literature captures the inherent debate and variations of employee engagement.

Numerous studies have reported the benefits of employee engagement. For instance, employee turnover is significantly reduced when there is high level of employee engagement (Shuck, Reio, & Rocco, 2011). Also, EE has positive influence on organisational performance indicators such as customer satisfaction and loyalty (Oakley, 2005; Salanova et al, 2005; Menguc, Auh, Fisher, and Haddad, 2013), financial performance and profitability (Oakley, 2005; Xanthopoulou, Bakker, Demerouti and Schaufeli, 2009; Harter, Schmidt, Killian, and Agrawal, 2009; Halbesleben, 2010), productivity and profitability (Harter, Schmidt and Hayes, 2002), and safety (e.g. May, Gilson and Harter, 2004; Hansez and Chmiel, 2010). Moreover, employee engagement over time leads to organisational commitment (e.g. Hakanen, Schaufeli, Ahola, 2008b; Boyd, Bakker, Pignata, Winefield, Gillespie, Stough, 2011), and more personal initiative and innovative behaviour at work (Hakanen, Perhoniemi, Toppinen-Tanner, 2008a), and reduces absenteeism (Schaufeli, Bakker, and Rhenen, 2009). Finally, employee engagement has been associated with more organisational citizenship behaviours and reduced unproductive

attitudes and behaviours (Sulea, Virga, Maricutoiu, Schaufeli, Zaborila and Sava, 2012).

As a result of its superior business outcomes, organisations and governments around the world have been in search of ways to increase employee engagement (Wollard and Shuck, 2011). This has led to research exploring the key factors that can enhance, and perhaps help the development of an engaged workforce (Saks, 2006; Wollard and Shuck, 2011). As such, research has reported different antecedents to employee engagement such as job characteristics, perceived organisational support, perceived supervisor support, rewards and recognition, value congruence, work-life balance, job fit, workplace safety (Harter et al, 2002; Kahn, 1990; May et al., 2004; Saks, 2006). However, the increase in the list of the antecedents of employee engagement has only led to disparate and disconnected debates because of the lack of consensus on its meaning and characteristics (Grumman and Saks, 2011). This is because of different issues which call for more exploratory studies focused on the antecedents of employee engagement. While various academic studies have focused on the antecedents to engagement (e.g. Saks, 2006; Macey and Schneider, 2008; Shuck et al, 2011), there still exist lacuna in the understanding employee engagement in both practice and academics.

Firstly, many of the reported antecedents of employee engagement were from studies based on hypotheses testing (e.g. Harter et al., 2002; May et al., 2004; Saks, 2006). While these quantitative studies have tested and validated already constructed theories employee engagement, it is important to note that such studies have certain weaknesses. For instance, such quantitative studies may not reflect the original understandings of the research participants (Choy, 2014; Creswell, 2013). Also, the theories used might not reflect the research participants' understandings (Choy, 2014). Besides, the researcher may miss out on phenomena occurring because of the focus on hypothesis testing rather than on theory building (Creswell, 2013). Finally, the knowledge produced may be too abstract and general for direct application to specific situations, contexts, and individuals (Creswell, 2013; Choy, 2014).

Secondly, many of the studies on engagement has been within the western context, especially in the United States, Canada, and the United Kingdom, as well as some parts of Asia, Oceania and South America, and these cover more of the private sector than the public and the third sectors contexts. Also, little or nothing is known about employee engagement in an emerging economy like Nigeria. It is pertinent to note that most of these studies as earlier mentioned are generally theory testing, and validating, which means the true meaning of employee engagement and the factors that drive it may still be elusive

within these contexts despite the research results. This may be responsible for the lack of a generally acceptable definition for employee engagement, and the diverse views as regards its antecedents.

Hence, the purpose of this paper is to explore and understand the antecedents to employee engagement within the Nigerian public sector as a means to initially develop a strategic plan for engagement in the sector. This will help identify and understand employee engagement and its antecedents based on the understanding of the constituents of the research context. Also, this paper seeks to see if the results of this study would be similar to other antecedents already identified in literature. The main research question for this study is that; what are the antecedents to employee engagement?

This research will provide guidance and be helpful for management and other decision making bodies within the Nigerian public sector most especially the education sector. This study will be useful for policy makers and practitioners in the education sector of Lagos State and Nigeria. It will provide certain direction for future researchers interested in understanding employee engagement and its features within this context. Moreover, this study will provide recommendations for Lagos State government on how to increase the engagement level of teachers as well as other civil servants in the state. The findings of this study will recommend that employee engagement is very important to any organisation that seek to improve its performance. Employee engagement helps the organisation to reduce turnover, augments team work and improves the employee productivity, which in turn enhances the overall organizational performance. Furthermore, employee engagement helps the organisational sustainability and improves the economic development of the country.

Hence, the next section examines some of popular the antecedents of EE found in the literature and considered likely to influence the engagement level of teachers in public senior secondary schools in Lagos, Nigeria. The section begins by clarifying the term antecedents before discussing the significance of understanding the antecedents of EE. Then, some proposed antecedents of EE as reported by literature are examined in relation to Kahn's psychological conditions of meaningfulness, safety and availability. This section ends with a summary of the discussion about the antecedents.

II. THEORETICAL FRAMEWORK

While the focus of this study is to explore and identify the antecedents of employee engagement, it is important to note that this study follows Kahn's (1990) theory of personal engagement. Therefore, Kahn's (1990:694) definition of personal engagement as - "the harnessing of organisation members' selves to their work roles: in engagement, people employ and express themselves physically, cognitively, emotionally, and mentally during role performances" – is the working definition adopted by this study. This definition is adopted because it reflects the understanding of engagement from the perspectives of the research participants in Kahn's (1990) study. Also, this definition reflects employees' positive behaviours towards work role expressed cognitively, emotionally and physically, which are

products of psychological conditions of meaningfulness, safety and availability – engagement (Kahn, 1990).

Employee engagement is an essential tool required to reshape business strategies in today's challenging and unpredictable economic atmosphere (Shuck, 2011). Many studies have constantly confirmed the relationship between employee engagement and profitability through higher productivity, increased sales, customer satisfaction, and employee retention (Bakker and Leiter, 2010). As a result, many organizations are now measuring employee engagement because of the positive outcomes it purportedly brings to organizations (Rigg, 2013). This is owing to the fact that engaged employees have been shown to perform better than disengage employees (Rigg, 2013). As Bakker and Demerouti (2008) indicated, engaged employees perform better because they experience positive emotions, happiness, joy and enthusiasm, better health, and they may even transfer their engagement to others in the organization. Moreover, in the academia, EE has been said to be associated with positive work attitudes and behaviours (e.g. Shantz, Alfes, Truss and Soane, 2013; Sulea et al, 2012; Hansez and Chmiel, 2010), individual health and well-being (Hakanen and Schaufeli, 2012), and better role performance (Bakker and Bal, 2010).

For instance, Harter et al (2002) that employee engagement is of great importance to business. In their meta-analyses of research in 7,939 business units in 36 companies, Harter et al (2002) investigated the relationship between employee satisfaction, engagement and customer satisfaction, productivity, profits, employee turnover and safety at business unit levels. Employee engagement has positive links with business outcomes which includes customer loyalty and satisfaction, profitability, productivity, employee turnover and safety (Harter et al, 2002). Engagement relates positively to business unit outcomes with the strongest effects for customer loyalty and satisfaction, employee turnover, and safety (Harter et al, 2002). Through this study, Harter et al (2002) concluded that building engagement in the workplace can have significant impact on business successes. Other research too support the findings of Harter et al (2002) and agree that engagement is related to positive business outcomes such as customer satisfaction and loyalty (Salanova et al, 2005 Menguc et al, 2013), financial performance and profitability (Xanthopoulou et al, 2009; Harter et al, 2009; Halbesleben, 2010), and safety (Hansez and Chmiel, 2010).

Kahn (1990) opined that engagement positively affects employee performance. Also, studies report that engagement improves the innovative behaviours of employees (Agarwal, Datta, Blake-Beard, and Bhargava, 2012), and leads to better employee performance (e.g. Xanthopoulou, Heuven, Demerouti, Bakker and Schaufeli, 2008; Bakker and Bal (2010). In addition, engagement makes employees to be more intensively involved in their work and pay attention to details (Bakker and Leiter, 2010). Employee engagement makes employees go beyond mere job description, but it makes them dynamic in performing their work in a manner that suits the changing work environment (Bakker and Leiter, 2010). For instance, in a survey of over 9000 people across 12 organisations, Robertson, Birch, and Cooper (2012) found that engagement relates positively with employee productivity. Furthermore, Merrill, Aldana, Pope, Anderson, Coberley, Grossmeier, and Whitmer (2013) in a survey of 20,114 employees from three geographically dispersed companies in the

United States found that engagement improves job performance and employees' productivity. Similarly, in a survey of 979 managerial employees from six service sector organisations in India, Agarwal et al (2012) found that employee engagement relates positively to employees' innovative work behaviours that boost productivity. Taken together, employee engagement is certainly beneficial in terms of productivity.

Also, there are claims that employee engagement reduces employee turnover and boosts employee retention. For example, in a survey of 5443 employees from 185 departments within a large healthcare organisation in the United States, Collini, Guidroz, and Perez (2013) found that employee engagement helps to reduce the rate of employee turnover. When nurses are engaged, they are happy and have no intention of quitting their jobs (Collini et al, 2013). Similarly, Agarwal et al (2012) also reported that engagement relates negatively with intention to quit jobs amongst Indian managerial employees. Moreover, in a study of 291 managers from Indian industrial sectors, Agarwal et al (2012) identified that a negative relationship exist between employee engagement and turnover intentions. Lastly, a cross-national study of 853 practising teachers from Australia, Canada, China (Hong Kong), Indonesia, and Oman, Klassen et al (2012) reported a significantly negative relationship between employee engagement and quitting intentions across the five countries. This confirms earlier views held by other researchers (e.g. Schaufeli and Bakker, 2004) that engagement is fundamental to employee retention. Generally, employee engagement helps to increase employee retentions and reduce employee turnover.

Generally, there are strong evidences that employee engagement leads to positive results for both organisations and employees. Already, there are suggestions that engagement significantly reduces employee turnover; enhances job performance, task performance, OCBs, productivity, safety, customer satisfaction-loyalty, self-efficacy, and profit. Thus, it is clear that employee engagement matters a lot. As a result of the benefits of engagement to organisations and individuals, business leaders, political leaders and public service leaders are working towards improving the levels of engagement within their influence (Wollard and Shuck, 2011). Organisations are looking for ways to embrace employee engagement, formulate development strategies for it, and measuring engagement amongst their workforce to identify initial things to do (Ketter, 2008). Although attention has been on achieving the highest level of engagement, research suggests that there might be antecedents to employee engagement, which worth paying attention to in order to help the development of employee engagement (Saks, 2006). Limited research in the field of human resource management have paid attention to the antecedents to employee engagement (e.g. Saks, 2006; Macey and Schneider, 2008; Shuck, Reio and Rocco, 2011). Most of such studies have primarily focused on correlational tests of variables rather than trying to identify such antecedents through the understanding of workers' experience of factors that get them engaged at work (e.g. Saks, 2006; Shuck et al, 2011). Therefore, the aim of this study is to explore, and identify the antecedents to employee engagement through the understanding of workers experience of what gets them engaged at work.

III. RESEARCH METHOD

PARTICIPANTS

Twenty-eight teachers from eight government owned secondary schools across three local government areas – Alimosho, Ikeja, and Lagos Island local government areas - in Lagos state, Nigeria took part in this study. Teachers across the eight schools were informed of the study through the Commissioner for education and the Tutor-generals in charge of each local government areas, who sent the advert to the teachers in the different schools. The teachers were also informed about the study by the researcher when he was at each school. Of the twenty-eight teachers who participated, eight were from two senior secondary schools in Lagos Island which is a suburb area; ten teachers from three schools in Ikeja which is an urban area; and another ten teachers from Alimosho which is a rural area. Of the twenty-eight teachers, sixteen of them were females while the remaining twelve are males. The teachers cut across all subjects and years of experience in order to get the views of all classes of teachers – early years teachers (0 – 11years in service), mid-experienced (12 - 23years in service), and senior teachers (24 – 35years in service). The criteria were that the participants must be subject teachers in public senior secondary schools across the three local government areas mentioned above. The three local government areas were selected because they were the once easily accessible by the researcher within the budget available for the study. In addition, these twenty-eight teachers were the ones who showed interest in finding out more about the study and decided to take part in it.

PROCEDURE

Information about the study was delivered to the teachers by the Principal of each secondary school within the three local government areas. The researcher approached potential participants, invited their interest, informed them of the study, and then gave a copy of the consent form and the statement of the study to teachers who agreed to participate in the study before making arrangements for an interview with each potential participant. All participants were advised that they could withdraw from the study at anytime. None of the participants withdrew their participation from the study.

A semi-structured interview schedule was designed and used to obtain information about teachers' experience and knowledge of the factors that get them engaged to work. In the interviews, questions were asked about teachers' understanding of engagement, factors that influenced them to be more engaged at work and otherwise.

The interview questions were unstructured and designed in such a way that promotes open – ended responses from the teachers. The interviews were between 45 minutes and an hour long. The interviews were audio-taped with the consent and permission of the participants and transcribed.

Transcripts were analysed for main themes and then coded according to those themes using the three phase coding system of Nueman (2000). During the initial coding stage, the researcher performed an initial scan of the data to highlight words and phrases used by the participants, and to locate initial themes. The primary researcher invited other researchers to participate in the analysis in order to avoid going down narrow analysis paths, and ensured that individual biases about “what is going on” are kept

in check. The research team identified the core themes through a process of collaborative analysis and linked the core themes to the purpose of the study. In the second phase, the researcher focused on connecting themes and finding links in the data. Finally, the researcher read through the data again, and assigned citations that elucidate the final themes. All coding was checked by another researcher to ensure it was coded accurately.

IV. FINDINGS

The analysis of interviews with the teachers revealed six main themes: passion for the job, availability of materials for the job, work environment, relationship between employees, training and retraining, and pay and remuneration.

PASSION FOR THE JOB

Most of the teachers interviewed spoke how their mind-sets, what they desire, and what they love to do have influenced their choice of profession and performance in the teaching role. Most of the teachers expressed that they are doing the job they have always desired and loved to do. When asked about how to describe an engaged teacher and what influences teachers to be engaged, most of the responses revealed that the passion an individual has for a profession makes him or her committed to the job as well as engaged. For instance, Rotimi, a male teacher with 18 years of experience, having a smile on his face said that *"I think I will first of all start from your mindset as an individual...this job I love it...from the onset I want to be a teacher...a job that you love you will be committed to it."*

The interviews also revealed that having the heart and interest for a job and being ready to sacrifice one's energy and time for and on the job indicate the love an individual has for a job. An individual who has the heart for a job, interested in the job, and ready to sacrifice for the job has passion for the job. These characteristics indicate passion for the job which in turn influences engagement. For example, Niyi a male teacher with 23 years of experience stated that *"if somebody has that heart for the job...you will be ready to sacrifice...you will sacrifice your time, sacrifice your energy, sacrifice personal belongings like money."*

Also, teachers reported that their love for children and having the interest of the students in mind influence their love for the job. They claimed that caring for the students is an important factor that made them become teachers. For instance, when asked to describe an engaged teacher, Bimbo, a female teacher with years of experience stated that *"A fully engaged teacher is somebody that is willing to work, love his job and ready to achieve the organisational goals...has the interests of the students at heart and he's willing to know and achieve the organisational goals..."* In response to how teachers get engaged, she said *"you love the job first of all... you have the interests of the students...you see the students like they are your own children..."* When asked the same question, some teachers pointed out that love for a job could be as a result of parents' occupation and the love an individual has for children. A good example of this is Tomilola, a female teacher with just 8 months in service who reported that *"another thing is that you need to have passion for the job...for example, I really love this job...I have always wanted to be a teacher and that is because my dad*

is a lecturer...also, I have passion for children...I like being around children...and that encouraged me to become a teacher as well..."

AVAILABILITY OF MATERIALS FOR THE JOB

Most of the teachers reported that having the right tools and resources needed for the job essentially influence employee engagement. Kolade, male teacher with 8 years of experience identified that availability of materials needed for the job is a precondition to employee engagement. He said that *"the facilities and materials for teaching help teachers to be engaged when they are available..."* In fact, Laide, a female teacher for years identifies materials for the job as being an important factor for getting teachers engaged. She said *"one of the factors will be the availability of materials needed for the job... if all those things are not available, there is no way the teacher will be able to discharge the duty very."* Teachers believe that having instructional materials needed for their job helps them to be engaged. Bimbola, a male teacher for 6 years has a clear idea about how availability of materials for the job helps teachers to be engaged. He said *"there are some things that we needed as sort of materials or equipment or devices that will be used by that teacher to effectively discharge that duty...one of such is instructional materials... if those things are provided, at least it will aid teaching..."* most of the teachers are of the view that when they are well equipped with the tools and materials they require within their different fields to teach, such would get them engaged with their work.

WORK ENVIRONMENT

Another major theme that emerged from the interviews was that a good work environment influences individuals to be engaged to work. For instance, Rotimi talked about how the immediate surroundings of the workplace (the school), and other factors such as the quality of the classrooms, staff rooms, quality of the air (ventilation), and the noise level can be positive or negative for employee engagement. Most teachers believe that when the environment is of good quality, it serves as an antecedent to engagement. For instance, Folake, a female teacher with 19 years of experience believes that having good ventilated classrooms and staff offices would encourage teachers to be engaged to work. Speaking excitedly about how teachers become fully engaged, Folake said, *"I think number one is good environment...if we have airy classes, conducive classes...then the classes are not overpopulated...and good quality, well designed offices...we will be engaged."* Another teacher, Adeyemi who has only been a teacher for three years claimed that the environment in of his school really attracted him to work. He said *"...so teachers are highly engaged through the following factors....one, a very conducive environment for the teachers...having the right furniture in the staff room and classes encourage teachers to be more engaged."* In fact, in a particular school, all the teachers identified work environment as a major factor that influence their engagement to work. An eye-catching statement was made by one of them, Bahorun, a male teacher with 19 years in service stated that *"I feel comfortable ...if I am not comfortable with the job and this school...no matter the challenge I face...I will remain here because the environment is conducive for me...in fact...I love being here than being at*

home.” In fact, another teacher, Abeke, a female teacher with about 3years 2months experience in service made a submission about the school she work in; *“the environment here is very good for learning and teaching...the quality of classes and offices are good and lovely...it encourages teachers to be effective...I enjoy coming to this school to work every day unlike my former school where the environment is nothing to write home about.”* This clearly indicates that a good and conducive work environment could be a precondition to engagement. a good work environment makes the workplace attractive to employees and in turn encourages them to be engaged to work.

RELATIONSHIP AND SUPPORT BETWEEN EMPLOYEES

A major theme identified from the interviews could be relationship between employees. Teachers talked about how the cordial relationship and family-like relationship that exist amongst them serve as a precursor to employee engagement. This was identified as a major theme in every school where teachers were interviewed. For example, Niyi, male teacher with 23 years of experience claimed that *“relationship with co-workers serves as a way of motivating me to be engaged at work...supports from colleagues in all forms help a lot”*. Niyi’s statement shows that good relationship amongst employees encourages supports on the job amongst them. Niyi talks about how the cordial relationship among teachers in his school has resulted into the creation of a social committee in the school. This social committee is made up of teachers and through it they attend to one another’s needs. This cordial relationship promotes teamwork among the teachers as well. In the interview with Bola, a female teacher with 10 years’ experience, she shared experience about how other teachers were able to help her and other teachers who were busy preparing the final year students for their final exams with other responsibilities of their jobs as a result of the good relationship they have. In an event that happened while interviewing a teacher which reveals the cordial relationship and support among the teachers, Simbi, a female teacher with 25 years’ experience sought the help of another teacher to take her class while she took part in the interview. The other teacher happily jumped at the request and made for the class immediately. Also, Hammed, a male teacher with just 6months experience in service expressed that having cordial relationships with other teachers have helped him to be engaged because whenever he is faced by any challenge on the job, others are easily accessible for him to seek their help. For instance, Folake described a scenario that supports Hammed’s point, but her final statement says it all; she stated that *“at least I have seen people in this school calling on another staff within the school to teach a topic...and the person did it with all pleasure...and it was done...I think that is a good relationship...and it has helped...”*. In describing how relationship and support between employees help them to be engaged, Bolarinwa, a female teacher with up to 12 years’ experience said *“ in this school we are working as a team...then we work as brothers and sisters...keeping good relationship with ourselves...”*

TRAINING AND RETRAINING

Teachers also identified training and retraining as a precondition to employee engagement. Teachers talk about how

learning new skills about their jobs in response to the twenty first century technological changes have made them become engaged to their jobs. Making a point for how training has help to engage teacher to work, Bimbo, a female teacher with 14years of experience was quick to say *“we enjoy trainings and seminars here which help teachers to be engaged...the trainings and seminars are focused on how to help teachers resolve any challenges they are facing...these trainings are regular..”* In fact, a teacher claimed that training contributed to the love for the job. Tomilola, a new female teacher with about six months in service said *“the training I got when I was doing my teaching practice internship made me love the job completely and I made up my mind that this is where I am needed...”* In addition, teachers believe that training and retraining has helped them understand their jobs better in terms of duties and responsibilities of the role. Laide, a female teacher with 10 years in service stated that *“with the trainings and seminars, teachers have been exposed to the understanding that we are stakeholders in the education sector and we have our quota to contribute...so, understanding your position and responsibilities as teachers helps us to be engaged in this school...”* The availability of training and retraining for employees from the responses of the participants suggests it could be an antecedent to employee engagement.

PAY AND REMUNERATION

Pay and remuneration was highlighted by teachers as an important antecedent to employee engagement. For instance, Sholape, a female teacher with 3years of experience claimed that pay is the *“real antecedent of engagement for me.”* Most of the teachers confirmed that pay rise will reduce teachers’ turnover and encourage them to be engaged to work. This is because teachers believe they are poorly remunerated. According to Laide, a female teacher with 10years’ experience, *“if there is no increment in salary”* teachers will not be engaged to work. Laide concluded that *“salary is important”* and that if there is an increment in salary, it would be good for teachers. While Tolu, a male teacher with 20 years’ experience identified that good salary can help engage teachers to work, Rotimi pointed out that salary increment could reduce employee turnover. Rotimi identified that if you are *“well remunerated”*, you will not be searching for other jobs or businesses to make extra income and you will be focused on your job. In another response supporting this theme, Funmito, a female teacher with 23 years of experience, talks about the fact that *“when you are well paid, you will be committed”*. These views from the teachers revealed that pay and remuneration could be an essential factor influencing employee engagement among workers.

V. DISCUSSION AND CONCLUSION

Prior studies have indicated that employee engagement has positive results on organisational performance. It has been reported that employee engagement reduces employee turnover, increases profitability and productivity at work (Harter et al, 2002). Hence, employees become innovative and proactive (Hakanen et al, 2008a), and avoid unproductive behaviours (Sulea et al, 2012).

Little research has been conducted to explore in-depth the factors that influence employee engagement or antecedents to engagement in the public sector, especially in Nigeria. The aim of this study was to interview teachers about their knowledge and experiences of factors that influence them to be engaged at work. Twenty-eight teachers were interviewed in-depth.

Six main themes were identified as important factors influencing employee engagement amongst teachers in public senior secondary schools from three local government areas in Lagos State, Nigeria.

The passion an employee has for his or her job is important in developing interest and love to be engaged to such job. In particular, most of the teachers highlighted that employee engagement would occur only when an employee has passion for the job he or she performs. One explanation for this is that passion for the job or passion for work has a link with engagement (Ho, Wong and Lee, 2011). Also, this explains the suggestion made by Zigarmi, Nimon, Houson, Witt, & Diehl (2009) that employee work passion results in consistent, constructive work intentions and behaviours, which highlights employee engagement. In addition, this highlighted the suggestion of Gilbert and Foley (2012) that passion for work is associated with employee engagement.

Another antecedent to engagement reported by the teachers is availability of the materials needed to perform the job roles. Many of the teachers reported that adequate provision of the tools needed to carry out their works will influence their engagement to work. Availability of the materials employees need to do their job is important in maximising employee competence, in showing employees that their work is valued, and in showing the organisation's support for them in performing the work they are asked to do (Harter, Schmidt, Killham, and Agrawal, 2009). It appears that providing the needed materials needed by employees for their jobs preconditions them to be engaged.

The work environment was also shown to be important in influencing employees to be engaged at work. From the perceptions of the teachers, the condition and quality of the work environment really matters in terms of engagement to work. If a good work environment is provided by employers, it is likely that tasks will be completed successfully, and employee engagement will occur (Bakker, Schaufeli, Leiter and Taris, 2008). A work environment that protects the health and safety of employees serves as a precondition to employee engagement (Dollard and Bakker, 2010). This suggests that a good work environment could influence the engagement state of employees at work.

The relationship and support employees give to one another in the workplace goes a long way in influencing their state of engagement to work. Previous studies suggested that co-workers relationships might influence employee engagement (Yanchus, Fishman, Teclaw & Osatuke, 2013). Also, Gruman and Saks (2011) suggested that co-workers support could be a precondition to employee engagement. This can be explained on the suggestion that as the level of trust and interpersonal relations increase among employees at a workplace, employee engagement could occur. Trust has a fundamental role in the engagement process as workers trust that their investment of energy, time, and personal resources will be rewarded (Gruman and Saks, 2011). Macey, Schneider, Barbera, & Young (2009) have stated that

employee engagement cannot exist without trust as trust and fairness are the basis for workers to feel and act engaged.

Training and retraining has been identified to be a possible factor to influence employee engagement. This study suggests that providing a workplace that allows employees to acquire knowledge, skills and competencies that relate to their work roles could make them engaged. Previous studies have suggested that training positively influences engagement (e.g. Saks, 2006; Gruman and Saks, 2011; Jiang, Hong, McKay, Avery, Wilson, & Volpone, 2014). Availability of training to workers helps career development and this influences employee engagement (Gruman and Saks, 2011). Training can help prepare employees to cope with the job demands. As described by Kahn (1990), employees are more ready and available to engage in their roles when they can cope with different demands and when they have the ability to engage in coping strategies.

The results of this study show that pay and remuneration is an important antecedent to employee engagement. Many teachers were of the view that their salaries and benefits influence their level of focus and concentration on the job. Teachers believe that increasing their pay and benefit would get them to be engaged. While this confirms the findings of previous research that bringing pay and benefit up to market levels could influence engagement (e.g. Buckingham and Coffman, 2005), some other studies have reported that pay and benefits are not of great importance to employees (Kompaso and Sridevi, 2010). However, Kompaso and Sridevi (2010) argued that this might be the case in the developed economies of the world and may vary in developing economies. This study has indeed revealed that there is variance in terms of antecedents to engagement across the globe.

The strength of this study is that the use of in-depth interview gave room to the exploration of new themes emerging in order to provide a thorough understanding of the antecedents to employee engagement. A limitation of the study is that it only focused on just eight senior public secondary schools within three local government areas in Lagos State, Nigeria. Therefore, it may be that these results are not generalizable to a large proportion of teachers in public senior secondary schools across Lagos State and Nigeria as a whole. Also, the results may not be generalizable to the whole education industry and the whole of the public sector. In addition, the small sample may limit the generalisability of the results, especially in relations to junior public secondary schools and public primary school teachers. Therefore, further studies are required to include a larger and more diverse sample of teachers.

On the overall, it is recommended that for build employee engagement among teachers in senior secondary schools, the management of the schools need to understand the factors that influence their workers first. Also, while passion for the job could be identified at the point of recruitment and selection, management needs to pay attention to providing modern materials needed to perform the job, an enabling work environment that encourages co-workers support and relationship, training, and better pay and benefit packages. It is important for the management of each school to design its employee engagement strategy in relations to their peculiar needs.

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APPENDIX

INTERVIEW SCHEDULE FOR TEACHERS

A EMPLOYEE ENGAGEMENT: CONCEPT AS PERCEIVED BY PARTICIPANTS

- 1.) Have you heard about employee engagement before? [prompt: Give a little texts meaning of engagement]
- 2.) How would you describe a fully engaged teacher? [Prompt: engagement 'v' commitment]
- 3.) Who is a teacher fully engaged to? (prompt question)

B EMPLOYEE ENGAGEMENT: ANTECEDENTS

- 5.) How do teachers become fully engaged? [cognitive, emotional, and physical/behavioural]
 - a) Ask follow-up questions on why they provided particular responses
 - 6.) What is critical to achieving EE here in this school?
 - a) Ask follow-up questions on why they provided particular responses

C EMPLOYEE ENGAGEMENT: BARRIERS

- 7.) What challenges do teachers encounter in getting engaged? What are the barriers for EE in this school?
 - a) In what ways do policies help or hinder/restrict teachers' efforts at becoming engaged?

D EMPLOYEE ENGAGEMENT: DRIVERS

- 8.) What initiatives or measures do the school management takes to help enhance teachers' engagement?
- 9.) How effective are these measures?

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Application of Geographical Information System Techniques in Urban Flood Risk Assessment and Vulnerability Mapping

‘A Case Study of Cardiff, Wales’

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Abstract- Flood risk refers to areas that are at risk of flood hazard. A flood occurs when normally dry lands are temporarily covered by water, it is when a water body breaks out through its natural or artificial bank as a result of snow melting, heavy rainfall, dam failure, raising of the sea level. Floods disasters are common in most part of the world and GIS as a modern technology has several techniques and tools that can be used for effective flood modelling and mapping. The development of GIS functionalities for hydraulic and hydrological models made it possible to identify areas that are at risk of flooding in a particular earth's surface area. The purpose of flood risk mapping is to steer strategies towards protection, prevention and preparedness, in attempts to minimize future costs from flooding. This paper exploits the utilization of GIS techniques in assessing flood vulnerability with a goal of identifying and mapping areas that are at risk of flooding within Cardiff city. This lead to identification of flood risk areas and identification of properties that lies in a flood risk within the study area.

Index Terms- GIS, flooding, flood risk, flood vulnerability, flood risk mapping, Cardiff.

I. INTRODUCTION

Flood risk refers to areas that are at risk of flood hazard. In UK flood risk is defined as “probability of flood occurrences and its potential consequences” (Alexander et al 2011, p.6). In a research study conducted by James Thompson (2010) reveals that more than 12% of the total population that is around 2.2 million homes and 185,000 businesses in the UK lies in flood risk areas. His study also discovered that in Wales and England “valuation of assets at risk in flood risk areas stands at 221 billion pounds” (p. 3). Considering these facts, areas that are at risk of flooding need special attention and more sophisticated

approach. There is no doubt that a research in this area no matter how small will provide a fruitful outcome.

Mapping is an important aspect of managing many environmental hazards; it can be used for effective and intelligent representation of information on spatial flood risk, therefore areas that are vulnerable to floods can be presented easily on maps (Alexander et al 2011). However, flood risk mapping is an important ingredient for appropriate urban planning in order to reduce the likelihood of flood occurrence and also reduce the consequences of flood hazard when it happens (Leinster, 2009). In GIS there are several techniques and tools that can be used in flood mapping and modelling. The technology made it possible to measure the amount of rainfall that can cause river channels to rise. It can also model the DTM or DEM of an environment to provide answers to several questions (Alexander et al 2011) like; if flooding occurs what percentage of land cover is likely to fall under water, how many people will be affected, and which areas need more attention.

II. STUDY AREA

The study area of this study is Cardiff city which is an urban settlement located in the southern part of Wales. The city covers an area of approximately 158km² with a population of about 346,000 according to 2011 census (Govier, 2013). As shown in figure 1 above, Cardiff is located at approximately latitude 51° 28' N and longitude 3° 10' W. The city is the largest city in Wales and the 10th largest city in the United Kingdom. It is also the commercial and capital city of Wales. Cardiff bordered with Caerphilly and Valleys to the north, Vale of Glamorgan to the west, Newport city to the east, and North Atlantic Ocean on the southeastern part (Cardiff Council 2011).

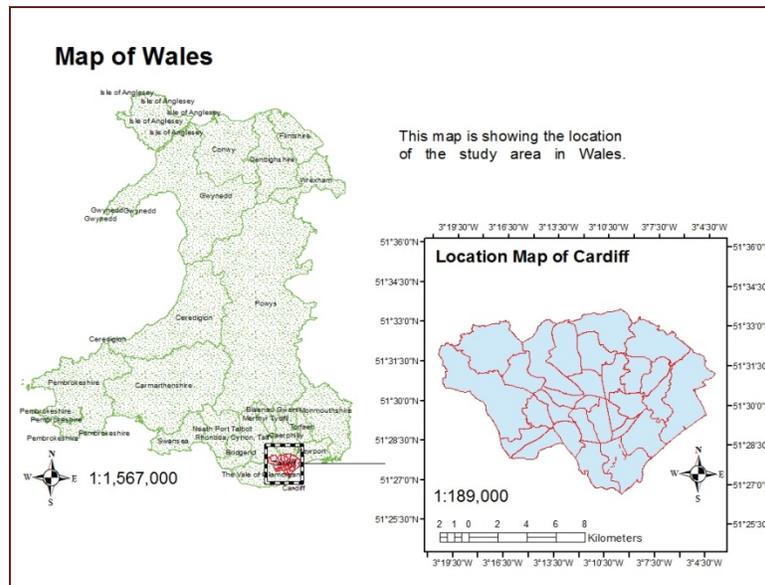


Figure 1: Location map of Cardiff

The terrain of Cardiff is relatively flat in the city center and it's bordered by hills to the North, east and west, and a relatively flat surface at the south toward the coastline. The city has two main rivers, river Ely and river Taff which flow from west and north respectively. The terrain pattern which is relatively flat in most part of the city and the two rivers (River Ely and River Taff) increases the risk of pluvial flood in the city; that is flooding as a result of high intensity rainfall or due to snow melting. Likewise Cardiff is bordered with a sea which increases the risk of tidal flood (Govier, 2013). A Cardiff flood report conducted by Atkins Limited (2009) and the study Govier, (2013) provide data and information of past flood events in Cardiff. The historical flood events are summarized in a table below.

Table 1: Notable historical floods in Cardiff

Year	Catchment	Flood Cause	Impact
1946	River Taff	Snow Melt	Low
1947	River Taff	Snow Melt	Low
December	River Taff	Heavy rainfall	High
December	River Taff	Heavy rainfall	High
December	River Taff	Heavy rainfall	Low
March 1998	River Ely	Heavy rainfall	Low
October 1998	River Taff	Heavy rainfall	Low
October 2000	River Ely	Heavy rainfall	Very Low
September	River Ely	Heavy rainfall	Low

In the last few decade river Ely catchment has suffered three significant flood events with low property damage. In contrast, River Taff catchment experienced significant number of notable flood occurrences over the last 60 years. The most notable flooding occurred in 1960 and 1979 on river Taff catchment which both resulted in the loss of many properties respectively. These resulted in Government spending a

considerable amount of money on building flood defences. Although the most vulnerable flood risk area lies in Cardiff Bay, but the area has no significant record of flooding. These low lying areas are currently protected by a defence system known as Cardiff barrage. The barrage significantly reduces the vulnerability of flooding but prior to its construction, Cardiff bay is noted as the most vulnerable flood risk area in Cardiff (Cardiff Council 2011).

The major rivers that flow through Cardiff are River Taff, River Ely, and River Rhymney, these rivers contribute to the hydrological pattern of the city. Taff river which is the largest river in Wales sources its waters from the Brecon Beacons (a mountain range in South Wales) and two main tributaries Little Taff (Taff Fechan) and the Big Taff (Taff Fawr). The river passes through several towns with a long distance of 64km. There are also few tributaries that empties their waters into the Taff river such as river Rhondda, river Cynon, Nant Clydach and Bargoed Taff. The river flows through Cardiff Suburbs of Whitchurch, Radyr, Llandaff, Pantcanna, the city center, Grangetown and finally emptying into the coastal area of Cardiff Bay (Akins 2009).

River Ely contributed in shaping the terrain of Cardiff. The river passes through the Cardiff suburb of Pentrebana, Cearau and Cardiff Bay. The river flows from the Tonyrefail Village with about 29 kilometers long, ending it movement in Cardiff bay. The water sources of river Ely are mountains in the south of Tonypandy, near Tonyrefail town. Before reaching Cardiff the river passes through towns of Llantrisant, pontyclun, Peterston and Ely. River Rhymney also passes through two districts of Cardiff, Llanrumney and Rumney at the eastern part of the city. The river has a high tidal influence with 223km² (Akins 2009).

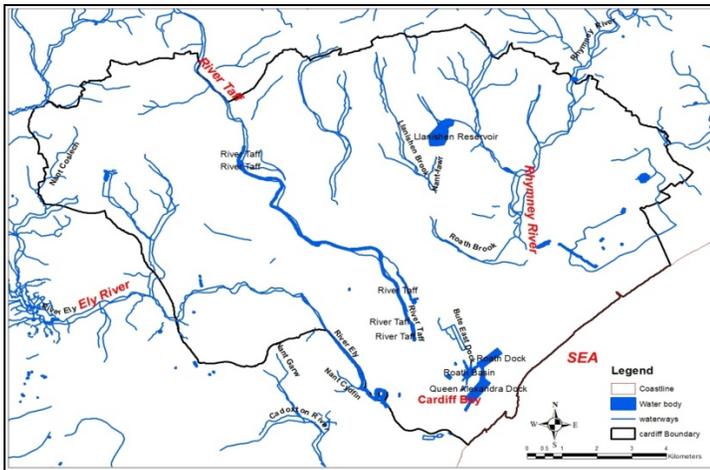


Figure 2: Hydrological map of Cardiff

III. METHODOLOGY

3.1 Software

This research utilized two different software packages, Arc Map 10.1 software package with HEC-GeoRAS tool extension and HEC-RAS 4.1 software Package. Utilizing these software packages offers the best opportunity to perform flood inundation mapping and analysis (Alagmand, et al 2010). Arc Map 10.1 was used for watershed delineation mapping and analysis. It was also used together with HEC-GeoRAS extension for pre-processing and post-processing for flood risk inundation mapping. HEC-RAS 4.1 software package was used in simulating flood modelling.

The flexibility of Graphical user interface of the ArcGIS software package allow users to incorporate additional capabilities and tools (extensions) that are not originally available in the software environment (Alagmand, et al 2010), these reasons permit this research to utilize the software successfully for a desired end result in flood inundation mapping and analysis.

HEC-GeoRAS tools and utilities are ArcGIS extension that uses a Graphical User Interface (GUI) for processing of hydraulic and hydrological models of geospatial data. “The interface allows the preparation of geometric data for import into HEC-RAS and the process simulated results exported from HEC-RAS” (Hydrologic Engineering Center 2013). In ArcMAP, HEC-GeoRAS tools and utilities uses functions associated with ArcGIS 3D Analyst and spatial analyst extension. These extensions are available and enabled in the ArcMAP software that was used for this research.

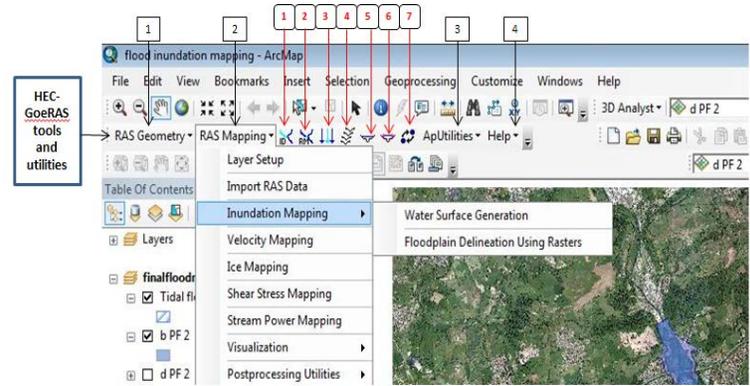


Figure 3: HEC-GeoRAS description in ArcMAP

As illustrated in figure 3 above HEC-GeoRAS toolbar contains four menu options which are RAS Geometry, RAS Mapping, ApUtilities, and help menu. The first menu contains tools for pre-processing of data which can be exported to HEC-RAS for flood modelling and simulation. The second menu contains functions and tools for post processing of imported hydraulic model from HEC-RAS for flood inundation mapping. The third menu contains tools for data management, and finally the last menu contains help document with explanations on how to use functions and tools on HEC-GeoRAS toolbar. HEC-GeoRAS toolbar also has seven buttons/tools that allow users to manipulate and interact with data during both pre and post processing of flood mapping (assign river code/reach code, assign from the Station /toStation, Assign LineType, construct XS cutlines, Plot cross section, and assign levee elevation) as shown in red boxes in figure 3 above.

HEC-RAS software is used for flood modelling and simulation. HEC-RAS is a software program for modelling and analyzing hydraulics of water flow (Warne, C. Et al 2010). Both HEC-GeoRAS and HEC-RAS application is now open source (free) application developed by the Hydrologic Engineering Center (HEC) purposely for US Army Corps of Engineer’s needs. This research obtains HEC-GeoRAS application and HEC-RAS software from US Army Corps of Engineers web page.

3.2 Data Source, Description and Quality

The two primary data used in this research are Digital Terrain Model (DTM) and aerial photographs of the study area. Although, floodplain mapping strongly requires DTM/DEM or Triangular Irregular Networks (TIN). Aerial images or landuse maps are also useful for identifying natural and man-made features that may affect flood inundations (Schubert, and Sanders, 2012). The DTM data utilized in this study are Ordnance Survey ‘profile DTM’ obtain from the Digimap web site. The site is a web mapping application and online data delivery service owned and developed by the EDINA national data center for UK academia. EDINA collects several geography and GIS data from British Geological Survey, UK Ordnance survey and other environmental agencies for delivery to UK academia to support academic research and higher education. OS profile DTM is a land form profile data that provide details of terrain height. The data are provided in ASCII file format with a

pixel resolution of 10m and 1:10,000 scale raster. This research found OS profile DTM sufficient in floodplain mapping and flood inundation modelling. A subset area of 170sq covering the

entire Cardiff and without any loss of details (data) is extracted from the available DTM datasets.

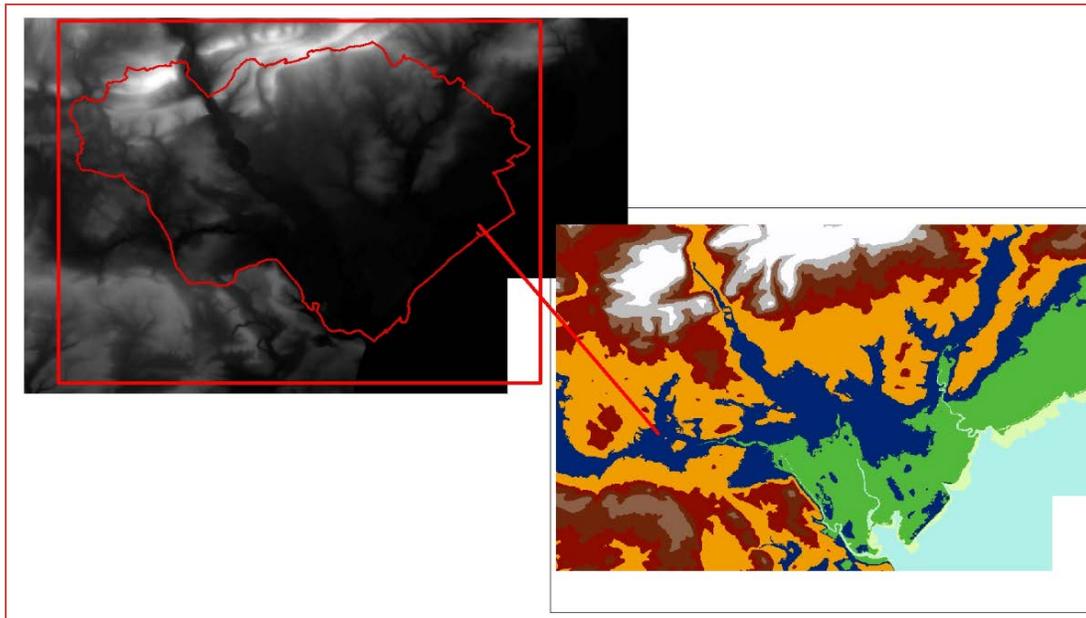


Figure 4: OS profile DTM subset of the study area

Table 1: properties description of the datasets

Raster Information		Spatial Reference		Extend	
Columns and	2014, 1341	British_National_Grid		Top	185505.00
Number of Bands	1	Linear unit	Meter (1.000000)	Left	306595.00
Cell Size (X, Y)	10, 10	Angular unit	Degree (0.017453)	Right	327005.00
Format	GRID	False_Easting	400000	Bottom	172095.00
Pixel Type	Floating point	False_Northing	-100000	Elevation Statistics	
Pixel Depth	32 bits	Central_meridian	-2	Min	-4
Colormap	Absent	Scale_factor	0.9996012717	Max	302.0000
Compression	None	Latitude_of_origin	49	Mean	51.7668
Mensuration Capabilities	Basic	Datum	D_OSGB_1936	Std dev.	53.2234
				Classes	0

The aerial photographs were obtained from university of Glamorgan library drive; they were provided and made available for student by faculty of advance technology of the university. These aerial photographs are in ECW file format with 3 numbers of bands and cell size (X, Y) value of 0.4. The research utilizes these aerial photographs for digitizing essential features (such as river centerline, bank, and flowpath) that are required for an effective flood modelling. In urban flood risk mapping, digitizing features that affect water runoff within a watershed or floodplain is necessary (Merwade, 2012). Therefore, from the aerial photographs, this research identifies and digitized features along the rivers and within the watershed boundary that may affect runoff. These are areas with water but with zero flow/velocity such as areas behind culverts and bridges and areas within the floodplain but with no water such large buildings were also identified. Apart from primary data mentioned above, additional

datasets were used to ensure a qualitative and accurate analysis. These datasets are demographic data from Casweb ‘super lower output’, land use data from the OS vector master map, OS raster master map as background map, and river flow information from existing literatures. The Casweb data used in this research are population data of the 2001 UK census. Therefore, Cardiff lower super output data of casweb is used to estimate the number of people and household that reside within the flood risk areas. OS topographic area polygons were used as land use data.

3.3 Hydraulic Modelling, and Flood Risk Mapping

The processes of hydraulic modelling, and flood risk mapping in this research are done by utilizing ArcMap 10.1 with HEC-GeoRAS extension and HEC-RAS. Note in this research hydraulic modelling, and flood risk mapping were different. This means that hydraulic modelling were used to simulate the behavior of water flow in floodplain areas of the river Taff, river

Ely, and Rive Rhymmy. While flood risk mapping involves flood inundation mapping and visualization of hydraulic model and also the process of combining (overlay) several map layers to demonstrate and identify various urban (Cardiff) flood hazard categories. The processes adopted for hydraulic modelling and flood risk mapping involves three stages that are identified as pre-processing of data, executing the model, and post-processing of model. Hydraulic and flood risk mapping requires three

essential data, which are elevation data, aerial photographs and flow information of the study area (marwade, 2012). The elevation data used is OS profile DTM, the full description of the data and also the description of aerial photographs were discussed above. The three stages that are utilized for hydraulic modelling and flood risk mapping in this research are discussed below.

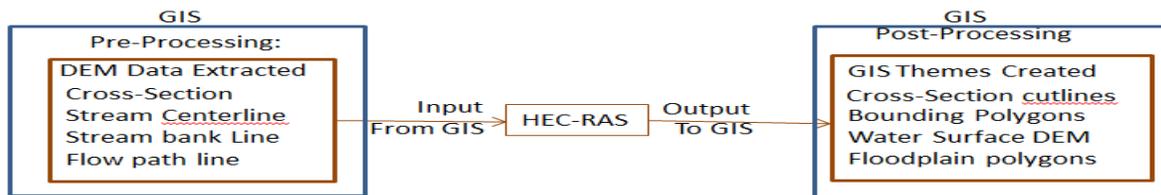


Figure 5: Model Framework of flood inundation mapping in HEC-RAS

3.3.1 Pre-processing of Data

Preprocessing of data is the first step of both hydraulic modelling and flood inundation mapping. The process involves utilization of HEC-GeoRAS to developing the required geometric data needed for hydraulic modelling. In the pre-processing stage of data, elevation data is essentially required and additional datasets that may be used for digitizing essential features (Tate, and Maidment, 1999). However, this research uses raster grids DTM as the source of elevation while aerial images were used to visualize and digitize important features. The spatial features that must be digitised are river centerline, river bank, flow path and cross section of floodplain areas. And for effect analysis and accuracy of result it is essential to also digitize other features (such as ineffective flow areas, bridges/culverts, land use) that can affect the outcome of the result (Tate, and Maidment, 1999). The stages that are used in this research for pre-processing of data are explained below.

1. Setting analysis environment for HEC-GeoRAS in Arc Map; this involves making sure the coordinate system of all data sets is check and is the same with the layer file, and select the source of elevation from the layer setup of HEC-GeoRAS toolbar.
2. Creating RAS Layer; this stage involves developing a geometry file that can be used in HEC-RAS. It is the process of creating features and their attributes in GIS, and then convert them to the HEC-RAS geometry file. Each feature created will be stored in a single layer together with its attribute. Creating layer begins with creating an empty GIS layer, that is created using the RAS geometry menu on HEC-GeoRAS toolbar.

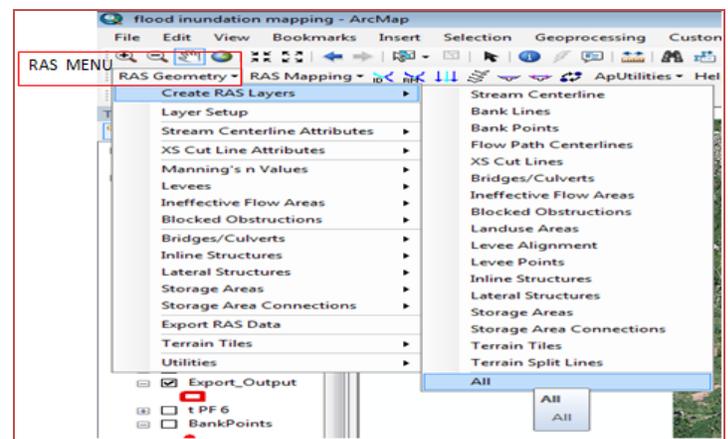


Figure 6: RAS Geometry menu

RAS geometry contains the list of all layers that can be created, and they can be created individually or multiple at once. This process of creating layers also creates a geodatabase that stored all layers in one location. Since layers created are empty, a digitizing tool of the standard ArcGIS tool is used to digitize features that will populate the empty layers (Hydrological Engineering Center 2002). In this research, features that are digitized are river centerline, river bank, flow path, cross-section, bridges/culverts, ineffective flow areas, and obstruction. The empty land use layer is substituted with OS topo area vector map. After digitizing these layers they were converted to 3D features as required before converting to HEC-RAS file.

3. Creating HEC-RAS File; creating a GIS file that will be used as an import into HEC-RAS package is the last step of pre-processing of data. This stage involves exporting RAS data that can be used as geometry data into HEC-RAS for hydraulic modelling, the process creates two files with extension format GIS2RAS. RASimport. sdf and GIS2RAS.xml. on HEC-GeoRAS, a menu that export geometric data into HEC-RAS file is located on the RAS Geometry menu.

3.3.2 Hydraulic Modelling

HEC-RAS is popular free software that is used in hydraulic and hydrological model. It can be used to perform one-

dimensional unsteady flow, steady flow and temperature modelling (Hydrological Engineering Center 2002). However, in this research steady flow analysis is utilized.

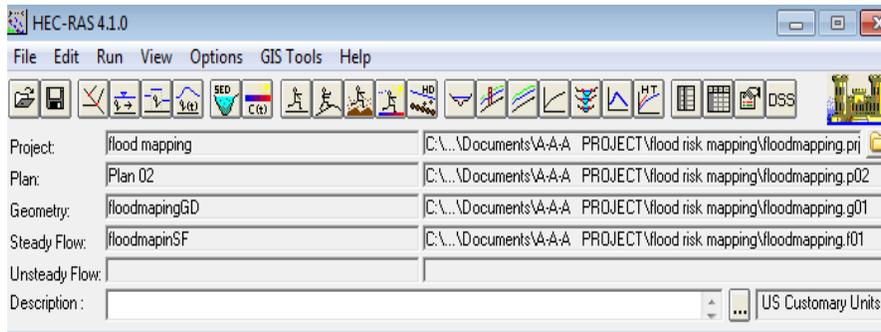


Figure 7: HEC-RAS Environment

The first step of hydraulic modelling is importing the geometry data earlier created from HEC-GeoRAS and ArcGIS utilities into HEC-RAS environment. It can be done by using the editor menu then Geometric data option and then import

Geometry data. After successfully importing the geometry data, HEC-RAS will automatically open geometric editor window as shown below.

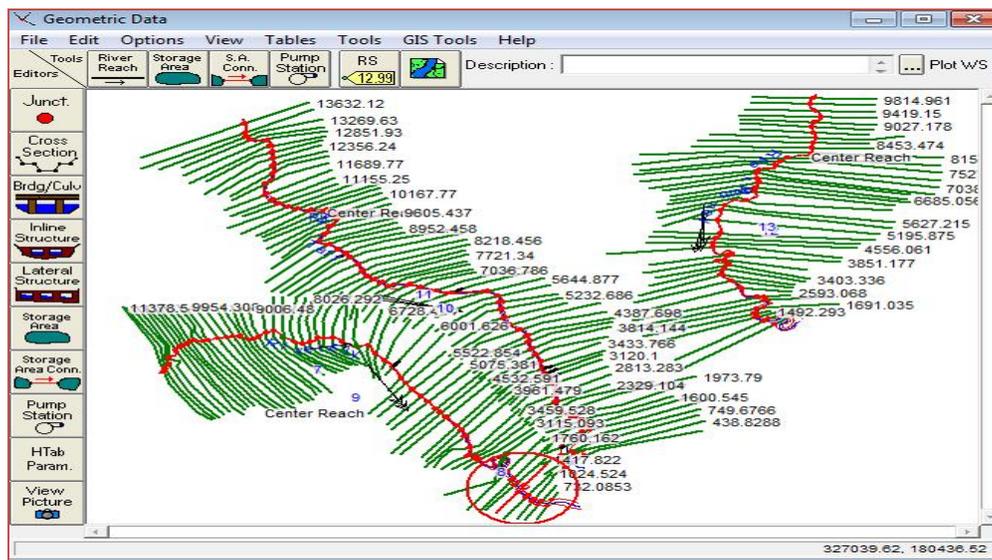


Figure 8: Geometric data editor

Geometric window is used to perform a quality check of the data to make sure the information imported from GIS is correct; information that contains some errors can be edited and corrected (Hydrological Engineering Center 2002). In this research several information such river bank station and manning's n information were edited from geometric window.

The final stage of hydraulic modelling is running HEC-RAS simulation and exporting the HEC-RAS file into GIS. Simulating the model can be done from the Run Menu on the

HEC-RAS main menu. Run Menu contains several simulation options. For this research, steady flow analysis is used. "Steady flow describes conditions in which depth and velocity at a specific channel location do not change with time" (Tate, and Maidment, 1999 p.15). After running the simulation successfully, the result of the simulation analysis can be viewed and analyse in profile plot window, rating curve window, general profile plot-velocities, and X,Y,Z perspective plot window.

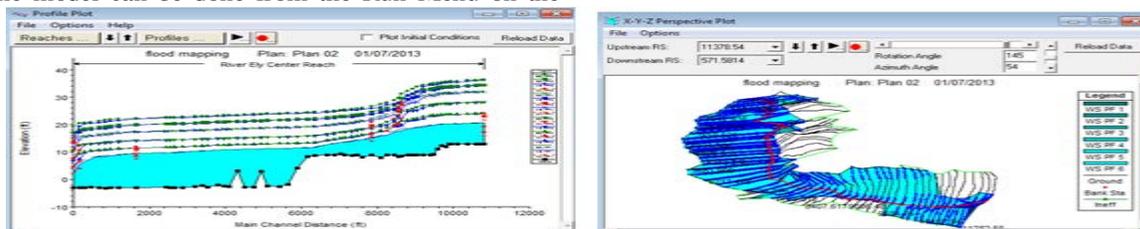


Figure 9: Profile plot window and X,Y,Z perspective plot window

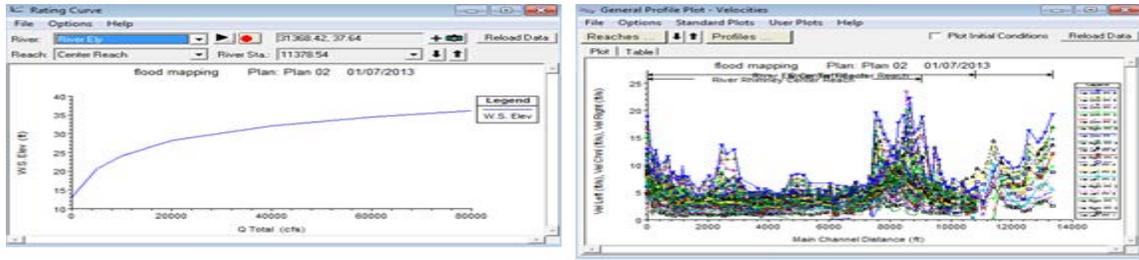


Figure 10: Rating curve and general profile plot-velocities windows

The final process of this stage is exporting the model result into GIS, and this can be done from HEC-RAS main window by selecting file menu and then Export GIS data. The exported files can be used in ArcGIS for flood inundation mapping which are referred to as post processing of the model.

3.3.3 Post-Processing of Model

The exported HEC-RAS file can be imported into ArcGIS by using HEC-GeoRAS functionalities. This stage of hydraulic modelling is known as flood inundation mapping. The functions that are responsible for post processing model on HEC-GeoRAS reside under RAS Mapping menu. In this research these functionalities are utilizing for flood risk polygons of the study area. Areas with 1% flood probability in 100 years are identified.

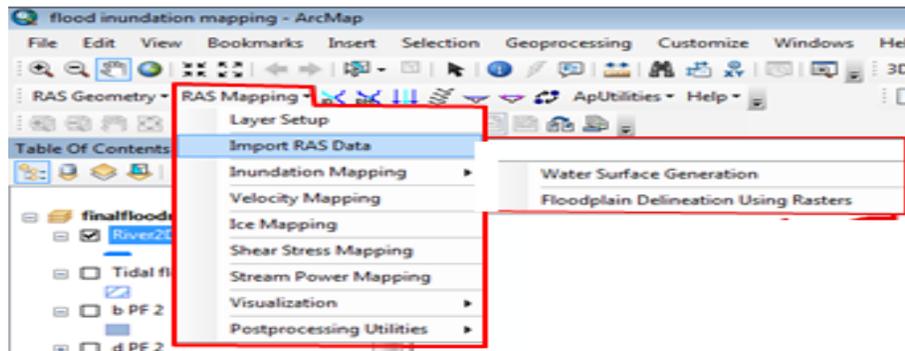


Figure 11: HEC-GeoRAS post processing Functionalities

A flood inundation process in HEC-GeoRAS convert the water surface to a Grid and the DTM grid is subtracted to from the water surface grid. The the process identifies flood areas as

areas with positive result, that is areas with water surface higher than the terrain. And areas with negative result are non-flood areas.

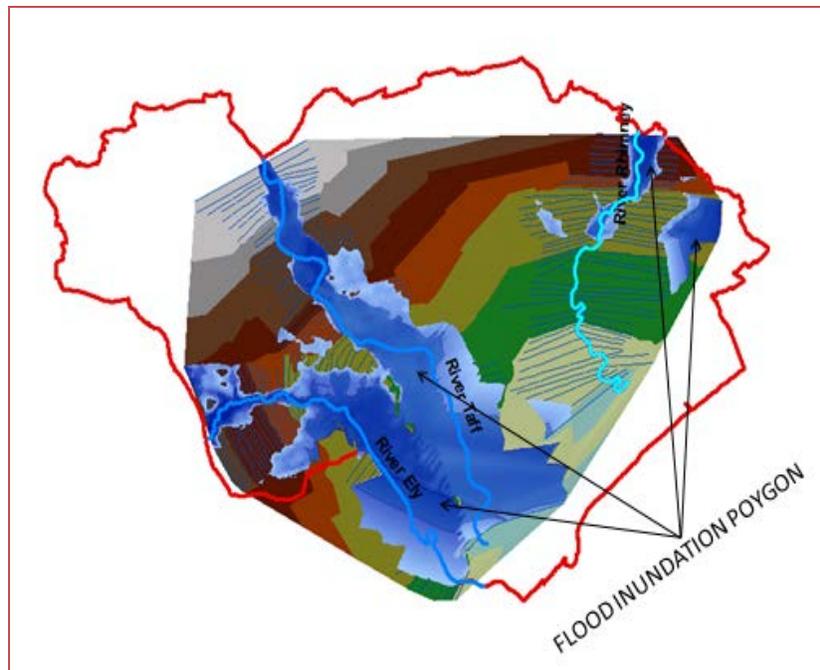


Figure 12: HEC-RAS post processing of flood model

The flood risk maps generated in this research reveal the flood behaviour and characteristics of floodplain areas of the study areas. This research adopts an overlay and query analysis method in GIS to interpret and analyse the flood risk areas within the study area and its possible consequences. Arc Map 10.1 is used to overlay flood risk maps generated in this research with population data, building data and household data. This method discovered the number of the population that live within the flood risk areas, the number of both commercial/business and residential buildings that lies within the flood risk areas, and it also reveals the estimated cost that may be lost in case of flood

occurrences. The population data and household data are sourced from CASWEB while buildings, railways and road data are sourced from DIGIMAP. Due to non-availability of business and property value data, this research adopts a sampling technique method in estimating the value of properties that lies in flood risk areas. The sampling method use here selects the average value of a building and multiplied it by the number of buildings that lies within the flood risk areas; the same procedure is adopted for estimating business cost. The average value of the residential building is £100,000 and for business is £3000, 000.

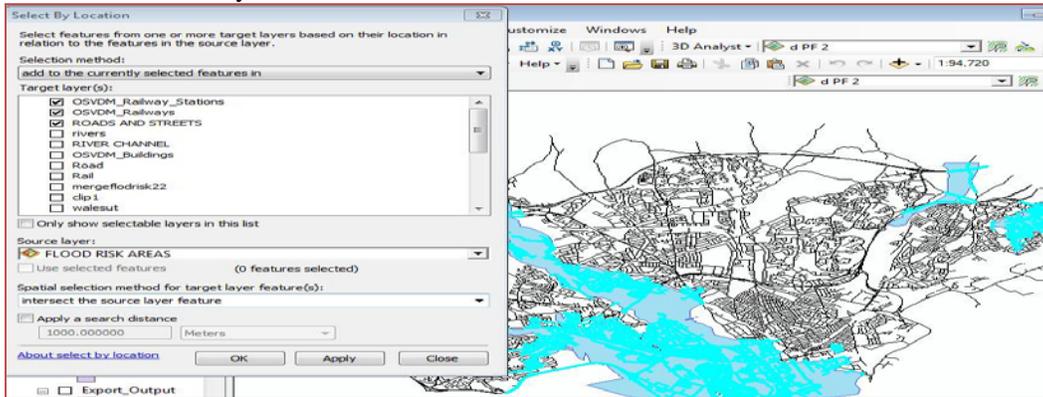


Figure 13: Arc MAP query dialog box

IV. RESULT AND DISCUSSION

4.1 Flood Risk Map

Figure 14 below depicts a flood hazard map of Cardiff generated using a combination of different GIS techniques and RAS packages. Flood risk areas are identified in dark blue colour while the extent of maximum flood is shown in lighter blue colour.

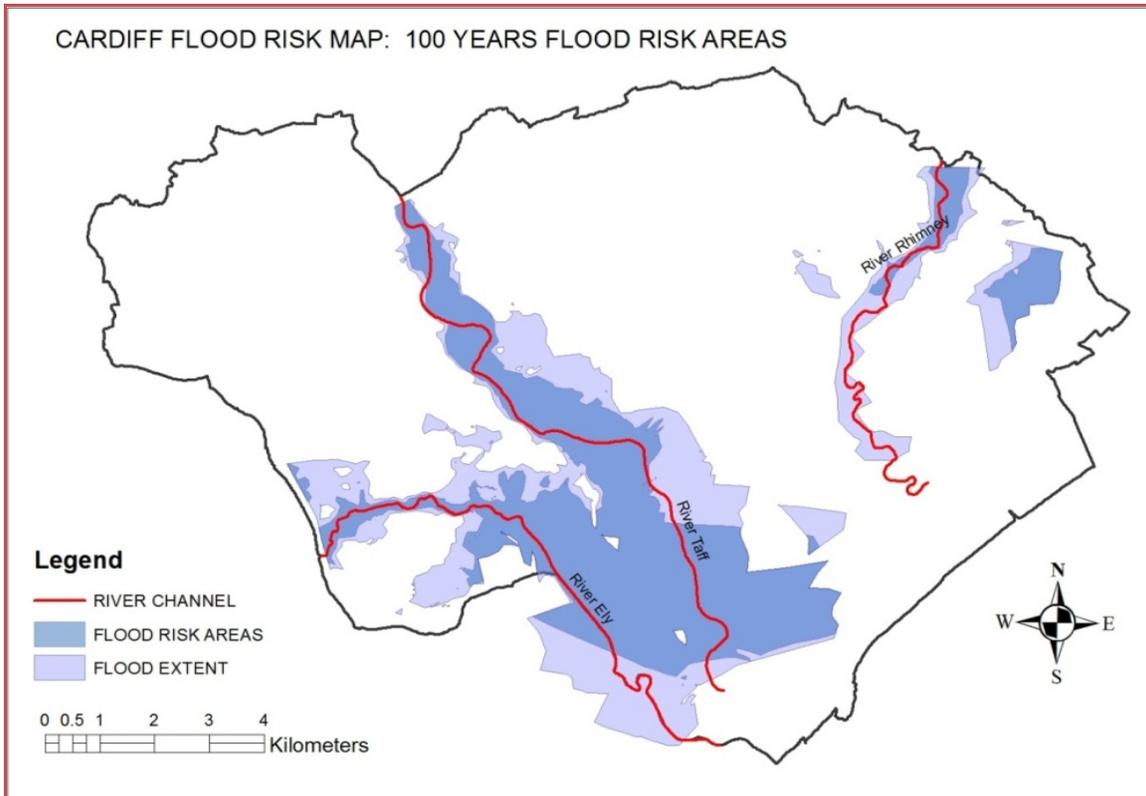


Figure 14: Flood risk map of Cardiff

The flood risk map generated in this research shows areas that have a 1% probability of flood occurrence in 100 years. However, in the following discussion flood risk area and flood areas will use to express the probability of flood occurrences. In Cardiff flood risk is mainly from river in the lower parts of the Rivers Taff and Ely, both of which discharge into Cardiff Bay

The flood risk map clearly shows that high flood risk areas of the city are found around the river channel areas, this is because the river site areas of Cardiff are drainage basin areas. Waters from snow melt and rain that falls in and around the city runs (flows) into the three rivers that flow through the city, and the waters are accumulated into pour point of the catchment areas. Areas that are identified as high flood risk areas in this research had also experienced significant flood occurrences severally within the past 100 years. The introductory chapter above gives an account of some these notable flood occurrences, evidence of the account can be found in the work of Govier, (2013).

Cardiff topography is one of the major factors that significantly contributes and influence flooding within the flood

risk areas of the city. Conner, et al (2002) stresses that topography of an area strongly determines the characteristics and behaviours of surface water balance. During flood events, surfaces that are lowland and relatively plain within the floodplain topography are more likely to be affected.

4.2 Flood Impact Analysis

By measuring the boundary data obtained from CASWEB, the Cardiff district covers an approximately land mass of 140,064,100m² which is about 140k². Within this boundary, an area coverage of about 22k² has been identified as high flood risk areas with 1% probability of flood occurrence in 100 years. In an event of extreme flood the size of the flood event can expand up to about 29k². Therefore, 7k² of land cover within the extent of maximum flood are identified as low risk areas with 0.5 probability of flood occurrence in 100 years. This extent of flood probability in this study is referred to as maximum flood extent. However, areas that are not at risk of flood in Cardiff covers an approximately 110m².

Table 3: Percentage of flood risk areas and non flood risk areas

Area Type	Areas in Sq.m	Area in Sq.Km	Percentage of Area in Sq.km
High flood risk areas	22,806,500.00	22.00	15.71%
Maximum flood extent	16,407,800.00	7.00	5%
Total flood risk areas	39,214,300.00	29.00	20.71%
Non flood prone areas	100,849,800.00	111.00	79.28%
Total land cover	140,064,100.00	140.00	100%

4.3 Overlay analysis of flood prone

An overlay of flood prone areas with demographic and spatial data is used to carrying out queries that reveal the words areas, population, land use and properties that are at risks of flood in Cardiff. Overlying flood risk polygon with a ward boundary map of Cardiff district as shown in figure 17 below identifies areas in each ward that are at risk of flooding. Although, the study of Mills (2010) shows that, the current likelihood of widespread flooding is relatively low as Cardiff has

an extensive network of flood defences. He also states that currently it is only the main local area of Whitchurch that are at risk of significant flooding. However, in this research flood defences were not covered due to lack of data and resources, this can be considered as one of the limitation of this research. But this will not affect the aim of the research which demonstrate the application of GIS techniques in assessing and identifying areas that are vulnerable to flooding in an urban area.

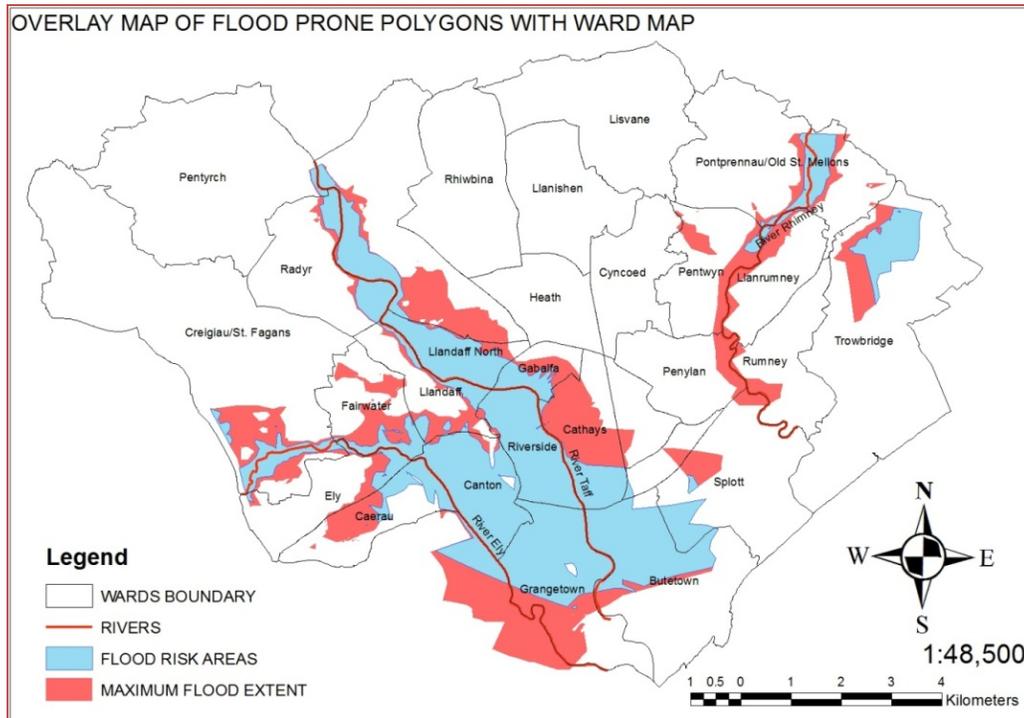


Figure 15: Map showing ward areas at risks of flood

As shown above Cardiff district comprises of 29 ward areas. Out of these words, it is only four (Heath, Lisvane, Llanishen, and Rhiwbina) words that are completely not at risk of flooding. The wards are outside the extent of both high flood risk and maximum flood extent. Although, apart from these wards there are also other words which are not at risk of flooding but in an event of maximum flood occurrence (0.5% probability in 100 years) they can be affected, these wards are Cyncoed, Penylan, and Rumney. However, the most vulnerable wards that have

more than 50% of their land area at risk of flooding are Riverside, Canton, Llandaff North, Grangetown, and Butetown.

4.4 Population and Household at Risk of Flooding in Cardiff
 The demographic data (according to 2001 census) obtain from CASWEB webpage, revealed that there are 305,353 people and 127,255 households in Cardiff district. The data are collected in tabular format with fields represent northing and easting. It is added to ArcMap for visualization as point vector data that contain information about population characteristics for different spatial locations within Cardiff, as shown in figure 18 below.

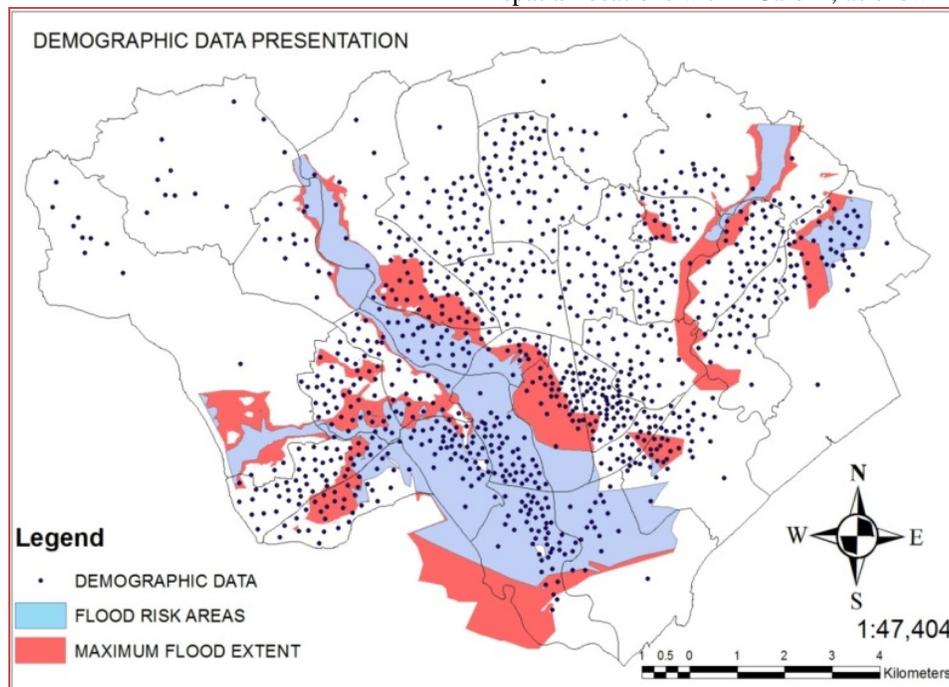


Figure 16: Demographic data and flood risk map visualization

With the demographic data visualize in ArcMap, selection by attribute and selection by location query methods are employed in estimating the number of people and household at risk of flooding.

According to the result obtained from the queries executed an estimate of more than 108,971 people, that is around 36% of the total population of Cardiff district lies in flood risk areas. The study also revealed that there are about 43,865 households at risk of flooding in Cardiff that is around 34% of the total household. Figure 20 which depicted the relationship between population distribution and flood risk areas revealed that more 60% of population and household of five wards in Cardiff are at high risk of flooding. These wards are Butetown, Canton, Grangetown, Llandaff North, Riverside which are all located in floodplain areas of the River Taff and River Ely. The location of these wards areas lies in lowland areas and their terrain elevation is between 0 to 25 meters above sea level.

4.5 Land Use and Cost of Property at Risk of Flooding

As mentioned in the methodology section of this paper, Ordinance Survey (topo_area) vector master map is used in conducting GIS queries and identifying land use features that lays in flood risk areas in Cardiff. The utilization of land use data is essential in conducting urban flood risk assessment, this is

because it shows land usability which can be used to estimate the consequences of flood in flood risk areas.

In a report of Hooton, (2011) Cardiff is estimated to have 8,011 non-residential properties, 148108 residential properties and 1,341 services (electricity sub-station, hospitals, care homes, police, schools, fire and ambulance station, and prisons). In an urban area with such facilities, it is essential to conduct a flood risk assessment that clearly identifies properties at risk of flood hazard. This will provide information on areas or properties that need emergency response in an event of flood occurrence. However, according to the GIS query results obtain in this research, there are about 41,803 buildings at risk of flooding in Cardiff that is about 43,865 homes and 3,500 businesses. The fact Cardiff is the administrative city and commercial city of Wales, it is estimated that about 30% of the buildings at risk of flooding are commercial buildings. An average commercial or business building can cost up to £300,000 while an average of residential building can cost about £100,000. Therefore the valuation of properties at risk of flooding in Cardiff is estimated to stand at about £7,018,300,000 (more than 7 billion pounds). Figure 20 below depicts an overlay of building polygons with flood risk polygons; it shows buildings that lie in flood areas. This map is used in conducting GIS queries that reveal the estimated figures mention above.

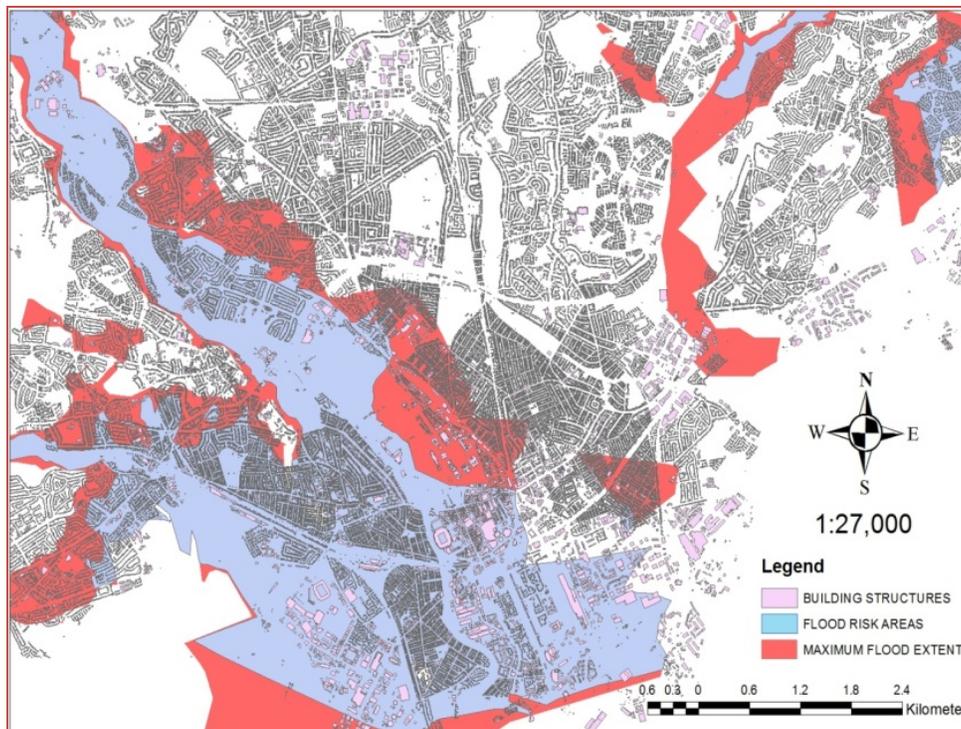


Figure 17: Overlay of building data with flood polygon

Buildings that are located in flood polygons are more likely to be affected during flood event therefore they are considered in this research to be at risk of flooding.

Furthermore, to have clear information on land use that is at risk of flooding. Figure 17, figure 18 and figure 19 are used to

show land use that are at risk of flooding in Cardiff. The results shown are mappings of land use that are likely to be affected in an event of flood. This map can be used to aid concerned authorities in preparing a quick flood warning during a flood prediction.

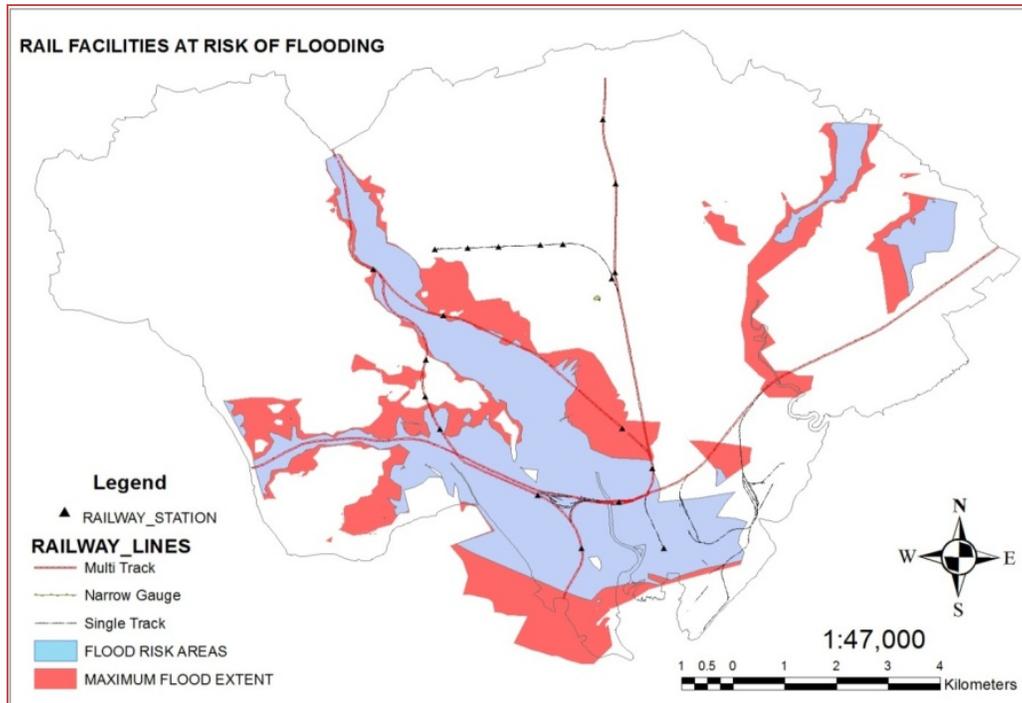


Figure 18: Railway facilities at risk of flooding

Table 4: Affected train station

Affected Train Station		
ID	STATION NAME	WARD AREA
1	Cardiff Bay	Butetown
2	Cardiff Central	Cathays
3	Grangetown	Grangetown
4	Ninian Park	Grangetown
5	Waun-gron Park	Fairwater

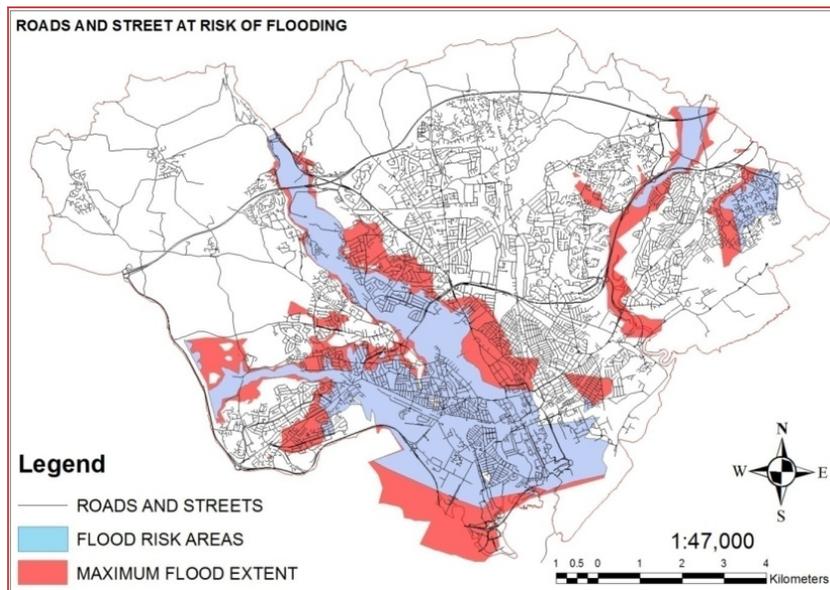


Figure 19: Raod lines at risk of flooding

Table 5: Affected road types

Affected Road Type		Number of roads	Total Length of Road in METERS
ID	Road Classification/Categories		
1	A. Road	413	37430
2	B. Road	133	8088
3	Local Street	2139	151764
4	Minor Road	699	46952
5	Motorway	46952	4132
6	Pedestrianised Street'	11	1645
7	Primary road	79	9447
8	'Private Road Publicly Accessible'	6	498
Total		50432	259956

Table 4 and table 5 shows result obtained from GIS queries conducted in ArcGIS. The first table shows the length of the affected road type and the number of street or road that may be affected. The other table present the name of train stations that lies in flood risk areas of Cardiff.

V. CONCLUSIONS

This research is a GIS risk-based approach in flood studies that successfully present areas that are at risk of flooding in Cardiff. The flood risk areas are identified using GIS techniques and methods that are fully discussed in section 4 of this paper. In GIS it is possible to obtain Geo-spatial data in digital format, process the data in a computer environment which can provide hydraulic and hydrological information and models of that same Geo-spatial location. The result can be analysed and further process to create a flood modelling and GIS can present flood models in forms of maps, tables, charts, diagrams and in many ways of presenting information.

In GIS the essential dataset required for flood risk modelling and mapping is DEM or DTM or TIN. And for high accuracy in flood modelling especially in urban areas a high resolution digital data sets are required. It is important to note that lower resolution of the DEMs and DTMs can provide a misleading result especially in conducting Floods analysis.

The flood risk map generated in this research shows areas that have 1 % probability of flood occurrence in 100 years. Areas that are identified as high flood risk areas in this research had also experienced significant flood occurrences within the past 100 years. More than 16% of the total land areas of Cardiff are identified in this research as flood risk areas.

VI. RECOMMENDATION

This research recommends further studies of the study area that can be done with the use of LiDAR data. The data can provide higher resolution ranging between 25 cm and 2 meters, by creating 1m contour interval while keeping base contour 33m at lake water level and find out how much land use, road and other properties would be affected for each interval in flood prone zones.

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Factors Affecting the Net Interest Margin of Commercial Bank of Ethiopia

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Abstract- This paper analyzes the factors affecting the commercial bank of Ethiopia's (CBE's) net interest margins during 2005 to 2014, a period characterized by increasing the bank's net interest margin. The pooled ordinary multiple regression models are used to estimate the results without compromising the classical linear regression assumptions. In line with findings in the previous literature, this paper finds that capital adequacy (risk aversion), credit risk, operating costs, degree of competition (Lerner index) and deposit growth rate are the most important drivers of CBE's net interest margins. Almost all variables in the model indicates a positive and highly significant association ship with net interest margins, and are found to be the most important bank specific factors that determine the net interest margin of the bank, CBE. The results of the study also suggests that high concentration led to lower competition, and thereby increase the net interest margins of banks, especially the dominant bank like CBE in case of Ethiopia. All in all, the results suggests that there has to be a measure to be taken by the sector to reduce the banks concentration ratio, operating costs, risk premium on credits, and increase the level of capital to offer competitive interest margins and fairly shared growth rates in deposits among others. In doing so, this paper conclude that further structural reforms and merger or consolidation enter alia may lower CBE's net interest margins and share the market potentially fairly to other private banks operating in the industry.

Index Terms- Net interest margin, performance, commercial bank of Ethiopia, competition, concentration.

I. INTRODUCTION

One of the main objectives for the establishment of financial institutions is mobilizing resources (in particular domestic saving) and channelling these to user. This intermediation role of financial institutions takes different forms in different economic systems (Geda 2006). In most countries, banks provide essential financial services that facilitate economic growth. They lend money to start businesses, purchase homes, secure credit for the purchase of durable consumer goods, and furnish a safe place in which societies can store their wealth. In particular, for developing countries, improvements in the banking sector could have significant impact on the allocation of financial resources since the sector remains, still, the most important source of financing private investment of firms, given the underdevelopment of the financial markets (Sufian & Habibullah, 2010). Banks play a key role in improving economic efficiency by channelling funds from resource surplus unit to

those with better productive investment opportunities. Banks also play key role in trade and payment system by significantly reducing transaction costs and increasing convenience. In less monetized countries, like Ethiopia, whilst financial sector is dominated by banking industry, effective and efficient functioning of the Banks has significant role in accelerating economic growth. In Ethiopian context, the financial system is dominated by banking industry, and yet, it is amongst the major under-banked economy in the world (Eshete, Tesome & Abebe 2013).

Identifying the determinants of bank performance is an important predictor of unstable economic conditions and may help bank management and shareholders to present professional plans and achieve their long-term aims more quickly. A profitable banking system is likely to absorb the negative shocks, and so the stability of financial system. Identifying key factors influencing bank performance, profitability enter alia, is of importance to improve bank internal management and perform banking policies (Chen & Liao, 2009). A sound, profitable, competent and well managed banks enables both the economy and the country to stay competitive and able to withstand any negative shocks (Hamidi, Karim & Jamal (2012). In Ethiopia, banks are regarded as dominant financial institution, thus, their health condition is crucial as it will give effect to the general health of the economy. According to these authors, therefore, having the knowledge on factors influencing commercial banks' performance is not only important but also is essential in stabilizing the economy as well as for the benefits of other parties involved such as the government, financial authorities and other stakeholders.

Thus, the study of performance is important in assessing the health of organisations. However, profitability, (in terms of return on average assets, return on average equities and net interest margins among others), of the banking sector is particularly crucial as the soundness of the sector is closely related to the soundness of the entire economy (Lipunga 2014), especially for those countries which relies on bank based finance in the absence of well structured stock market like Ethiopia.

Despite extensive reforms in the financial sector in Sub Saharan Africa during 1980s and 1990s, with a view of improving access to financial services to private agencies, financial depth in the sub-region has remained very low and not improving over the years. Commercial bank performance has been poor characterized by low levels of private credit, high interest rate spreads, high levels of non-performing loans, poor asset quality, operational inefficiencies, among others (Panayiotis, et al., 2005). On the other hand, Commercial banks appear very profitable in Sub-Saharan Africa (SSA) compared to other regions with average returns on assets of about two (2)

percent over the last 10 years, significantly higher than bank returns in other parts of the world. The major reasons behind high return in the region as outlined by Ongore (2013) were investment in risky ventures and the existence of huge gap between the demand for bank service and the supply thereof. That means, in SSA the number of banks are few compared to the demand for the services; as a result there is less competition and banks charge high interest rates. This is especially true in East Africa where the few government owned banks take the lion's share of the market (Ongore, 2013).

Following the banks liberalization reform since 1994, the number of private banks in Ethiopia showing an increasing trend in the market share of the banking industry, however, the involvement of private banks in the industry is still lagging behind as compared to neighbouring countries. The major financial institutions operating in Ethiopia are banks, insurance companies and micro-finance institutions. The number of banks operating in the country reached 19 of which 16 were private, and the remaining 3 state-owned (NBE annual report, 2013/14). In Ethiopia bank concentration defined as the asset share of the three largest banks was 100 percent in 1994 and down to 93.6 percent in 1998. It progressed further downward to 69.6 percent in 2006. This implies that the share of government owned banks also declined. According to Kiyatta et al., cited in Bezabeh & Desta, (2014) in seven out of nine years private banks had a higher ROA than state-owned banks. This is due to several factors: the spread has increased for both public and private banks and private banks have higher spreads than publicly owned banks. These authors suggested that, since privately owned banks are superior in terms of efficiency and profitability, publicly owned banks need to be privatized.

The dominant bank, commercial bank of Ethiopia (CBE) is leading the sector in terms of assets, loans and advances, deposits, capital, employees, technologies enter alia. CBE is still leading the market share of the sector in terms of total assets (72.54%), total loans and advances (68.90%), and total deposits (72.16%) (NBE, 2014). In addition the Ethiopian banking sector is unique by abandoning foreign banks to come and invest in the sector with the reasons from the Ethiopian government side that if we open the sector for foreign investors; on one side our banks will become incompetent with different aspects since they are found at infant stage. On the other hand if the government made open the sector for these investors, they may not be willing to borrow more than 50% of their assets/ capital to the small and medium sized firms which are the priorities of the government in the country. Furthermore, a foreign citizen even not allowed having more than 50% shares in domestic banks. Hence, the strategy of the government is gradualism, yet not decided when to make open the sector to foreigners. Concerning its performance the CBE is showing an increasing trend in its profitability measured by return on asset (from 1.87% in the year 2005 to 3.43% in 2014) and net interest margins (from 1.07% in 2005 to 3.63% in 2014). The focus of this study is to see factors affecting the net interest margins of the state bank, CBE.

1.1 PROBLEM STATEMENT

Apparently, the financial sector in Ethiopia is dominated by banks, insurances and financial institutions. The country has no any formal secondary market except treasury bills, interbank

transactions and informal initial public offers, where the scarce resources are to be mobilized from surplus to deficit areas in the economy. It is also known that banks are playing the pivotal role in making a county's economy smooth by resisting negative shocks in the economy. In country where the financial sector is dominated by the banking sector in the absence of formal secondary financial markets, the role of banks is crucial to the advancement of the country's economy.

As to the case of Ethiopia, since 1992 the country has been engaged in liberalizing its financial sector. According to Geda (2006), the hallmark of the strategy is gradualism, and this approach is not without problems especially from Bretton¹ Woods Institutions that saw the reform as a sluggish process. The concern of (Geda 2006) was liberalization program by analyzing the performance of the sector before and after the reform and noted that the presence promising development of the financial sector in the country, the relatively good shape in which the existing financial institutions find themselves, the government's strategy of gradualism and encouraging direction of its overall reform, though the supervision and regulation capacity of the regulating agency is weak. And he argue for charting out clearly defined time frame for liberalization and exploring the possibility of engaging with foreign banks to acquire new technology that enhance the efficiency of the financial sector in general and the banking sector in particular. In addition, Monetary and Banking proclamation No.83/1994 and the Licensing and Supervision of Banking Business No.84/1994 laid down the legal basis for participation of the private sector in banking business, which had been completely prohibited before. As per the Progress Report of awash international bank as of Sept. 30, 2013, the number of private banks has reached around fourteen in the country, now they are sixteen. The government's strategy for financial development was characterized by gradualism and maintaining macroeconomic stability (Addison and Geda, 2001).

Besides, Ethiopia appears unique compared to its East African neighbours (namely Kenya, Tanzania, and Uganda) and many other developing countries in that it has not yet opened its banking sector to foreign participation. The Ethiopian banking sector remains isolated from the impact of globalization. Although Ethiopian policy makers understand the potential importance of financial liberalization, it is widely believed that liberalization may result in loss of control over the economy and may not be economically beneficial (Kozo, Barbara & Stern 2007). Furthermore, the "Banking Business Proclamation No. 592/2008" of Ethiopia declared that foreign nationals or organizations fully or partially owned by foreign nationals may not be allowed to open banks or branch offices or subsidiaries of foreign banks in Ethiopia or acquire the shares of Ethiopian banks.

Ethiopia's financial sector remains closed and is much less developed than its neighbours, and it has no capital market and very limited informal investing in shares of private companies. A series of financial sector reforms has been introduced since 1994, when private banks were allowed to be re-established. But the

¹ The Bretton Woods system of monetary management established the rules for commercial and financial relations among the world's major industrial states in the mid-20th century.

three large state-owned banks continue to dominate the market in terms of capital, deposits and assets. Ethiopian financial system is highly bank dominated. From 2001 to 2008, the banking sector constitutes 95 percent of assets, 96.53 percent of deposits, 94 percent of loans and deposits and 76.78 percent of equity of the financial sector on average (Kapur & Gualu 2011).

In most cases, the dominant bank (Commercial Bank of Ethiopia) still seizes quasi-monopoly power (Eshete, Tesome & Abebe 2013). They argue that the Ethiopian banking industry can be characterized as incontestable as entry in the industry is difficult, due to legal, technological and economic factors, and Competition in terms of price is relatively weak in the Ethiopian banking industry which confirms that there is monopolistic competition among banks in terms of prices. In a nut shell, banks in the Ethiopian case are competing in terms of service quality and efficiency (including use of technological advances), branch network expansions, advertising and prices, put in the order of their significance.

According to the Standard microeconomic theory, in a perfect competition setting a bank will be a price taker that maximizes profits by minimizing costs, and can increase output up to the point where marginal costs equal marginal revenue and average costs are minimized. However, Bikker and Bos (2008) argue that there are a number of reasons why banks may not be price takers and may not operate in a perfectly competitive market. They mentioned the following among others. 1) In the presence of increasing returns to scale a single bank should theoretically serve the market. 2) Price discrimination can give rise to monopoly powers, for instance through switching costs, search costs and product differentiation. 3) cross-subsidization may cause spill-over effects from one concentrated banking market to another. 4) Existence of regulatory barriers. All in all, the CBE is leading the industry with great government interference and earning abnormal profits through interest margins and return on assets in such a market where there is no stiff competition with the private banks in the sector, though little completion in terms of branch expansion, technology adoption and advertising in addition to individual fixed-effects of their management abilities.

Empirical findings by Desta & Bezabeh (2014) on banking sector reforms in Ethiopia, suggests that eliminating government interference in the banking business is critical for the efficient mobilization of savings and allocation of deposits to profitable enterprises. They point out some Examples of government interferences that have disrupted the banking sector in Ethiopia as; first, the minimum loan and deposit rate on savings is set by the National Bank of Ethiopia. Second, private banks are now required to offer 27 % of their loans to the government and do so at an interest rate of 3 %. In regard to determining the value of the Ethiopian Birr (ETB), the gradual devaluation policy followed by the government did not prove to be useful. All in all, to the best knowledge of the researcher, the factors affecting the net interest margin (NIM) of the typical state bank, CBE, not yet investigated.

Furthermore, the state bank of Ethiopia, CBE, is recognizing a significant amount of interest margins by setting high lending rates and low deposit rate. The former discourages investment and the latter savings, hindering economic growth. To avoid high NIMs, banks need to be both efficient and

competitive. In the year 2012/13 and 2013/14, the shares of the three state owned banks in terms of branch networking and capital reached 45.4% and 44.7% respectively. Out of which, the shares of CBE is found to be 38.8% and 34.2% respectively. In the same year the rest of 16 private banks take the balance figure 54.6% & 55.3% respectively.

As one measure of competition in the banking sector, concentration ratio is the percentage of combined total assets, total deposits, total net interest margin, total loans and advances, total income among others, of the leading four or eight firms in the industry. Hence, by considering all banks, the first four leading banks in terms of total outstanding credits in the year 2013/14 are commercial bank of Ethiopia (89,665.2), Development bank of Ethiopia (22,666.8), Dashen bank (9567.7) and awash international bank (9176.40), these all in millions of birr.

In the year 2013/14, the concentration ratio is amounted to be 77.86% taking in to account the four big banks in terms of total assets. Alternatively, solely by considering commercial banks operating in the industry (excluding development and cooperate banks, the ratio has been computed here bellow. In this case, the four leading commercial banks, in terms of total credits outstanding during the year 2013/14, are commercial bank of Ethiopia, Dashen bank, Awash international bank and Nib international bank. Concentration ratio= (0.6316) + (0.0674) + (0.0650) + (0.0390) = 80.3%.

Furthermore, commercial bank of Ethiopia alone does have the concentration ratio of (0.6316) = 63.16%. International findings, For example Maudos, & Nagore, (2004) found that HHI ranges from a low value in the USA (1.03) and Germany (1.88) to a high value in some African banking sectors (68.41 in Zambia; 65.04 in Botswana). Literature suggested the benchmark ranges so as to interpret the meanings of concentration ratios computed in this manner. The concentration ratio of 0% implies absence of concentration, rather perfect competition in the market. The concentration ratios ranges in between 1% to 50% enlighten the presence of low concentration and monopolistic competition. The concentration ratios ranges in between 51% to 80% enlighten the presence of medium concentration and monopolistic competition/ oligopoly. The concentration ratios ranges in between 81% to 100% enlighten the presence of high concentration and oligopoly or monopoly. Hence, the Ethiopian banking industry is characterized by medium concentration, monopolistic completion or oligopoly since the concentration ratio falls in the range of 51 to 80% as computed above. Moreover, the Herfindahl - Hirschman Index (HHI) is considered as more formal and commonly used measure of market concentration. Empirical studies by Beck et al. (2004); cited in Kiyota et al, (2007), concluded that increases in bank concentration were an obstacle to obtaining finance. They found that the constraining effects of bank concentration were exacerbated by more restrictions on bank activities, more government interference in the banking sector, and a larger share of government-owned banks. It would appear therefore that the highly closed nature of the in Ethiopian financial sector would serve to negate the positive effects that would otherwise come from greater financial intermediation.

All in all, the aforementioned situations inspired the researcher to see one element of measuring banks performance,

net interest margin to answer the question that what factors affect the net interest margin of the state bank (CBE) since 2005 to 2014, the time where the banks performance increases persistently.

1.2 OBJECTIVE OF THE STUDY

Customarily, studies under quantitative approach do have one main objective and as many specific objectives as required. The general objective of the study will be to analyse the factors affecting the net interest margins of the CBE. Specifically, the study will attempt to:

1. Examine the effect of capital adequacy/risk aversion on net interest margin (NIM) of the state bank (CBE)
2. Examine the effect of credit risk on net interest margin (NIM) of the state bank (CBE)
3. Examine the effect of management efficiency on net interest margin (NIM) of the state bank (CBE)
4. Examine the effect of the CBE's growth rate on net interest margin (NIM) of the state bank (CBE).

1.3 STUDY HYPOTHESES

After stating the research problem and reviewing the literature, the ground is prepared for structuring hypothesis. A hypothesis is an expectation of what the researcher believes that he/she might find in the data. It provides a directly testable relational statement and facilitates extension of knowledge. Hypothesis should always be in declarative sentence form, and should relate either generally or specifically variables to variables. Hypotheses are formulated usually either from a research problem statement, an existing theory or the findings of previous studies. Thus, based on both the research problem statement, an existing theory or the findings of previous studies the researcher has formulated the bellow hypotheses in declarative sentence form to show the relationship between the dependent and independent variables selected for this study based on the prior studies and the best knowledge of the researcher.

1. H_0 : Capital Adequacy does not significantly affect CBE's NIM.
2. H_0 : Credit risk does not significantly affect CBE's NIM.
3. H_0 : Management efficiency does not significantly affect CBE's NIM.
4. H_0 : The degree of competition does not significantly affect CBE's NIM.
5. H_0 : The CBE's deposit growth rate does not significantly affect CBE's NIM.

1.4 SIGNIFICANCE OF THE STUDY

This section elaborates on the importance and implications of a study for researchers, practitioners, and policy makers (Creswell, 2003). According to him, in designing this section, one might include three or four ways in which the study adds to the scholarly research and literature in the field, helps improve practice and why the study will improve policy. Thus, the researcher suggests the potential benefits for potential audiences as bellow. On the whole, it will help CBE's Bank managers in particular, and police makers, bank supervisors, and regulators in

general, to frame policies aimed at maintaining the growth momentum of the banking sector in the country. Most typically this study will help managers in different ways; by focusing on the key factors net interest margins in the banking industry, it may be helpful in order to develop new deposit and loan business, for supervision and staff motivation, achieves individual and branch sales goals through new business sales and Participates in community affairs to increase the Bank's visibility and to enhance new and existing business opportunitiesand thereby increase performance of bank in terms of NIM, among others. At last, the study will be help full for researchers in the area, using the limitations of this study as stepping stone, to further investigate the factors affecting the cost of intermediation (NIM) and forward their suggestions to the potential beneficiaries.

1.5 DELIMITATION AND LIMITATION OF THE STUDY

In most studies, it is believed that more observation means more information for generalization. The focus of this study is just to see the factors affecting the cost of intermediation (NIM) of CBE, the dominant bank in the Ethiopian banking sector, from the period 2005 till 2014, in this time span the CBE has shown a significant increasing trend in net interest margins. This study is designed to be investigated by applying ordinary least square multiple regressions on time series data by taking care of the classical linear regression assumptions. The study will be better generalized if one could see these factors by in comparison with other private banks using panel data further to see their individual fixed-effects. The study also will get enriched by incorporating all potential factors recommended by previous studies as bank specific, industry specific and macroeconomic factors, and using mixed approaches too.

II. RELATED LITERATURES

The net interest margin (NIM), measured as the difference between interest income and interest expenses, is widely regarded as an indicator of intermediation efficiency or the cost of intermediation (Raja and Sami, 2015). These authors suggested that efficient intermediation is one of the most important functions of the banking system in supporting economic growth. Prior empirical literature suggests five main factors/determinants of banks' interest margins: bank specific factors, market structure, regulation, institutional environment, and the macro economy.

Concerning bank specific factors, Empirical studies often use bank operating cost, managerial efficiency, credit risk, liquidity risk, interest rate risk, implicit interest payment, bank size, capital adequacy ratio, and non-interest income share as bank-specific variables. Many authors has reached a consensus that net interest margin is positively related to operating costs, and agreed that banks pass these costs on to customers (Maudos and Fernandez 2004; Williams 2007, enter alia). Koffie, Edder, & Martinez (2014) analyzes the determinants of banks' net interest margins in Honduras during 1998 to 2013—a period characterized by increasing banks' net interest margins, foreign bank participation and consolidation. In line with findings in the previous literature, they find that operating costs are the most

important drivers of banks' net interest margins. These authors suggest that more efficient banks have lower costs, serve the best-quality borrowers and garner greater market share.

Most of the papers on the determinants of interest margins show that credit risk—proxied by nonperforming loans (NPLs) to total assets and loan loss provision to total assets—exert a positive effect on interest margins (Maudos and Fernandez de Guevara 2004; Angzabo 1997; and Maudos and Solis 2009, among others), which means that banks charge additional risk premiums to compensate for credit risk. Most studies on the factors affecting the net interest margins have proxied the credit risk by nonperforming loans (NPLs) to total assets and loan loss provision to total assets exerts a positive effect on interest margin, which indicates that banks could charge additional risk premiums to compensate credit risk. Other authors such as Williams (1997) and Hess (2007) found a negative association between credit risk and net interest margins, attributing this result to weak banks that decrease margins to cover expected losses.

Another bank specific factors affecting bank's net interest margin is the capital adequacy ratio, which is used to proxied risk aversion of banks. One straightforward link is that retained profits are a principal source of capital. Accordingly, under a regulatory system requiring banks to meet various capital adequacy requirements, profit is an important prerequisite for the expansion of a bank's portfolio of risky assets. The capital adequacy ratio has a positive and significant impact on banks' spreads, confirming the assumption that banks ask for higher margins to compensate for better tax treatment of debt over equity (Saunders and Schumacher; Brook and Rojas (2000). On the contrary, other authors such as Dabla-Norris and Floerkemeier (2007) found a negative relationship between bank's interest margins and capital adequacy ratio, reflecting that well-capitalized banks charge lower spreads for their lower risk of bankruptcy and greater stability. Recently studies find that banks with well-developed non-interest income sources have lower net interest margins; this suggests that banks may tend to offer loans with small or even negative margins to attract clients and compensate with higher fees (Raja and Sami, 2015).

Concerning the impact of market structure on net interest margins provides divergent results. Some of which found the positive relationship between bank concentration and net interest margins. Indicating that net interest margins tend to increase with bank concentration and market power (Angbazzo 1999, Williams 2007, Saunders and Schumacher 2000, and Maudos and Solis 2009, among others). Demircuc-Kunt and others (2004) found that the positive association between concentration and bank margins disappears when institution quality variables are included; suggesting that contestability and other non price factors are better measures of bank competition. Others such as Claessens and Leaven (2004) attribute the absence of links between market structure and banks' spreads to the fact that concentration variables are not good proxies for the degree of competition in the banking sector.

Basing the theory of the factors affecting bank interest margins (refer to Maudos and Fernandez de Guevara (2004) and given the scope of this study the variables considered are bank specific ones and one market structure variable, competition. All in all, capital adequacy (risk aversion), operating efficiency,

credit risk, competition (learner index) and the bank growth are the variables accounted in this study.

1.6 OPERATING EFFICIENCY

The other important ratio is that proxy management is operational efficiency (OE) is the operating cost to gross income ratio i.e. the operating costs necessary to generate one unit of gross income. The relationships are expected to be negative, since high costs are likely to erode net interest margins. However, to the extent that an institution's ability to pass on costs to their clients is a function of market power, the sign may be positive in highly uncompetitive markets. The sign may be negative or positive (Sharma & Gounder 2011).

1.7 CAPITAL ADEQUACY/RISK AVERSION

Capital refers to the amount of own funds available to support a bank's business and, therefore, bank capital acts as a safety net in the case of adverse development (Athanasoglou *et al.*, 2005). Capital is calculated as the ratio of equity to total assets. The ratio measures how much of the banks' assets are funded with owners' fund and is a proxy for capital adequacy of a bank by estimating the ability to absorb losses (Ommeren, 2011). Risk aversion is proxied by the ratio of equity to total assets. A higher ratio indicates higher risk aversion on the part of bank managers. According to Raja & Sami, (2015), the expected sign on this variable is ambiguous: on the one hand, highly capitalized banks are more solvent, which will reduce their funding costs and, therefore, strengthen their margins; on the other hand, higher risk aversion may encourage banks to invest their resources in less risky assets, producing lower margins.

1.8 CREDIT RISK

Credit risk concerns the probability that a borrower will default on a loan (Koffie, Edder & Anabel Pineda, 2014). These authors suggested two ways in which a risky loan portfolio will raise the spread: (i) intensive use of the bank's productive resources to service risky loans; and (ii) higher probability of default leading to a risk premium on the loan rate. Empirical studies of bank spreads generally use either loan write offs, the delinquent loan portfolio, or provisions for NPLs as indicators of default risk. As noted in the literature problem with these measures is that they are often backward looking (reflecting realized defaults) rather than forward-looking proxies for default risk. On the other hand, Raja & Sami, (2015) defined credit risk as the ratio of loan loss provisions to gross loans. A higher ratio is associated with lower credit quality and high credit risk. Banks are expected to require higher interest margins to compensate for funding riskier projects, and to maintain adequate loan reserves (Poghosyan 2012; cited in Raja & Sami). An alternative interpretation is that a bank may mitigate high credit risk by investing in low-return government securities (Valverde and Fernandez 2007; cited in Raja & Sami).

1.9 GROWTH RATE

From the realistic facts the growth rate of the state bank of Ethiopia, CBE, shows an increasing trend (i.e. 11.51% & 30% in the year 2005 and 2014 respectively). An expansion in deposits provides banks more funds available for lending, thereby, encouraging credit extension and eventually net interest margins.

Berger et al (2003) suggested that a bank operates with superior efficiency might choose to reduce price, leading to growth through the capture of increased market share. Alternatively, it might also decide to convert its efficiency advantage in to higher profit, forgoing the opportunity for growth. According to these authors, moreover, market structure might influence or dictate the choice between these alternatives. A bank operating under highly competitive conditions might be forced in the direction of price reductions and growth. A bank in a market characterised by imperfect competition might enjoy greater discretion to opt for profit. Hence, the Ethiopian banking sector is characterized by imperfect competition in the market that more than 76% of concentration ratio in the year 2014, and more than 38% of the loan distribution is accounted for the state owned commercial bank of Ethiopia. This bank is still persistently recognising a high amount of net interest margin and which inspires the researcher especially to examine the factors contributing or causing such an achievement in this regard.

1.10COMPETITION

Banks mobilize, allocate, and invest much of society's savings, so bank performance has substantive repercussions on capital allocation, firm growth, industrial expansion, and

economic development. as a result, research on the effects of bank concentration and competition on performance has important policy implications (Beger et al, 2003). Eventually, to see the impact of competition on bank's net interest margin is the learner index. Competition is measured by the Lerner index instead of the concentration ratio, because the latter cannot provide a satisfactory measure of the degree of market competition in the banking sector (Beck and Hess 2009). The Lerner index is the difference between the price and the total marginal costs (operating + financial) as a proportion of the price (total revenues). The sign of the relationship is expected to be positive as it was explained in literatures. The literature contains two different positions regarding the impact of bank concentration on pricing decision and bank performance, the structure performance hypothesis and the efficient structure hypothesis. The former claims that a more concentrating banking sector will behave oligopolistic ally, while the latter argues that concentration will be conduct to better efficiency as more efficient banks buy less efficient ones (Sami & Mohammed, 2011). However, as one aspect of banks performance measure, net interest margin, the learner index is weighing over the concentration ratio to proxy bank's competition in the industry.

Table 1: Definitions, notations and expected effect of independent variables on NIM

Variables	Description	
Dependent variables: Net interest margin (NIM) (in %), defined as Net interest income divided by total assets. It measures the gap between what the bank pays the providers of funds and what the bank receives from firms and other users of bank credit		
Independent variables		Expected effect
Capital adequacy	Equity over total assets (%)	+/-
credit risk	Loan loss provision/total loans (%)	+/-
Operating/management efficiency	Operating expense / total asset (%)	+/-
Degree of Competition/market power	The difference between total revenue and total cost divided by the total revenue as a proxy for market power.	+
Bank's growth rate	Measured by the percentage growth of loans	+

Source: Researcher Own Computation, 2015

III. RESEARCH METHODOLOGY

As an approach, this study is designed to follow a post positivism philosophy which states that researchers under social science can confirm the existing body of knowledge by gathering data from the relevant sorceress. Meaning, this study follows survey (i.e. explanatory research design) research design through which the collected data are analyzed through econometric model to see the significance of the parameters/ coefficients of each of the variables under investigation.

1.11RESEARCH DATA

The major data has been collected from annual publications of the national bank of Ethiopia (NBE) and the CBE's audited

annual financial reports. The audited financial statements of the bank over the study period has been obtained from National Bank of Ethiopia, (which is responsible for maintaining the audited financial statements of all banks operating in the country and regulate their operating activities), the country's central bank. Basically, the balance sheet and income statements were the main sources of the relevant data to address the stated objectives of this study. The variables have been selected based on prior studies and professional judgment of the researcher. The variables considered are: equity -to- asset ratio as a proxy for capital adequacy/risk aversion of the CBE, loan loss provision-to-total loans to proxy credit risk of CBE, cost-to-income (operating cost + financing/total revenue)-a learning index to proxy competition in the market/industry and operating expenses -to- total asset ratio to proxy for management/operational

efficiency, and total loans growth rate in percent to proxy for the growth of the bank, CBE.

As one element of the research methodology, the purpose of this study does not allow the researcher to detail the appropriateness of the various sampling techniques for the study. Hence, purposefully, the researcher selected the state bank, CBE, as a case study to examine the factors affecting the realization of high net interest margin in the period under consideration.

1.12 DESCRIPTIVE STATISTICS

It is usually advisable to supplement the explanatory research design with descriptive statistics so as to see the characteristics/nature of the data and make it ready for the model adopted to examine the cause and effect relationship of the dependent and explanatory variables under consideration. It is used as complimentary data analysis tool in order to report the descriptive statistics for the variables in the regression analyses, most typically to observe the mean, median and standard deviations of the entire dependent and independent variables for the entire study period. This statistics has used primarily to describe the nature of data.

1.13 ECONOMETRIC MODEL SPECIFICATION

An ordinary least square linear regression model will be applied to examine the significant factors affecting the net interest margins of CBE.

The general specification of the model looks the following:

$$y_t = \alpha + \beta x_t + u_t \dots \dots \dots (1)$$

Where the subscript t (= 1, 2, 3 . . .) denotes the observation number.

The disturbance term can capture a number of features. Y denotes the response variable (NIM). X denotes a vector of explanatory variables. A is the constant term/intercept and β is the slop coefficient/ coefficient of parameters. To make the model more realistic, a random disturbance term, denoted by u, is added to the equation.

Substituting the explanatory variables in the model, the final model to be estimated looks the following:

$$NIM_t = \alpha + \beta CAR_t + \beta LLP_TL + \beta cost_inc + \beta opexp_ta + \beta G_rate + u_t \dots \dots \dots (2)$$

Where, NIM is the bank’s interest spread, CAR stands for capital adequacy ratio computed as equity-to-total assets, LLP_TL (loan loss provision-to-total loans to proxy credit risk, learner index (total revenue-total cost/total revenue) to proxy competition and opexp_ta (operating expense-to-total assets) to proxy for management/operational efficiency, and G_rate (growth rate in terms of the rate of growth of loans in percent). Since every econometric model is estimated with ceteris Paribus assumptions it is must to incorporate the disturbance term ut in the model. Clearly this model is not realistic without the zero mean disturbance term. Statistically if one leave the error term here, it would correspond to the case where the model fitted the data perfectly- that is, all of the data points lay exactly on a

straight line, in reality it cannot be. To make the model more realistic, a random disturbance term, denoted by u, is added to the model.

1.14 ESTIMATION ISSUES AND TESTS

Obviously, it has been suggested that the ordinary least square could be efficient and consistent estimator of the parameters under time-series and cross-sectional data without compromising the classical linear assumptions of multiple regression of such kind. These assumptions are: normality of the data, linearity, homogeneity of variances, and absence of serial correlation/autocorrelation, among others. All these assumptions have been depicted in the table bellow, and treated using the appropriate tests recommended for such types of research designs. Assumptions concerning disturbance terms and their interpretation

Table 2: Assumptions concerning disturbance terms and their interpretation

Technical notation	Interpretation
(1) $E(u_t) = 0$	The errors have zero mean
(2) $var(u_t) = \sigma^2 < \infty$	The variance of the errors is constant and finite over all values of xt
(3) $cov(u_i, u_j) = 0$	The errors are linearly independent of one another
(4) $cov(u_t, x_t) = 0$	There is no relationship between the error and corresponding x variate

Source: Researcher Own Computation, 2015

1.14.1 TEST OF NORMALITY AND SERIAL CORRELATION

The structure of the data has been visualized through different graphical methods such as stator plots, histogram, box plots and line graphs as well. Through these means the s potential outliers in the data have been identified and avoided by the method called winsorizing-replace the maximum and minimum values which are outliers with the nearby/ next minimum or maximum values which are not outliers in the data set .Latter the normality of the data has been statistically tested and checked for the null hypothesis that the data is normal. Autocorrelation/serial correlation may not be a problem in small samples, if nay it will be checked by autocorrelation/partial autocorrelation post estimation tests.

1.14.2 LINEARITY

The use and interpretation of multiple regression models often depend on the estimates of individual regression coefficient. The predictor variables in a regression model are considered orthogonal when they are not linearly related. This issue has also been checked by the two-way scatter plot in stata software.

1.14.3 MULTICOLLINEARITY TEST

When the regressors are nearly perfectly related, the regression coefficients tend to be unstable and the inferences

based on the regression model can be misleading and erroneous, and create a condition known as multicollinearity.

Multicollinearity exists when there is a strong correlation between two or more predictors in a regression model. It poses a problem only for multiple regressions because (without wishing to state the obvious) simple regression requires only one predictor, and as co linearity increases there are three problems that will arise: Untrustworthy beta coefficients (bs)-As co linearity increases so do the standard errors of the b coefficients, then big standard errors for b coefficients means that these bs are more variable across samples, it means that the b coefficient in our sample is less likely to represent the population, it will limit the size of R and makes it difficult to assess the individual importance of a predictor importance of predictors Field (2009). This problem makes a significant variable insignificant by increasing its standard error. If the standard error goes up, the t-values will goes down and will come up with high p-values, so that a particular variable will become insignificant but in reality it is not (Hossian Academy).

There are different ways of identifying this problem. One way of identifying multicollinearity is to scan a correlation matrix of all of the predictor variables and see if any correlate very highly (by very highly to mean correlations of above .80 or .90). According to Field (2009), this is a good ‘ball park’ method but misses more subtle forms of multicollinearity. Luckily, SPSS produces various collinearity diagnostics, one of which is the variance inflation factor (VIF), which indicates whether a predictor has a strong linear relationship with the other predictor(s). Although there are no hard and fast rules about what value of the VIF should cause concern, Myers (1990) suggests that a value of 10 is a good value at which to worry. What’s more, if the average VIF is greater than 1, then multicollinearity may be biasing the regression model. Related to the VIF is the tolerance statistic, which is its reciprocal (1/VIF). As such, values below 0.1 indicate serious problems although Menard (1995) suggests that values below 0.2 are worthy of concern. Finally the researcher will take different ways of correcting the problem. Dropping variables with high multicollinearity problem is the one among the different ways by comparing the p-values of the variables from the already estimated model (i.e. drop the variable(s) with higher p-values, lower level of significant all the time, and run the model again).

1.14.4 TESTING FOR HOMOGENEITY OF VARIANCE (HETEROSKEDASTICITY TEST)

The linear regression model (LRM) assumes that the variance of the equation disturbance term is constant over the whole sample period. At each level of the predictor variable(s), the variance of the residual terms should be constant. This just means that the residuals at each level of the predictor(s) should have the same variance (Homoskedasticity, scatterdly plotted, random, no systematic pattern); when the variances are very unequal there is said to be Heteroskedasticity (systematic pattern). If the researcher collected continuous data (such as in co relational designs), this assumption means that the variance of one variable should be stable at all levels of the other variable (Field 2009). There are different Test statistics for the presence of Heteroskedasticity. This thesis will use the Breusch Pagan test and Goldfeld Quandt test to test the null hypothesis that there

is no Heteroskedasticity (to accept or reject the null by comparing the probability chi-square with p-value <5%), and Plotting of regression residuals may also help to detect Heteroskedasticity. Normality of disturbance term will be tested using Jarque-Bera (1981) test to test the null hypothesis that residuals are normally distributed and this will be accepted or rejected by doing the same as above.

IV. RESULTS AND DISCUSSION

Table 3 report the descriptive statistics for the variables used in the analysis. On average the bank have a NIM of 2.35% over the entire period from 2005 to 2014. On average, the capitalization of bank is 6.5% which is less than the minimum requirement set by the banking regulation of 8%. To see in comparison this figure with international facts, for example, in Switzerland the most capitalized banks have a capital ratio of 87% and the least capitalized institutions total equity only covers 0.5% of total assets (Dietrich & Wanzenried, 2011).

Table 3: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
NIM	.0234723	.0086508	.010703	.036332
CAR	.0647683	.0219974	.04201	.09711
LLP_TL	.0038333	.0020384	.0015	.0072
opexp_TA	.0195121	.0041403	.014761	.026191
G_rate	.259493	.1393495	.115071	.551773
L_index	.3234064	.0474694	.256621	.404071

Source: Survey, 2015

The loan loss provision relative to total loans, which is an indicator of credit portfolio, amounts to 0.4% on average which seems quite low. As pointed out above, the operating expense to total asset and learner index ratio indicates 2% and 32% respectively. Both of which seems minimal, this might be because of by transferring such costs to the potential depositors. Lastly, the deposit growth rate is about 26%, which highlights a persistence increase in deposits. This is because the bank’s markets share; in terms of loans, total assets, customers enter alia, as compared to other private banks in the industry is reached at 38% in the year 2013/14.

Table 2: Determinants Bank’s Net Interest Margins

Variables	Model specification
CAR	.173 (4.31)* *
LLP_TL	2.67 (6.39)*
opexp_TA	1.074(5.67)**
L_index	.098 (6.36)*
G_rate	.045 (8.27)*
Constant	- .062 (-.28)*
Prob > F	0.0066
R-squared	0.984
Adj R-squared	0.9581

Source: Survey, 2015

This table presents the results from the regression conducted to examine the sources of net interest margins. The estimations were performed using ordinary OLS multiple regression after the different diagnosis regarding the classical linear regression assumptions to keep the consistency and efficiency of the model.

**t-statistics are in parenthesis and significant at 1%

*t-statistics are in parenthesis and significant at .01%

^a The test for the variance of the errors is constant and finite over all values of xt (i.e. $\text{var}(ut) = \sigma^2 < \infty$), Breusch-Pagan / Cook- Weisberg test for Heteroskedasticity has accepted the null hypothesis that the variance of the error term is constant with mean of zero and variance of σ^2 across all variables of the model. This test shows very high p-value of 63.51%, which is very far from 5%.

In addition to these tests, I also checked for the normality of the data prior to developing the fitted model to the data. This has been checked with Skewness/Kurtosis tests for Normality as shown in appendix table 5. The joint probability of this test (p-values) indicates that the acceptance of the null hypothesis that the data is normal. Furthermore, the data has also been checked for potential outliers and linearity. In both cases I could not see any outlier in the data (i.e. the box plot for example is symmetrical with the mean), and I also do not find any orthogonal relationship between the response and all explanatory variables of the model. There is no serial correlation problem in the data set; this is because normally autocorrelation is not a concern in small sample with limited time series. All in all, the data is fitted with the classical linear regression assumption.

Table 4 summarises the empirical results for the net interest margin. It is apparent that the overall explanatory power (in terms of adjusted R^2) of the model is to high, more than the conventional recommended rate of 60%. The coefficients of capital adequacy ratio, loan loss provision to total loans ratio, operating cost to total asset ratio, the learner index (revenues-costs)/ revenues and the deposit growth rate are highly significant with very low p-values and vey high t-values. All variables exhibit the positive causation in the model.

The capital adequacy ratio, the risk aversion measure, is positive and highly significant effect on net interest margins of the bank under consideration. This confirms the positive and highly significant impact of bank capitalization on net interest margin. Equity is considered as an expensive financial device, so to provide a fair remuneration to stock holders, banks should provide better margins, to compensate additional risk, which results in higher profit (Sami & Mohammed, 2011). Equity as measured by "equity/total assets" is an important indicator of solvency. Well-capitalized banks face lower costs of borrowing and low risk of bankruptcy. As a result of the lower costs and low risk of bankruptcy, well-capitalized banks should charge lower margins (Ahokpossi, 2013). On the contrary the commercial bank of Ethiopia can be categorized as undercapitalized firm with an average equity to asset ratio of 6.5% which is below the minimum requirement of 8%. Most studies suggest that, on the one hand, high interest margins can contribute to strengthening bank capitalization, through transfer of profits earned by banks to their capital base. On the other

hand, high interest margins are usually interpreted as an indicator of inefficiency, which adversely affects domestic real savings and investment (Brock and Rojas-Suarez; 2000). Ethiopia may particularly be at risk because, like all developing countries, its financial system is less developed and bank loans are the main sources of funding. In case of commercial bank of Ethiopia this study finds that the bank is generating higher amount of interest margins as it has been indicated by highly significant effect of the capital adequacy ratio as a proxy to risk aversion. Al, in all, the finds of the study shows that CBE is charging higher amount of interest to loans to customers and providing lesser deposit interest rate for depositors. For instance, in the year 2013/14, the minimum and maximum saving rate is found to be 5% and 5.75%, respectively. Similarly, the minimum and maximum lending rate has been reached at 7.5% and 16.25% respectively. The minimum deposit and lending rates are set by national bank of Ethiopia, central bank, while the maximum ceilings are kept open for the market (NBE annual report, 2013/14).

Thus, the null hypothesis that the capital adequacy/risk aversion does not affect the net interest margin of CBE has been rejected at 1% significance level.

The findings also indicated that the ratio of loan loss provisions to total loans (measure of credit risk), which is a measure of credit quality, is positively and significantly correlated with bank's net interest margins. Credit risk concerns the probability that a borrower will default on a loan. Two ways have been suggested by prior studies in which a risky loan portfolio will raise the spread: these ways are intensive use of the bank's productive resources to service risky loans; and the higher probability of default leading to a risk premium on the loan rate. It has been shown by the previous studies that credit risk—proxied by nonperforming loans (NPLs) to total assets and loan loss provision to total assets—exert a positive effect on interest margins (Maudos and Fernandez among others), which means that banks charge additional risk premiums to compensate for credit risk. On the contrary, other researchers (seeWilliams (1997) and Hess (2007) found a negative association ship between credit risk and net interest margins, and the attribute this result to weak banks that decrease margins to cover expected loses. As capital adequacy ratio increased by 1%, the NIM may get higher by 0.173%.

This result suggests high margins create barrier for the deepening of financial intermediation as lower deposit rates discourage savings flow into bank deposits and high lending rates reduce investment opportunities of banks, in case of Ethiopia, the average lending and saving rate spread indicates 10.5% in the year 2014 . Fungáčová & Poghosyan, 2009, suggested that, in emerging economies with poorly developed capital markets, both firms and individuals often have nowhere else to turn besides bank loans to raise money, which, in turn, may even hinder growth. These all attributes to the CBE, where the banking sector is characterized by high concentration, low competition and bank based financing of the economy with no forma stock market. Currently this bank is dominating the banking sector with high percentage of market share by expanding its branch networks throughout the rural areas where the market is too rigid and imperfect, and thereby exert higher risk premium on loan rates, and increase transaction costs among others. Through these mechanisms the bank might improve risk

assessment, reduce nonperforming loans, and the need for higher loan loss provisions. All in all, the null hypothesis that credit risk does not affect the net interest margin of CBE has been rejected at 0.01% significance level. As loan loss-to-total loans increased by 1%, the NIM may get higher by 2.67%.

Operating costs to total assets (as proxy for operational/management efficiency) of the bank under investigation do have a significant and positive relationship with the net interest margin. Various studies have shown that operational inefficiency leads to higher costs of intermediation and therefore to higher margins. The higher the operating costs, the higher the interest margins a bank has to charge Brock and Rojas Suarez (2000) and Gelos (2006); cited in Ahokossi, (2013). According to these authors, operating costs reflect the activities in which different banks specialize; banks that focus more on retail operations usually face larger operational costs than banks that are more oriented toward wholesale markets, this is because of the reason that retail operations involve the establishment of a large number of branches, equipment and personnel to serve the retail customer, which is the case for CBE. These larger costs usually translate into a higher spread (Brock and Suarez; 2000). On the other hand, deficiencies in the legal system contribute to high cost of credit. Outdated bankruptcy procedures increase the cost of asset recovery while lengthy civil procedures related to contract enforcement and adjudication of claims make credit operations riskier and costlier (IMF; 2001). Furthermore, operating costs reflect less efficient management and inferior organizational structures. All in all, such potential reasons contributing for higher interest margins can characterize the commercial bank of Ethiopia (CBE), the state owned. Hence, the bank has realizing higher amount of net interest margins persistently in the year under consideration. The coefficient of the operating expense variable is significant and positive; indicating that a bank with high operating costs will pass them on to consumers in the form of wide margins, especially if the banking environment is not competitive (Raja & Sami, 2015). Thus, the null hypothesis that operational efficiency does not affect the net interest margin of CBE has been rejected at 1% significance level. As operating costs-to-total assets increased by 1%, the NIM may get higher by 1.02%.

With respect to the market structure variables, the Lerner index, a proxy of market power, has the expected positive and highly significant impact on net interest margin. This result reveals that banks with market power charge higher lending rates and offer lower deposit rates as it has been discussed so far in the reviews of related literature. The findings indicates that since the CBE is the dominant bank in the Ethiopian banking industry, in terms of different aspects of competition, it could easily exert higher amount of loan interest rate by expanding its branch net works throughout the rural areas where other private banks in the industry could not address as competent as possible. The value of the Lerner index ranges from 0 (perfect competition) to 1 (monopoly) Raja & Sami, 2015, the Lerner index for CBE in the year 2014 indicates more than 40%, imperfect competition. The result of the regression analysis suggest positive relationship between the Lerner index and the interest as expected, banks with greater market power can fix higher spreads than they could in a more competitive market. The result confirms the previous

studies that as market concentration rises, competition declines, and interest margins increase.

Furthermore, to link this result with the theories concerning market structure (structure conduct hypothesis and the relative market power), Banks with relative market power (RMP), that is, banks with larger market shares, can exercise market power in pricing and therefore earn higher margins. Regarding the concept of structure-conduct-performance (SCP), which asserts that market performance (profits, price, product quality, etc.) depends on market conduct (pricing behaviour, legal tactics, merger, collusion, etc.) that in turn depends on market structure (number of buyers and sellers, barriers to entry, etc), there could be a link between interest margins (performance) and market concentration (structure) (Ahokossi, 2013). This paper confirms the SCP hypothesis, implies that a positive relationship between bank interest margins and market structure reflect non-competitive pricing behaviour in concentrated markets like the case of Ethiopia. All in all, the analysis presented here accounts for both market power (RMP) and market concentration (SCP) to untangle their impacts, this is because the concentration ratio of the banking sector and the market share of CBE in terms of its total assets has been computed from the audited annual reports of the bank as 76.59% and 66% in the year 2013/14, respectively². Thus, the null hypothesis that the degree of competition does not affect the net interest margin of CBE has been rejected at 0.01% significance level. As Lerner index increased by 1%, the NIM may get higher by 0.98%.

The last, not the least, variable investigated in the research is that of deposit growth rate. Like other explanatory variables in the model, the deposit growth rate is positively and significantly affects the net interest margin of CBE in the period under consideration. The result of this study suggests that as the bank's deposit liabilities increases, the bank might get much fund inflows from the savers. This finding is consistent with the exercise of market power under the structural-conduct-hypothesis (SCP) hypothesis. The dominant bank, commercial bank of Ethiopia, is collecting saving deposits at lower interest rate; the floor is being set by the national bank of Ethiopia at 5% and made open the ceiling to the banks themselves in the industry. In the year 2014, on average, the minimum and maximum saving rates has found to be 5% and 7.75%, respectively. Similarly, the floor of lending rate is also being set by the national bank of Ethiopia at 7.5%, and leaves open the ceilings to the banks themselves. As of June 30, 2014, the minimum and maximum of this rate revealed at 7.5% and 16.25%, respectively, and the spread has reach at maximum 10.5% (i.e. 16.25%-7.75%). These shows that by providing lower deposit rates and higher lending rates, the CBE, might transfer its operating costs as a result increase its net interest margins. The result of the regression analysis indicate that deposit growth rate of CBE is positively and highly significantly at (0.1%) affect the net interest margin of the bank, and it rejects the null hypothesis that deposit growth rate does not significantly affect the net interest margin of the

² The concentration ratio was calculated by taking the three largest banks assets in proportion to the 18 banks, except development bank of Ethiopia, total assets for the year 2014, and the market share of CBE similarly computed by taking its total assets in proportion to the 18 banks total assets in the same year.

CBE. As deposit growth rate increased by 1%, the NIM may get higher by 0.045%.

V. CONCLUSION AND REFLECTIONS

The result shows that virtually all bank specific variables investigated in the research have a positive and significant impact on net interest margin of CBE. The results suggest that higher capital adequacy (as proxy for risk aversion), higher operating costs (proxy for operational efficiency), loan loss provision-to-total loans (proxy for credit risk), Lerner index (proxy for degree of competition) and deposit growth rate are reflected in higher interest spreads. All in all, that higher of these factors increases interest spreads for the bank studied. These suggests that high operating costs, lack of competition, high concentration, high lending rates, low deposit rate, economies of scale for the dominant bank (CBE) and diseconomies of scale for small private banks remain key hurdle that prevent interest spreads from declining in commercial bank of Ethiopia. All in all, the results suggests that there has to be a measure to be taken by the sector to reduce the banks concentration ratio, operating costs, risk premium on credits, and increase the level of capital to offer competitive interest margins and fairly shared growth rates in deposits among others. In doing so, this paper conclude that further structural reforms and merger or consolidation, privatizing the state owned banks, allowing more private banks to join the industry enter alia may lower CBE’s net interest margins through competition and share the market potentially fairly to other private banks operating in the industry.

Appendix

Table I: Correlation matrix among explanatory variables

	CAR	LLP_TL	opexp_TA
	G_rate	L_index	
CAR	1.0000		
LLP_TL	-0.6206	1.0000	
opexp_TA	-0.3657	-.1252	1.0000
G_rate	-0.0079	-0.1381	-0.3685
L_index	0.1579	-.3516	.1151
	.2866	1.000	

Table II: Partial and semi partial correlations of NIM with explanatory variables Partial Semi-partial Partial Significance

Variable	Corr. Value	Corr.	Corr.^2	Corr.^2
CAR	0.9277	0.3117	0.8607	0.0971
LLP_TL	0.9652	0.4627	0.9316	0.2141
opexp_TA	0.9564	0.4104	0.9146	0.1684
G_rate	0.9788	0.5989	0.9580	0.3587
	0.0037			

L_index	0.9648	0.4603	0.9309	0.2119
	0.0079			

Table III: Skewness/Kurtosis Tests For Normality ----- Joint -----

Variable	Pr(Skewness) Prob>chi2	Pr(Kurtosis)	adj chi2(2)
NIM	0.7027 0.4201	0.2456	1.73
CAR	0.3614 0.1629	0.1296	3.63
LLP_TL	0.8040 0.3452	0.1871	2.13
opexp_TA	0.1982 0.3414	0.6859	2.15
G_rate	0.1076 0.1262	0.2624	4.14
L_index	0.6127 0.8790	0.9667	0.26

Table IV: Variance Inflation Factor For Explanatory Variables

Variable	VIF	1/VIF
CAR	1.99	0.503321
LLP_TL	1.85	0.541523
opexp_TA	1.57	0.637950
G_rate	1.44	0.692117
L_index	1.36	0.733658
Mean VIF	1.64	

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‘Manufacturing Emotion’: a study of the Emotion Work performed & Burnout experienced by Managers from a few selected manufacturing companies in India.

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Abstract- The objective of this study was to establish Emotion Work performed by Managers, specifically those from the Manufacturing sector in India and to ascertain the relationship between Emotion Work performed and Burnout experienced. A cross-sectional survey design was used. The study population (n = 118) consisted of managers from the manufacturing industry. Six subscales from the Frankfurt Emotion Work and Pines & Andersons Burnout Scale were used as measuring instruments. Cronbach alpha coefficients, Pearson product moment correlation coefficients, regression analysis were used to analyse the data. The results revealed that the Managers reported performing a significant amount of Emotion Work. Furthermore, the analysis of the data uncovered that the correlations between the studied dimensions of Emotion Work and Burnout were statistically and practically significant. Emotion Work predicted 28% of the variance explained in the Burnout experienced by these Managers.

Index Terms- Burnout, Emotion Work, Emotional Labour, Manufacturing, Managers.

I. INTRODUCTION

Emotions are feelings that people experience, interpret, reflect upon, express, and manage (Thoits, 1989; Mills and Kleinman, 1988). They arise through social interaction, and are influenced by social, cultural, interpersonal, and situational conditions (Martin, 1999). Quintessential as emotions are to Human Behaviour they permeated the walls of the work place a long time, yet only recently have organizational behavioural frameworks started giving both, acceptance and consideration to their presence (Brief and Weiss, 2002). Consequently ‘research’ for a very long time ignored the importance of Emotions at the workplace, primarily because emotions were viewed as ‘inappropriate & irrational behaviours’ in what was believed to be an extremely ‘logical & rationale workplace’ – Put another way researchers adhered to Weber’s advice and practiced “Administrative Rationality”(Ashforth and Humphrey, 1995). However, as the years passed Organizations themselves evolved into ‘Learning’ (Senge, 1990), ‘Thinking’ (Howard, 2012) and ‘Emotional’ (Finman, 2009) ‘Beings’ (Hardy & Shwartz, 1996). The realization that emotions were an integral part of an individual’s composition, that for obvious reasons, cannot just be checked in at the door of the workplace, slowly dawned upon researchers. Ashforth & Humphrey, 1995 set the context, by

stating ‘Employees bring their emotions to work and it cannot be denied that, emotions are an inseparable part of everyday organizational life’. Almost instantaneously, researchers realized it was necessary to attempt to understand the ‘omnipresent & complex web’ (more an invisible mesh) of emotions that exists in all organizations.

Ever since the publication of the first book about emotion in organizations (Fineman, 1993), the research world has been ‘buzzing’ with ‘Emotion’. It is well known that emotions that people display, play a central role in the nature of the interactions that take place and in some kinds of work, the display of emotion is in fact a central feature of job or task requirements. However, Briner (1999) emphasized that although there appeared to be much interest in emotions within work and organizational psychology, this interests had not led to a large body of published theory and evidence, nor to a range of practical techniques for assessing or intervening in emotion at work. Researchers soon realized that Hochschild (1983), had hit the nail on the head, by describing a more synergistic view of emotion at work that allowed for a better understanding.

Hochschild (1983) coined the term ‘Emotional Labour’ or ‘Emotion Work’, as the management of feeling to create a publicly observable facial and bodily display. Now, Hochschild was a sociologist, so when she used the term ‘Emotional Labour’, it was to denote; the exchange value of work which is sold for a wage. She specified that Emotional Labour differed from Emotion Work. i.e. Emotion Work was emotional labour performed in the ‘private context’ or without any assurance of receiving a wage in return. However, the term labour is usually used where sociological or societal concepts are involved, e.g., in the division of labour, labour– management relations, conflict resolution, and collective bargaining, Zapf (2002) therefore, made a valid point, when he pointed out that the term (labour) is seldom used for individual behaviour and intrapsychic concepts. For eg. Physical and mental *work* demands, *work* motivation, *work* involvement, *work* design, etc. Psychological studies focus on psychological processes, such as the regulation of Work actions, rather than societal and economic aspects of labour.

Hochschild did also mention, that from the psychological point of view, Emotion work inside and outside (implied or not) of the job –both had possessed the same acts and as a result so are most of the intrapsychic processes involved.

Hence, in order to be compatible with other fields of work and organizational psychology – it may be better to use the term Emotion Work.

Researchers primarily conceptualized Emotion Work as a duty of the front line 'service' employees (Ashforth and Humphrey, 1993; Ashkanasy and Daus, 2002; Brotheridge and Grandey, 2002; Morris and Feldman, 1996; Rafaeli and Sutton, 1987). Broadly it may be categorized that Emotion Work has been studied in 3 main types of service workers: 1) customer service jobs; (2) caring professions; and (3) social control jobs.

However recently, the scope of emotion work research has extended itself to consider some service-aligned yet uncommon professions, such as; Adventure guides (Sharpe, 2005; Torland, 2013), Flight attendants (Hochschild, 1983; Williams, 2003), Fast-food employees (Tan, Foo and Kwek, 2004), Hotel employees (Hwa, 2012), Call centre employees (Zapf et. al., 2003), Waitresses (Paules, 1991), Amusement park employees (Van Maanen and Kunda, 1989), Cashiers (Rafaeli & Sutton, 1987), bill collectors Sutton (1991), 911 Dispatchers (Shuler and Sypher, 2000), Police officers (Martin, 1999), Construction professionals (Lingard and Francis, 2005), Health care workers (Karl and Peluchette, 2006; Lewis, 2012), Teaching professionals (Naring et al., 2006), But rarely has research ever included a study of the Emotion Work of 'Managers'.

A study that did include Managers, was conducted by Brotheridge and Grandey (2002) and they uncovered that a manager's frequency of performing emotional labour was higher than that of physical labourers and *matched* that of sales/service workers and human service workers. In fact Brotheridge (2006) implored that emotional labour in managers was 'one of the areas that needs additional study'.

Managers by the very definition of their Organizational role, display a wide variety of emotions, ranging from friendliness, to sympathy and support, to anger. Correlating this to the 3 broad categories of service workers under which Emotion Work has been studied in the past (mentioned above), it is clear that they (Managers) must be able or are required to display all of the emotions required by all of them. Moreover, in the absence of clear display rules, (which is common parlance in manufacturing organizations), they have to bank upon their own judgment about which emotion to display and in what magnitude at a particular time. Considering that this decision is to be made almost spontaneously, increases the complexity and the erratic consequences. Hence, it would be safe to say that in such a scenario, performing Emotion Work for Managers may prove to be more arduous than that of the 'typical service worker', who often has to display the same emotion in a repetitive fashion.

Significance of the Research

This study has been undertaken to a) Explore & empirically establish the performance of Emotion Work in 'Managers'; b) Broaden the scope of Emotion Work research by proving it exists in the "non-service" i.e. manufacturing industries too, i.e. Managerial Jobs are impervious to the nature of industry; c) Establish a relationship between Emotion Work performed & burnout experienced by Managers in selected Indian Manufacturing organizations and d) add to the succinct emotion work research conducted in India.

Plausibly this study shall add impetus to the research of Emotion Work, in several ways; Firstly, by empirically establishing "Managerial Jobs" (irrespective of service or non-service industry) as a Job category that has Emotion Job

requirements or what may be referred to as an Emotion Work occupational category. Secondly, it shall add to the recent but scanty research in the Indian context and Lastly by establishing the relationship between Emotion Work performed and Burnout experienced it will allow organizational psychologists & HR managers to improve their understanding of a manager's experiences under an intensive emotion work environment, where display rules are tenuous. From the organizational perspective employee Engagement/Talent Retention could be enhanced if Emotional Dissonance and its negative consequences (if found Significant) are buffered against. Managers will need to learn how to perform the Emotion Work involved in their jobs, Training & Development could help with this.

Research Objectives

The major objective of this study is to broadly examine the perceived Emotion Work performed by Managers from the selected organizations from the manufacturing sector in India. And to study the relationship of emotion work performed with the feeling of burnout experienced.

- To measure & study the Various Dimensions of Emotion Work that are experienced / performed by the Managers of the selected organizations.
- To measure the Burnout experienced by the Managers of the selected Organizations.
- To analyze and establish a relationship between Emotion Work (EW) and its dimensions with Burnout experienced by the Managers of the selected organizations.
- To measure the impact of various Dimensions of Emotion Work on Burnout experienced by the Managers of the selected organizations.

II. REVIEW OF LITERATURE

This section briefly shares several researches conducted in the area of Emotion Work and highlights those that bring forth the proposed relationship between Emotion Work and Burnout.

There are several operating constructs or definitions of Emotion Work; Hochschild (1990) defined it as 'regulating one's emotions to comply with social norms'. She used the term emotion work to refer to 'any attempt to modify the experience or expression of a consciously felt emotion' and stated that when an individual performs emotion work as a required part of his/her actual job, it may be called emotional labour. Adding to this, Callahan & McCollum (2002) interpreted that the term emotion work's usage, is appropriate for situations in which individuals are personally choosing to manage their emotions for their own non-compensated benefits.

Grandey (2000) attempted to explain the process of Emotion Work by stating that 'Emotion Work may involve enhancing, faking, or suppressing emotions to modify the emotional expression'. According to Schultz, Bagraim, Potgieter, Vredge, and Werner (2003) Emotion Work represents the 'difference between the felt and displayed emotions' of employees. Whereas, Beal, Trougakso, Weiss & Green (2006) defined Emotion Work

as the managing of outward expressive display that is desired by the organisation.

However, most researchers are in agreement that Emotion Work possesses the following characteristics (Hochschild, 1983; Morris & Feldman, 1997; Zapf, 2002): (a) Emotion work occurs in face-to-face or voice-to-voice interactions with clients; (b) Emotions are displayed to influence other people's emotions, attitudes and behaviors; and (c) The display of emotions has to follow certain rules.

Another common observation in this context is that in order to perform a service in a desired manner, the organisation usually has in place, explicit or implicit 'Emotional Display rules' (Van Dijk & Kirk, 2007). The more demanding and strict these display rules are, the greater the sense of obligation (Grandey, 2000). In almost all customer service jobs, employees are specifically asked to or are usually expected to express positive emotions and suppress negative emotions (Adelmann, 1995; Brotheridge & Grandey, 2002; Sutton & Rafaeli, 1988). Such emotional demands may be referred to as 'Display rules' (Diefendorff & Gosserand, 2003; Gosserand & Diefendorff, 2005). Concerning however is the fact that some service organizations may go to the extent of attempting to control an employee's positive displays such as smiling, eye contact, and rhythmic vocal tone as well as their task-based skills for encounters with customers (Grandey et al., 2005), this is done by using a variety of techniques such as training, monitoring, and rewards (Hochschild, 2003).

When Emotion Work is being performed for a wage, clear Display rules – not bring out a sense of obligation to perform it, but covertly communicate a promise of a reward – this further strengthens the impact of the display rules. Therefore employees, in an attempt to conform to the implied or explicit display rules, adapt different strategies to regulate their emotions (Ashforth & Humphrey, 1993; Brotheridge & Grandey, 2002; Brotheridge & Lee, 2003; Grandey, 2000, 2003; Hochschild, 1983; Totterdell & Holman, 2003). Surface acting and Deep acting are the two main emotion regulation strategies that have been described in the literature reviewed (Brotheridge & Lee, 2002, 2003; Diefendorff, Croyle, & Gosserand, 2005; Grandey, 2003). There is however a third scenario – where there is a possibility of an employee simply expressing what (s)he feels i.e. Genuine expression (Ashforth & Humphrey, 1993; Diefendorff et al., 2005). Emotion work in this case is done in the 'automatic mode' which is supported by emotion theory (Ekman, 1984; Izard, 1977; Scherer & Wallbott, 1990). Or 'Genuine Deep Acting as Hochschild called it. However, this aspect has been paid very little attention in the research conducted which primarily focus on surface acting and deep acting (Brotheridge & Lee, 2002, 2003; Diefendorff et al., 2005; Grandey, 2003).

Deep Acting & Surface acting differ at the very basic level i.e. 'Deep Acting' requires an individual to influence what they feel in order to express the reaction or 'become' the role they are asked to display. So not only does deep acting require the expressed behaviour to be modified but also requires that the inner feelings are regulated, Hochschild (1983). On the other hand Surface Acting refers to the strategy utilized when employees try to manage only the visible aspects of emotions i.e. those that appear on the 'surface' and can be noticed by the interaction partner. So they align their outward expression to the organizational display rules, but their inner feelings remain

unchanged. Repeated surface acting results in a state of 'emotional dissonance' which is the differential that exists between ones inner feelings and the outer expression. Emotional Dissonance, may be defined as the gap between an employees' felt emotion and his/her expressed emotion (Abraham, 1998, 1999a; Morris & Feldman, 1996a, 1997; Zapf, 2002; Zapf, Vogt, Seifert, Mertini, & Isic, 1999).

Emotional Dissonance has several mentions in the emotion work studies reviewed (e.g., Abraham, 1998; Brotheridge & Lee, 1998; Bu'ssing & Glaser, 1999a; Grandey, 1998; Mann, 1999; Morris & Feldman, 1996, 1997; Nerdinger & Ro'per, 1999; Zapf, Seifert, Schmutte, Mertini, & Holz, 2001; Zapf et al., 1999).

Once researchers had figured out that individuals regulated their emotions (performed emotion work), that they did so using different strategies, they then set about exploring why employees chose the strategies they did and how this affected their work outcomes (Grandey, 2000). So the initial studies on emotion work (in this context) were mostly focused on performance (e.g., Rafaeli, 1989a, 1989b; Rafaeli & Sutton, 1990; Sutton & Rafaeli, 1988). In the words of Ashforth & Humphrey (1993) Emotion Work was likely to help employees successfully fulfil their task requirements and may even increase task effectiveness by making interactions more predictable and by avoiding interpersonal problems that might disrupt interactions with customers. However, it was Briner (1999), who made a very pertinent point (one which seemed to gain support) when he highlighted that even though Emotion Work performed was necessary, it needed to be reviewed from both, the employee's and the employers perspective. He highlighted that while it was vital to perform Emotion Work to ensure the quality of product or service, it is imperative to ensure that the Emotion Work being performed was 'safe' per se in terms of its possible effects on individual well-being. It may be surmised that although Emotion Work is required because of its positive effects for the organisation, specifically because it may be a necessary part of accomplishing a task, many researchers, including Tschan, Rochat, & Zapf (2005) and CÔté (2005) have identified unfavourable long-term consequences for employees that have to perform Emotion Work. In fact, Ashforth and Humphrey (1993) described emotional labour as a double-edged sword.

Postulating, on this researchers argued that there must be a manner to perform emotion work in a way that is 'effective'. Shortly afterwards, organizational research began to show some consistent relationships between self-efficacy beliefs and task performance. For example, Barling and Beattie (1983) showed that strong self-efficacy beliefs were associated with high levels of sales performance, while Taylor, Locke, Lee, and Gist (1984) found a similar relation between self-efficacy beliefs and the productivity of faculty research. This indicated that employees may not always view emotion work as problematic. In fact, they felt good about performing it. Those with low efficacy, on the other hand, lack the skill to cope efficiently and effectively when emotional expression is demanded. Researchers also investigated the relationships between emotion work and psychological strain, in particular burnout and job satisfaction (e.g., Abraham, 1998; Adelmann, 1995; Brotheridge & Lee, 1998; Grandey, 1998; Morris & Feldman, 1997; Zapf et al., 1999, 2001). Some studies also investigated disengagement, exhaustion, burnout and

negative emotions (Beal et al., 2006; Brotheridge & Grandey, 2002; Heuven et al., 2006; Lewig & Dollard, 2003; Montgomery et al., 2006).

During the last decade the influence of certain Organizational and Individual Factors that could influence, mediate or moderate the relationship between Emotion work and its outcome have also come under the scanner. There have been numerous studies pertaining to Organisational factors like Social support (Gallagher & Vella-Brodrick, 2008; Gray, 2002; Montes-Berges & Augusto, 2007), Service culture (Syed, 2008; Curtis & Upchurch, 2008), Role stress (Harris, 2002; Williams, 2003; Zapf et. al., 2003; Lewig & Dollard, 2003; Lingard & Francis, 2005; Pravettoni et. al. 2007; Murray and Rostis, 2007; Biron et. al. 2008;), Role efficacy, Role overload, burnout, Emotional exhaustion (Hochschild, 1983; Kahn, 1993; Morris & Feldman, 1996; Zapf et. al., 1999; Bakker et. al., 2003; Lewig & Dollard, 2003; Michinov, 2005), Aesthetic labor (Stevens, 2012; Williams, 2003), Sales performance (Sutton & Rafaeli, 1988;) Self-monitoring (Scott, Barnes & Wagner, 2012). Job dissatisfaction (Morris & Feldman, 1996; Grandey, 1999; Wharton, 1993).

The impact of performing Emotion Work on an individual's psychological well-being has also been discussed in the literature, This includes poor self-esteem, depression, cynicism, role alienation, and self-alienation (Richman, 1988; Ashforth & Humphrey, 1993; Fineman, 1993; Tolich, 1993; Wharton, 1993) Also individual factors like Gender (Guy & Newman, 2004; Meier, Mastracci, & Wilson, 2006) and Emotional intelligence (Austin, Dore, & Mc Donovan, 2008; Mikolajczak, Nelis, Hansenne, & Quoidbach, 2008) that influence these outcomes have been researched too.

Among those mentioned above several studies have specifically explored the relationship between emotion work & Burnout. Maslach (1982) defined burnout as the stress that results from the social interaction between helpers and then-recipients. And according to Schwab et al., (1986), burnout tends to occur when an employee becomes emotionally over involved in interactions with customers and has little way to replenish those emotional resources being spent. Brotheridge and Grandey (2002) highlighted that even though emotional exhaustion is at the core of burnout, burnout literature seldom considered emotion work demands as predictors of burnout.

Burnout is a stress outcome typically experienced in situations or jobs that induce repeated emotional responses that the employee must continuously regulate. It is only natural that employees experience emotional exhaustion, or energy depletion and fatigue. Sometime, to cope with these feelings, employees detach from the customers by objectifying or depersonalizing themselves (emotional dissonance). This may further lead to them feeling negative about their work, to the point where they experience a diminished sense of personal accomplishment (Cordes & Dougherty, 1993). It is important to note that specifically burnout has been associated with important organizational outcomes like performance and turnover (Singh et al., 1994; Wright & Cropanzano, 1998). And that it is considered a central part in work within the health professions and human service sector (Jackson et al, 1986; Zapf, Seifert, Schonutte, Mertini, & Holtz, 2001). Dormann and Zapf (2004) summed it

up by stating that burnout usually occurs in jobs that deal with a variety of customers and clients.

Another important revelation of the literature reviewed was that Emotion Work has almost always been studied in 'classic emotional labour jobs' i.e. in Jobs where the expectations of emotional display are relatively explicit, and involve frequent interactions between an employer and a customer or client and where the employee could not probably do their job if they did not engage in emotional displays. However, it would be safe to say that many, if not most jobs, involve the management of feelings and Display of emotions, hence the distinction between jobs that have emotion work requirements and those that do not is blurred. Yet most studies have continued to focus on the service' industry. Almost any managerial or supervisory job is likely to involve an element of emotion work as managing people effectively is likely to involve the suppression of some emotions and the display of others.

From the India(n) perspective, Modekurti-Mahato, et al's (2014) review of literature revealed that emotional labour studies in India hardly have a presence and just about 1% of studies have been researched empirically. Most of studies focus on call centers (Taylor & Bane, 2005; Shankar & Kasturi, 2006; Bryson, 2007; D'cruz & Noronha, 2008; Surana & Singh, 2009; Chong,2009; Agrawal & Sadhna, 2010, Nath, 2011; Rajan-Rankin,2012), a few on pharmaceutical representatives (Mishra et al, 2012), family care giving (D'cruz, 2010), retail sector (Gupta & Mishra, 2010), Medical representatives (Mishra & Bhatnagar, 2010; Mishra, 2014), Hotel & Hospitality executives (Augustine & Joseph, 2008; Satyanarayana & Shankar, 2012; Rathi et al, 2013; Shani et al., 2014), Teaching / Academicians (Gaan, 2012), Aviation Industry (Waddar & Aminabhavi, 2012), Hospital workers (Mathur et al., 2013; Thomas & Abhiyankar, 2014; Pandey & Singh,2015), Postal services (Raghavendra, 2015), Customer service employees (Sarkar & Suresh, 2013), Banking Sector, (Sharma & Sharma, 2014) etc.

Hypothetical Consideration: After reviewing a large body of literature, there appears a clear need to explore the prevalence of Emotion Work in Managers. Especially those in the non-service arena such as manufacturing where the display rules are non-existent or sketchy, relying entirely on the Managers judgement on how to perform the Emotion Work. There already exists sufficient evidence of burnout being a negative outcome of such Emotion Work, on an individual's well-being and it is linked to organizational outcomes such as hindered performance, turnover intention and reduced employee engagement – it warrants further exploration in all Managerial Jobs. And even though Emotion Work is slowly gaining interest among Indian researchers, yet apart from a few studies in certain 'typical' fields, the literature on emotional labour in India is scanty.

On the basis of the review of literature, hypothetical considerations & the research objectives, the following Hypotheses were framed:

H1: Managers of the selected organizations shall perform Emotion Work as part of their Managerial role.

H2: There shall exist a significant relationship between Emotion Work (EW) and its dimensions and the Burnout experienced by the Managers of the selected organizations.

H3: To measure the impact of the various dimensions of Emotion Work on Burnout experienced by the Managers of the selected organizations.

III. METHOD

Sample

Using a cross sectional research design, 150 cross functional managers were chosen with the help of snowball sampling from 5 manufacturing organizations (convenience sampling) in India and were asked to participate in the survey. The organizations were those whose business was manufacturing – Products / Power and Managers who had at least one direct reportee were included.

Measures

Self-administered questionnaires were used to collect data. Emotion Work was measured using 6 subscales from Zapf (2004) FEWS; Frankfurt Emotion Work Scale (permission was sought). The original FEWS, developed in Germany by Zapf et al, includes 61 self-reported items measuring the frequency of expression of organizationally desired emotions (Individuals indicated their responses on a five-point Likert scale ranging from 1 (very rarely/never) to 5 (very often/several times an hour)., responding to items such as: “How often in your job do you have to display Unpleasant emotion towards ‘clients’(i.e. Strictness or Anger if rules are not followed)”. With Client being explained as both External & Internal – Colleagues / Subordinates / supervisors. “How often is it necessary in your job to empathize with the client’s emotions?”

However, since the prime objectives of this study is to establish an ‘Emotion Work Requirement’ within the jobs of ‘Managers’, i.e. establish Emotional Demands, the subscales 1,2 and 4 were used (also seen in Giardini and Frese,2006). In sync with the definition of Managers as someone who had at least one subordinate it was decided to add the sub scales that measured ‘Demands for Sensitivity’ and ‘Emotion Control’. An important consideration was to keep the questionnaire comprehensible to managers from both different functions and different companies, therefore it was decided to not use the sub scales 6, 8, 10 and 11. By using only 6 sub scales the length of the instrument was also limited to 37 questions, which ensured that it was not too time consuming but the validity & reliability of the instrument were not compromised. The subscales utilized along with their corresponding reliability were tested & have been mentioned alongside the dimension: Display of Positive emotions- 9 items (0.72), Display of Negative emotions-8 items (0.76), Demands for Sensitivity – 4 items (0.91) and Emotional Dissonance- 5 items (0.75).

Burnout was measured using Pine & Andersons 21 item scale. It uses a five-point scale ranging from Never (1) to Always (5), individuals responded to items such as: “Being tired” and “Feeling disillusioned & resentful”.

Procedure

With the consent of the organizations, the authors administered the surveys. An online form (in addition to the paper one) was made available to encourage participation via mobile/ laptops. 118 usable surveys were obtained, accounting

for a response rate of 66 percent. 86 percent of the sample was men and 14 percent were female managers. While 80 percent of the managers were married. 29 percent of the respondents were between the ages of 20-29, 41percent were between the Age of 30-39, 22 percent were between the age of 40-49 and the remaining 8 percent of the respondents were between 50 and 59 years of age.

Data Analysis

For descriptive and relational analysis, Mean and standard deviation (SD) of each of the six FEWS sub-scale scores were calculated for the whole sample. Reliability values for each subscale regarding burnout and emotion work were calculated. Pearsons correlation was conducted in order to assess the strength of the relationship between Emotion Work & Burnout. In order to identify the dimensions of emotion work that are associated with burnout, hierarchical regression Analysis was conducted. The relationships between the burnout subscales (dependent variables) and the aspects of emotion work (independent variables) were evaluated by determining regression coefficients (standardized coefficients, β). A P value of <0.05 was considered significant for all tests. SPSS software, version 15.0 (SPSS Inc., Chicago, IL, USA) was used for all analyses.

IV. RESULTS

In total, 118 questionnaires were returned (response rate 66 %) from 150 Managers. Demographic variables i.e. Age, Gender & Marital Status related information were studied (Table 1).

Table 1. Demographic variables of participants

Item	Category	Frequency	Percent
Gender	Male	101	85.6
	Female	17	14.4
Marital Status	Married	202	171.2
	Single	48	40.7
Age	20-29	34	28.8
	30-39	49	41.5
	40-49	26	22
	50-59	9	7.6
Total		118	100

Reliability of the instrument used to measure Emotion Work & Burnout are shown below (Table 2).

Table 2. Reliability Statistics of scale used

Reliability Statistics			
Scale	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
Emotion Work	0.786	0.779	37
Burnout	0.841	0.84	21

Descriptive statistics revealed that the Mean and SD value of 'Display of Certain Emotions', 'Emotion Control', 'Display of Positive Emotions', 'Demands for Sensitivity' 'Emotional Dissonance' and 'Display of Negative Emotions', were 37.39(5.05), 12.43(2.85), 17.25(3.41),12.60(2.42), 14.59(3.16) and 17.75(4.01) respectively, Shown below in Table 3.

Table 3. Descriptive Statistics of Emotion Work & Burnout

	Emotion Work	Display of Certain Emotion	Emotion Control	Display of Positive Emotion	Demands for Sensitivity	Emotional Dissonance	Display of Negative Emotions	Burnout
Mean	113.9	37.39	12.43	17.25	12.6	14.59	17.75	52.51
N	118	118	118	118	118	118	118	118
Std. Deviation	13.51	5.05	2.85	3.41	2.42	3.16	4.01	9.19
Min	65	28	6	5	7	5	9	30
Max	137	48	18	23	18	20	31	70

In the above table the values of standard deviation for the dimensions of Emotion Work, range from 2.47 to 5.05, since the data is concentrated around the mean i.e. the smaller the standard deviation, this indicates that the responses were not too concentrated. Data was also viewed from a thumb rule that indicates that in case the value of the standard deviation is one fourth of the mean value of the series, the data is high on homogeneity. It is reviewed and found that data is homogeneous for all Dimensions except 'Display of Certain Emotion' (DCE), where the values of standard deviation and mean are 5.05 and 37.39 respectively – indicating that in this dimension of Emotion Work had the highest variance in responses from Managers.

The Correlation between the dimensions of Emotion work & Burnout was examined. (Table 4).

Table 4. Correlation statistics

	Display of Certain Emotion	Emotion Control	Display of Positive Emotion	Demands for Sensitivity	Emotional Dissonance	Display of Negative Emotions	Emotion Work
Pearson Correlation	-0.129	-.225(*)	.314(**)	.330(**)	.431(**)	0.089	.266(**)
Sig. (2-tailed)	0.162	0.014	0.001	0	0	0.339	0.004
N	118	118	118	118	118	118	118

** indicates significance i.e. p<.01 and * p<.05

The data indicated that Emotion Work and burnout were significantly related ($r=0.266^{**}$, $p=0.004$). Emotion Control was moderately (negatively) significantly correlated with Burnout ($r=-0.225^*$, $p=0.014$) Whereas, Display of Positive emotions

($r=0.314^{**}$, $p=0.001$), Demands for Sensitivity ($r=0.330^{**}$, $p=0$) & Emotional dissonance ($r=0.431^{**}$, $p=0$), were strongly correlated with Burnout. Surprisingly, the data did not show a relationship between burnout and the requirement to Display Negative Emotion in this study.

To investigate the second and third hypothesis, regression analysis was used (Table 5a & b). Three different regression models were employed to explore the full diversity of the effects using different sets of variables. Model 1 investigated whether the emotional dissonance reported by the Managers predicted burnout – which it did strongly. Next we added the dimension of Emotion Control, in Model 2 – this too enhanced the feeling of burnout. Model 3 investigated whether the requirement to display positive emotions also predicted burnout.

Table 5a. Model of Regression analysis

Model Summary										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.431(a)	0.185	0.178	8.338	0.19	26.4	1	116	0	1.874
2	.523(b)	0.274	0.261	7.906	0.09	14.03	1	115	0	
3	.553(c)	0.305	0.287	7.766	0.03	5.167	1	114	0.025	

a Predictors: (Constant), Emotional Dissonance
b Predictors: (Constant), Emotional Dissonance, Emotion Control
c Predictors: (Constant), Emotional Dissonance, Emotion Control, Display of Positive Emotion

Table 5b. Coefficients of Regression

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
		1	(Constant)	34.22			3.641		9.397	0
	Emotional Dissonance	1.253	0.244	0.431	5.138	0	0.77	1.736	1	1
2	(Constant)	44.26	4.372		10.13	0	35.6	52.92		
	Emotional Dissonance	1.394	0.234	0.479	5.949	0	0.93	1.858	0.974	1.03
	Emotion Control	-0.973	0.26	-0.302	-3.746	0	-1.487	-0.458	0.974	1.03
3	(Constant)	40.64	4.581		8.87	0	31.56	49.71		
	Emotional Dissonance	1.076	0.269	0.37	3.998	0	0.543	1.61	0.712	1.4
	Emotion Control	-1.121	0.263	-0.348	-4.258	0	-1.643	-0.6	0.914	1.09
	Display of Positive Emotion	0.586	0.258	0.217	2.273	0.03	0.075	1.097	0.668	1.5

V. DISCUSSION

The first hypothesis of the study was to empirically establish that 'Managers' and specifically those from the manufacturing sector (a segment ignored in earlier emotion work research) too, Perform Emotion Work. The mean score of emotion work in this study was reported as (113.9±13.51). Managers showed the greatest agreeableness to the "Display of Certain Emotions" in their job context – laying the foundation for considering "managerial jobs" as an Emotion Work job category.

This prepares the basis for the need for explicit Display rules – so that the Emotion Content of a Manager's job design is acknowledged and Managers are apprised on how to conform. Not only will this (adherence to the Display rules) ensure an enhanced feeling of self-efficacy but also a heightened sense of personal accomplishment (**Brotheridge & Grandey, 2002; Hochschild, 1983**), it will also pave the way for ensuring a job-person fit.

The second hypothesis was to explore the Manager's emotion work's predictive impact on burnout in a manufacturing scenario. The data indicated that Emotion Work and Burnout were significantly related, **Zapf et al (2001)** had also showed a unique contribution of emotion work variables in the prediction of burnout. Most previous researchers have analysed the relationship between specific aspects of emotion work (mostly emotional dissonance) and emotional exhaustion. Emotional Exhaustion is a key component of burnout (**Pugliesi, 1999; Wharton, 1993; Kruml and Geddes, 2000**). A strong statistically significant correlation between Emotional Dissonance and Burnout is corroborated by several studies; **Abraham, 1998; Brotheridge & Lee, 1998; Grandey, 1998; Kruml & Geddes, 1998; Morris & Feldman, 1997; Nerdinger & Ro'per, 1999; Zapf et al., 1999, 2001**. The moderate yet negatively significant relationship between Emotion Control and Burnout ($r = -0.225^*$, $p = 0.014$) could be explained by the fact that Emotion control for organizational purposes can also be referred to as Display Rules (**Ekman & Friesen, 1975; Rafaeli & Sutton, 1989; Wharton, 1993**). Since Display rules are non-existent in most manufacturing set ups, it is likely that Managers will welcome emotion control of some sort, as dealing with 'organized chaos' or a wild array of emotions with no formal structure – could understandably, be stressful. It could be inferred that Managers of this study showed an aversion to emotional autonomy. There have been a few other studies such as **Sarkar & Suresh (2013)** and **Kovacs et al (2010)** that uncovered a significant relationship between Emotion Control & psychological well-being (the theoretical opposite of burnout). The emotional compliance with organizational and social requirements is likely to lead to a predictable emotional display, which reduces the possibility that an embarrassing interpersonal situation may arise (**Gross and Stone, 1964**), that too shall enhance one's feeling of personal efficacy (**Markus & Kitayama, 2001**) and in turn reduce burnout. The finding that Demands for Sensitivity also correlate, in a statistically significant manner, to a feeling of Burnout, corroborated what **Zapf et al (2001)** had found in their sample i.e. that the requirement to be sensitive to the emotions of others was positively correlated to Emotional Exhaustion (the main component of Burnout). The correlation of the requirement to Display Positive Emotions and a feeling of Burnout as ironic as it sounds – may be explained by the 'requirement' being a forced one, of sorts. The fact that Display of Positive Emotions – contributes to the feeling of Personal Accomplishment (the diminishing of which results in Burnout) as found by **Zapf et al. (1999, 2001), Diefendorff et al (2005)** and more recently by **Kim (2008)** could also explain the relationship uncovered.

The results of the regression analysis between the various dimensions of Emotion Work and Burnout experienced by Managers revealed (and answered the third hypothesis) that in

this study the dimensions of Emotion Work influenced 27.9% of Burnout experienced by Managers. These findings clearly highlight the need for interventions that are designed to make Display rules explicit and reduce dissonance to prevent burnout.

VI. CONCLUSION

The literature reviewed suggested that individuals in the work arena (usually a service organization) frequently performed Emotion Work as part of their effort to influence a client's moods and emotions. Because the client's moods and emotions are likely to have a substantial effect on their performance or appraisal of it, employees who are successful at influencing moods are likely to be considered more 'effective'. In tandem with this we know that an effective 'Manager' (from any organization) interacts frequently with internal and external clients: However, the manner & quantum in which they perform emotion work is circumspect.

While service workers perform emotion work in a predictable or highly repetitive fashion, they usually have a narrow range of emotions that they are required to display as part of their organizational role. Added to this is the ratification of display rules' that are well communicated and the high probability that they have even been given adequate training on the same. But Managers, in contrast, need to display a much wider range of emotions in their efforts to manage employees, team members and clients on a daily basis. The larger gamut also implies switching between emotions of varying magnitude at the blink of an eyelid.

Let's visualize, a Manager in his cabin expressing disappointment to a team worker who hasn't delivered work as per a committed deadline (faking & exaggerating it slightly in an attempt to coach him into realistic goal setting- as the actual deadline is still a day away) and the phone starts ringing- its an external auditor appointed by the board who wants to discuss the findings and during the call a message from the boss flashes asking for an immediate video call. This is just an average 2 minutes in the life of a Manager. The complexities of handling diametrically opposite emotions within microseconds for long durations is bound to be exhausting. Managers that perform emotion work 'effectively' on a regular basis are likely to be emotionally expressive and better communicators but are also likely to be emotionally exhausted.

Sadly it is this 'Emotion Work requirement' of Managers which is rarely acknowledged let alone documented. Moreover, in a manufacturing setup (the scope of this study) – in the absence of display rules – Managers are required to exercise a considerable amount of judgment about which emotions to display. Not only do Managers perform Emotion Work in interactions but even as a demeanour, which may be considered a prolonged expression. They may for example need to publically display emotions indicative of exuding confidence and optimism, in times of crisis or when confronting Negative workplace situations i.e. at times when it is most important emotion work is required to hide their feelings of anxiety in front of a subordinate or client. Their choice of display could be beneficial or not, they may have adapted the correct emotion strategy merely by chance. However it is evident that they have no way of experiencing the

positive outcomes of Emotion work performed – until is not acknowledged, documented or linked to performance.

Restructuring the Emotion Job Design, putting in place Interventions that help Managers master the basic skills behind genuine emotional expression and deep acting may make the workplace more productive and enjoyable for them. Besides enhancing Engagement & Personal Efficacy at the individual level, this shall also add impetus to the already proven Organizational Gains such as Low turnover intention, etc.

VII. LIMITATIONS & RECOMMENDATIONS

The present study has certain limitations that should be acknowledged. Relying exclusively upon self-report measures, which could lead to common method variance (Podsakoff & Organ, 1986). The use of a cross-sectional design, does not allow the establishing of causal relationships among study variables and limits the ability to make generalizations about the total population from this sample. This study focused only on the 'negative consequence' of performing Emotion Work i.e. Burnout. It did not explore if there was a positive consequence or whether the individual outcome of performing Emotion affected the 'Managerial effectiveness'. The present study focused only on Managers of one non service sector. Larger samples of Managers from more occupations need to be studied. Also a greater understanding of display rules (and how they differ across context and target) can help managers and employees identify emotions and given this information, improve both workplace communications and interpersonal interactions. There is also a need to examine the task effectiveness of emotion work on such outcomes as organizational / team performance (e.g., win-loss record), Manager's perceived organizational climate, Manager's Job satisfaction, and subordinate / Client's trust toward Managers are recommended. Interestingly several authors have suggested that emotion work and especially the frequency of emotional dissonance could be dependent on personality variables, such as positive or negative affect and extraversion (e.g., Abraham, 1998; Morris & Feldman, 1996). However, little empirical support exists and this could be explored further as it could form the basis of several HR processes. Except for a few studies in certain fields, the literature on emotion work in India is very limited. An extensive research would be needed to understand the importance of emotion work in Managerial jobs across various sectors.

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Roman Domination Number of a Graph

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Abstract- A dominating set D of a graph $G = (V, E)$ is *roman dominating set*, if S and T are two subsets of D and satisfying the condition that every vertex u in S is adjacent to exactly one to one a vertex v in $V - D$ as well as adjacent to some vertex in T . The roman domination number of $\gamma_{rds}(G)$ of G is the minimum cardinality of a roman dominating set of G . In this paper many bounds on $\gamma_{rds}(G)$ are obtained and its exact values for some standard graphs are found. Also relationship with other parameter is investigated. We introduce Roman dominating set in which the interest is in dominating contains two types of subset.

Index Terms- Domination, Roman domination.

I. INTRODUCTION

The graphs considered here are simple, finite, nontrivial, undirected, connected, without loops or multiple edges or isolated vertices. For undefined terms or notations in this paper may be found in Harary [1].

Let $G = (V, E)$ be a graph. A set $D \subseteq V(G)$ is a dominating set of G if every vertex not in D is adjacent to at least one vertex in D . The domination number $\gamma(G)$ is the minimum cardinality of a dominating set.

Roman Emperor Constantine had the requirement that an army or legion could be sent from its home to defend a neighboring location only if there was a second army, which would stay and protect the home. Thus, there are two types of armies, stationary and traveling. Each vertex with no army must have a neighboring vertex with a traveling army. Stationary armies then dominate their own vertices, and its stationary army dominates a vertex with two armies, and the traveling army dominates its open neighborhood, which motivates to our roman domination number of a graph.

A dominating set D of a graph $G = (V, E)$ is *roman dominating set* if S, T are two subsets of D and satisfying the condition that every vertex u in S is adjacent to exactly one to one a vertex v in $V - D$ as well as adjacent to some vertex in T . The roman domination number of $\gamma_{rds}(G)$ of G is the minimum cardinality of a roman dominating set of G .

II. RESULTS

We use the notation $P_p, W_p, K_p,$ and C_p to denote, respectively, the *path, wheel, complete graph,* and *cycle* with p

vertices; $K_{1,p}$ *star* with $p + 1$ vertices, and $K_{m,n}$ *complete bipartite graph* with $(m + n)$ vertices (see [4]).

Theorem 1.

$$(1). \gamma_{rds}(C_p) = \left\lfloor \frac{p}{2} \right\rfloor + 1, \quad p \geq 3$$

$$(2). \gamma_{rds}(K_p) = p - 1, \quad p \geq 3$$

$$(3). \gamma_{rds}(W_p) = 3, \quad p \geq 4$$

$$(4). \gamma_{rds}(P_p) = \left\lceil \frac{p}{2} \right\rceil, \quad p \geq 3$$

$$(5). \gamma_{rds}(K_{m,n}) = m, \text{ where } m < n,$$

$$(6). \gamma_{rds}(K_{1,p}) = p = q = \Delta(K_{1,p})$$

Proof. Since, follows directly from the definition.

Theorem 2. For any graph $G, \gamma_{rds}(G) \leq p - 1$. equality holds when G a complete graph or a star.

Proof. Let D be a roman dominating set of G , such that S and T are two subsets of D , clearly, by the definition of roman dominating set the number of vertices in S are adjacent to a number of vertices in $(V - D)$ are equal. Then the number of vertices are in T are adjacent to a number of vertices in $(V - D)$ are greater than or equal to zero. Hence $\gamma_{rds}(G) \leq p - 1$.

Further, the complete graph or star achieves this bound.

Theorem 3. For any graph $G, p \geq 3$ vertices, a set S of independent $|m|$ cut vertices and each cut vertex is adjacent to a

$$\gamma_{rds}(T) = \sum_{i=1}^m \deg m_i$$

pendent vertex. Then

Proof. We know that, a dominating set D of a graph $G = (V, E)$ is *roman dominating set* if S, T are two subsets of D . Obviously, every cut vertex of S is adjacent to a pendent vertex u in $V - D$ as well as adjacent in T .

Thus,

$$\begin{aligned} &|N[S]| - |u| \\ \Rightarrow &|N(S)| \end{aligned}$$

$$\Rightarrow \gamma_{rds}(T) = \sum_{i=1}^{p-2} \text{deg } ree U_i \in S.$$

Theorem 4. For any graph G , $\gamma_{rds}(G) \geq \gamma(G)$.

Proof. Clearly, by the definition, roman dominating set is also a dominating set.

Theorem 5. For any graph G , $\frac{P}{\Delta + 1} \leq \gamma_{rds}(G)$.

Proof. It is known that $\frac{P}{\Delta + 1} \leq \gamma(G)$ and since $\frac{P}{\Delta + 1} \leq \gamma_{rds}(G)$, result holds

Theorem 6. For any graph G , $\gamma_{rds}(G) \leq p - 1$. And this bound is sharp.

Proof. Let D be a minimum dominating set of G . Then every vertex of $V - D$ except one vertex $v \in (V - D)$, then $D \cup (V - D) - 1$ is a roman dominating set. Thus

$$\gamma + P - \gamma - 1 = P - 1.$$

The Complete graph K_p achieves this bound.

Theorem 7. If T is a tree with m cut vertices and if each cut vertex is adjacent to at least one end vertex except one is adjacent to exactly one end vertex, then $\gamma_{rds}(G) = m$.

Proof. Let C be the set of all cut vertices of tree T with $|C| = m$. Then $V - C$ is a dominating set of all end vertices with $|V - C| > m$. We know that S and T be the subset Stationary and travelling respectively of a roman dominating set. Here a cut vertex u which is adjacent to one end vertex is belongs to stationary set and $|C - u|$ cut vertices are belongs to travelling set, therefore C is a roman dominating set. Hence, the roman domination number of G $\gamma_{rds}(G) = m$.

Corollary 8. For any tree T , with $m \geq 2$ cut vertices, then $\gamma_{rds}(T) \leq m$.

Proof. Suppose, the tree T contain m number of cut vertices. Follows form the theorem 6. If some cut vertices is belongs $V - D$, by the definition $\gamma_{rds}(T) < m$.

The following propositions, corollary are straight forward and the proofs are omitted.

Propositions 9. If a graph G has cut vertex v and is adjacent to an end vertex, then

$$2 \leq \gamma_{rds}(G) \leq P - 1.$$

Corollary 10. If a graph G has cut vertex, $P \geq 4$ vertices and every cut vertex has adjacent to at most two end vertices, then

$$\gamma_{rds}(G) = P - e, \quad \text{where } e \text{ be the end vertex.}$$

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Structural study and comparison of properties of hybrid green composites

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Abstract- The development of composites consisting of natural fibers and resins offers not only an opportunity to utilize an abundant natural resource but also a means to alleviate the serious disposal problem. Since natural fibers are durable, light-weight, excessive, nonabrasive, harmless, and low priced, they can serve as an excellent reinforcer or extender for resin. Such composites are finding applications as pallets, storage bins, and construction components.

There is lot of work has been done on the recycling of natural fibers. Recycling of high performance fiber is the new field. In our project we compare the properties of virgin kevlar composites with the regenerated kevlar composites. We use virgin kevlar fabric as reinforcement and epoxy as a matrix in virgin kevlar composites, regenerated kevlar fabric as reinforcement and epoxy as a matrix in regenerated kevlar composites, using vacuum bag molding technique for composite fabrication. We want to make it Green by recycling the virgin kevlar waste and wants to make durable product that do not involve the manufacturing processes again and again. The second purpose of this project is to develop the composites from the regenerated kevlar fabric to make it cost effective and achieve properties close to the virgin kevlar composites. We use 1/1 plain weave for both types of composites and made eight composites samples having different no.s of layers and stacking sequence of the layers.

Index Terms-Composites, mechanical Properties, structural study, hybrid green composites, natural Fibers, high performance composites

I. INTRODUCTION

The concept of composites is very old even when people use things that are made up of 2 or more things. But the clear concept of composites comes from the some 1500s B.C. ago. When Egyptians' use mixture of mud and straw to build strong and durable building for their living purpose.

Late, 1200 A.D, Mongols invented the first bow that is made up of composites. In which he uses wood, bone and animal glue. These bows were pressed and warped with birch bark. These bows are extremely strong power full and accurate. That time these bows are considers most power full weapons until the invention of the gun powder. "A composites material is formed when two or more different materials of different properties and nature are combined together to get a unique material that is superior in properties from its individual components from which it is made." In which one material is of continuous nature known as "Matrix" and the other material is of dis-continuous nature known as "Reinforcement" [1]. On the basis of matrix composites can be divided in to polymer, metal and ceramic matrix composites. While on the basis of reinforcement composites in to particle reinforced, fiber reinforced and structure reinforced composites [2]. For example concrete, Bath tub and shower stall (glass fibers, polyester, open molding), Fiberglass doors and Window frames.

Advantages of composites

The uses of composites increases day by day just because of their exceptional properties. They are using everywhere specially in automotive, air crafts, sports goods, military crafts, bullet proof vests, civil engineering etc. just because of these properties. Less weight, no corrosive behavior, non-conductor, low maintenance, low generation cost, long life, design flexibility [1].

Disadvantages of composites

There are few disadvantages of composites i.e. cost of material, cost of fabrication, Weak transverse properties. Weak matrix, low toughness, Reuse and recycle may be difficult, Analysis is difficult [1].

Types of composites

On the base of the nature of the matrix, and each type processes methods of fabrication. Composites can be categories in to four types are given below.

- Polymer matrix composites
- Metal matrix composites
- Ceramic matrix composites
- Carbon carbon matrix composites

Polymer matrix composites

The most advanced composites are polymer matrix composites. These composites consist of a polymer thermoplastic or thermosetting reinforced by fiber (natural carbon or boron). These materials can be shaped into a variety of shapes and sizes. They provide great strength and toughness along with resistance to decomposition. They have also low cost, high strength and simple manufacturing technique.

Metal matrix composites

Metal matrix composites, as the name implies, have a metal matrix. Examples of matrices in such composites include aluminum, magnesium and titanium. The characteristic fibers comprise of carbon and silicon carbide. Metals are mainly strengthened to suit the requirements of project.

Ceramic matrix composites

Ceramic matrix composites have ceramic matrix such as alumina, calcium, alumino silicate reinforced by silicon carbide. The benefits of ceramics matrix composites have high strength, toughness, low density, chemical inertness and high service temperature limits for ceramics.

Carbon carbon matrix composites

CCMs use carbon fibers in a carbon matrix. Carbon-carbon composites are used in very high temperature environments of up to 6000 of, and are twenty times stronger and thirty times lighter than graphite fibers [3].

Composites parts

Reinforcement

The function of the reinforcement is to provide specific shape, stability and carry the major portion of the load. The textile preform is classified on the basis of different criteria. Such as yarn orientation, manufacturing processes and geometric features. They are classified in to four levels i.e. fiber, yarn, 2D fabric and 3D fabrics. There explanation is given in the below table [3],[4].

Table 1.1 Fiber architecture for composite

Level	Reinforcement System	Textile Construction	Fiber length	Fiber orientation	Fiber entangle-ment
1	Discrete	Chopped yarn	Discontinuous	Uncontrolled	None

2	Linear	Filament yarn	Continuous	Linear	None
3	Laminar	Simple fabric	Continuous	Planar	Planar
4	Integrated	Advance fabric	Continuous	3D	3D

3D preform is classified in to four different shapes that are solid, hollow, shell and nodal Solid contains multilayer, orthogonal and angle interlock. while hollow contains multilayer Shell contain single layer and multilayer nodal include multilayer, orthogonal and angle interlock [4].

Resin

The purpose of resin is to hold the fiber in place, transferring the stress between the fibers and protecting the reinforcement material from the adverse environment. There are two types of matrices that are thermoset and thermoplastics.

Thermoset matrices

Thermoset matrices are those matrices that are set once by heating they become hard and they are not moldable and recycle able. First consider a typical thermoset polymer such as epoxy. To make this material, one first starts with the epoxy molecules. The epoxy molecules are relatively small [on the order of about 20–30 carbon-carbon (C–C links)]. This is relatively short as compared to the order of a few hundreds or thousands of C–C links for thermoplastic molecules. Since the length of the thermoset molecules is short, the material consisting of them usually has low viscosity and appears in the form of liquid at room temperature or moderately high temperature (about 100°C). Since the material appears in liquid form, in order to make a solid out of it, the molecules must be tied together with molecules of some other type. The tying molecule matrix materials are called the curing agents. They have good thermal stability and chemical resistant and show low creep and low viscosity. The disadvantages of thermoset polymer are long fabrication time and slow cross linking and solidifying processes [5]. They can be easily brittle and fail at low strain. The example of thermoset matrices are polyesters, epoxies, vinyl ester and phenolic.

Epoxy

Epoxy is a thermosetting resin containing one or more group of epoxide. A three member rings with one oxygen and two carbon atoms. They are used in resins for prepregs and structural adhesives. The advantages of epoxies are high strength and modulus, excellent adhesion, low shrinkage, good chemical resistance, and ease of processing. The disadvantages of epoxy are brittleness and the reduction of properties in the presence of moisture. The processing or curing of epoxies is slower than polyester resin. The cost of the epoxy is also higher than the polyesters.

Polyester

The term polyester is used for orthophthalic polyester resin or isophthalic polyester resin. These resins are generally inexpensive and fabrication processes is fast and they are generally used for low cost applications. The advantage of polyester is low cost and its ability to process quickly, thermal stability dimensional stability, creep resistant.

Phenolic

The phenolic polymers are condensation polymers that are based upon two types of chemical reaction. The reaction may contain excess of formaldehyde with a base catalyst and phenol and vice versa. The basic difference between these two chemicals is the no of

methylol groups in the novolacs and the resulting need for an extension agent of paraformaldehyde, hexamethylenetetramine, or additional formaldehyde as a curative. These resins have higher molecular weights and viscosities than their parent materials.

Thermoplastic

Thermoplastic molecules can be very long. Each molecule may contain up to several hundreds or thousands of C–C links. Due to high molecular length, it is difficult for these molecules to move around at room temperature. In order for these molecules to be able to move relative to each other, high temperature needs to be applied. The viscosity of these resins is large even at high temperature. However when the material is cooled down, it becomes solid fairly quickly. The processing time should be much shorter (it takes several minutes) as compared to thermoset resins (it takes several hours or days) the time is required to complete the linking reactions. The advantages of thermoplastic resins in thermoplastic composites are given below

- 1) The thermoplastic resin does not become hard even they are place for a long time.
- 2) Short process cycle.
- 3) Thermoplastic resin has higher ductility.
- 4) Thermoplastic resin can be melted and reuse i.e. they are recyclable.
- 5) Defects in thermoplastic composites can be recover by heating [5].

Laminates

When there is a single ply or a lay-up in which all of the layers or plies are arranged in the same direction, the lay-up is called a lamina. When the plies are arranged at different angles, the lay-up is called laminate. Continuous-fiber composites are laminated materials in which the single layers or plies are oriented in the direction that increases the strength in the primary load direction. Unidirectional (0°) lamina is very strong and stiff in the 0° direction. However, they are very weak in the 90° direction because the load is carried by the weaker polymeric matrix. While the matrix distributes the loads between the fibers and stabilizes the fibers and prevents them from collapsing in compression. Fiber orientation has direct impact on the mechanical properties depends on that how many layers are present in the direction of load. It is necessary to balance the load bearing capacity in all direction i.e. $0^\circ, +45^\circ, -45^\circ, +90^\circ, -90^\circ$ directions. If the laminate contain equal layers in all directions is known as quasi-isotropic laminates [6].

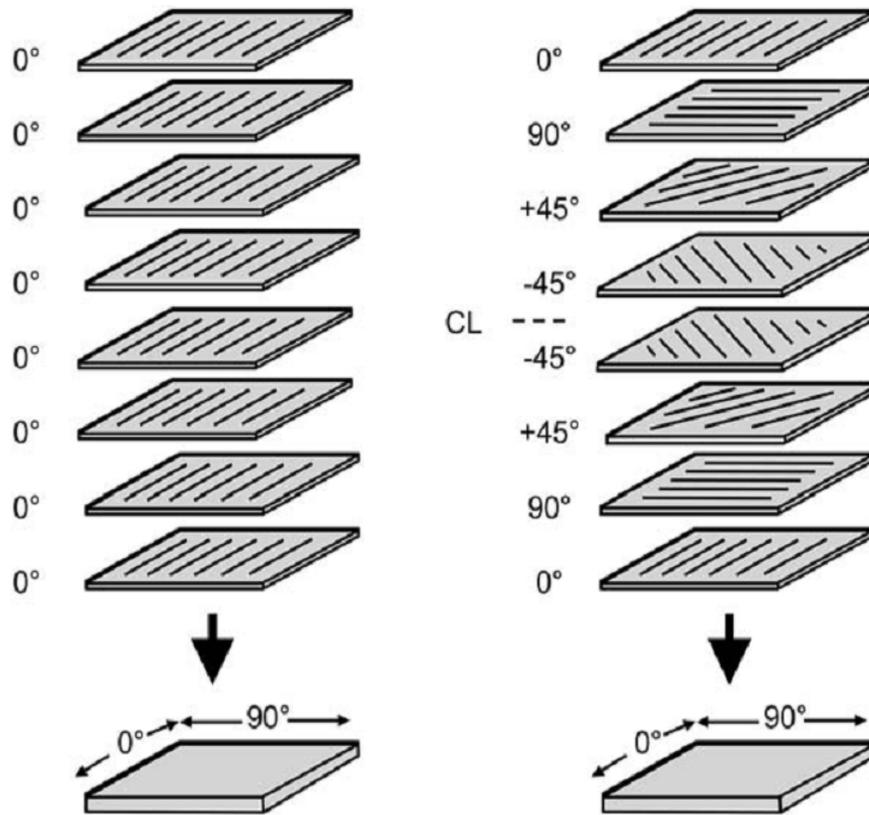


Figure 1.1 Unidirectional lay-up and quasi isotropic lay-up Processes

There are different methods for the fabrication of the composites that are given below

- Open Mold Processes.
- Close mold processes.
- Continuous processes.

There are two important stages in all molding processes:

- (i) Laying
- (ii) Curing

- **Laying**

The laying is the process in which molding materials are laid in the mold cavity or on the mold surface that conform the shape of the part to be fabricated.

- **Curing**

The process of curing helps the resin to set, thereby providing the fabricated part a stable structural form.

Open Mold Processes

Late in 1950's when resin is cured with the air develop the contact molding processes. This is used for manufacturing composites of all shapes sizes and complexities with relatively less investment. Only one mold is required male or female. There are three main techniques used in contact molding i.e.

- Hand lay-up.
- Spray lay-up.
- Roller saturator.

Gel coating

The durability of a composite molding depends on the quality of its exposed surface. The protection of the surface is achieved by providing resin rich outer layer. Special care should be taken while applying gel coat. While applying the coating we should take care of many things i.e.

- (1) Thorough mixing of gel coat, particularly adding catalyst, an inadequate catalyst mixing results in uneven cure of gel coat. Poor mixing of pigment results in the imperfection of outer layer. In order to avoid the mixing problems, we use low shear stirrer.
- (2) The gel-coat may be applied by brush or spray.
- (3) The thickness of the gel-coat ranges from 0.4mm to 0.5mm using 450g to 600g/m² to get required thickness. If the thickness is too thin then it may not be perfectly cure and may also come in attack with solvent from resin. If the layer is too thick then crack may be produce and more sensitive to impact damage. Gel-coat of uneven thickness cures at different rates on the surface.
- (4) In order to achieve full curing and optimum performance, we have to maintain the proper required conditions i.e. surrounding temperature must be 18°c medium reactivity MEKP catalyst and always used 2% addition level.

Once the gel-coat cured completely then the next step in the contact molding is applying back laminating. The backing laminate is applied after this simple test to check that gel-coat is ready for coating touch the gel-coat with the clean finger if the coating feels tacky and your finger remain clean then it will be ready for laminating.

Laminating

Hand lay-up

When the layer of the gel-coat is cured sufficiently then apply the first layer of the resin with hand evenly as much possible. Then place the reinforcement on its place and consolidate it with brush or roller in this process. The resin is completely impregnate in to the reinforcement and further resin is added if required before applying the more layers make sure that the first layer is free of air bubbles. The amount of the resin apply is calculated by weighing the reinforcement. The impregnation of the reinforcement can be carried out with brush or polyester roller. If we use brush that work with stippling action and that may displace the fiber and destroy their random nature. So if we work on large scale then we use roller that are available in different piles i.e. long and short pile.

One above the other layers of resin and reinforcement are spread until the required thickness is not achieved. But make sure that each layer is thoroughly impregnated and solidified. In order to prevent from the exothermic heat it is recommended that four layers of resin and reinforcement are to be placed in one time because that heat produces cracks in the gel-coat and pre-release distortion.

Where thick laminate is required then we follow the series of four layers and then cool and avoiding lengthy delay while placing the layers. In spite the resin with long green stage is not use.

In order to strengthen the mold the ribs should be reinforced in to the laminate that can be inserted at any stage depending on the shape and size of the mold. Generally it is best to reinforced before the last layer. Rib former is covered with the reinforcing material and thoroughly impregnated into the resin and then apply the last layer over the whole surface to get uniform appearance.

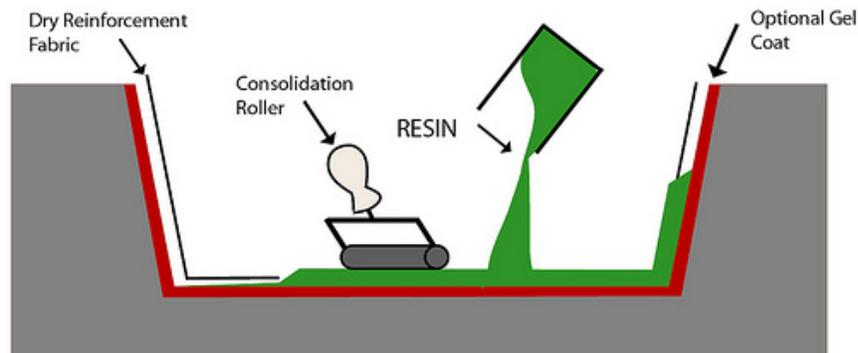


Figure 1.2 Line diagram of hand lay-up process

Spray lay-up

In this technique spray gun is used to deposit chopped glass and catalyzed resin onto the surface of the mold. Chopper gun is attached with the spray gun that chops glass roving into specific length and is directed toward the catalyzed resin as it exits the spray gun. The resin should be of low viscosity so that it can easily wet out the entire chopped strand and can easily atomize into desire pattern. Which allow the repaid solidification of the mold. In-order to remove the air bubbles thorough rolling of the laminate is necessary. Now a day many commercial pumps are available due to their higher output. For the production of large molding the pump system is more common.

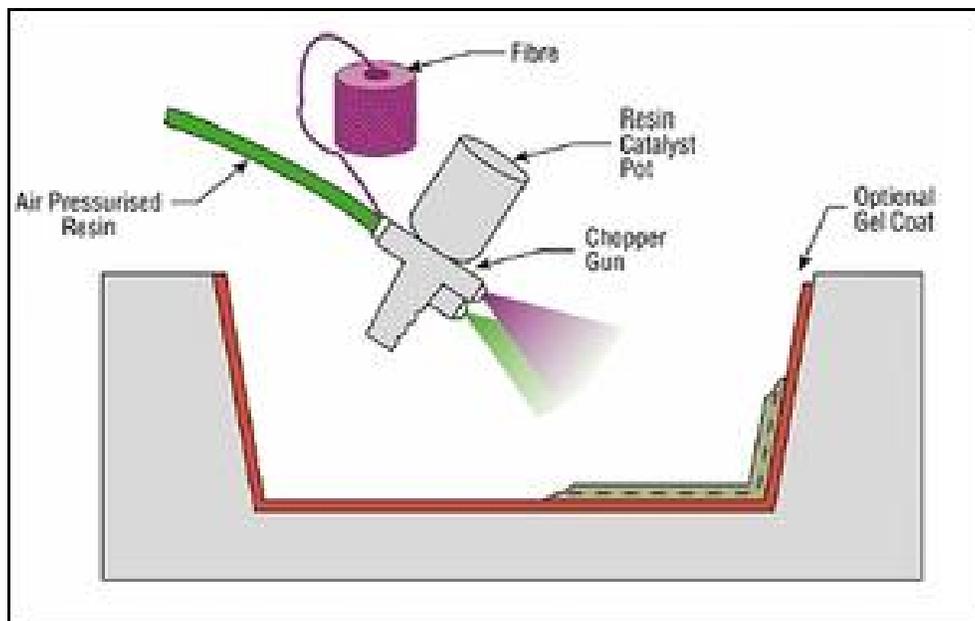


Figure 1.3 The line diagram of spray lay-up process

Roller/ saturator lay-up

Roller/saturator is an equipment that is use to saturate the reinforcement with the activated resin. The resin is held in the container and the pump is connected with the roller head. Roller/saturator is ideally used for large molding for example building panels. All methods in contact molding are cold cure. So laminates can take several hours to mature. This can be accelerating by applying heat. For gel-coat the temperature rise up to 30 – 35⁰c it is necessary to cool the gel-coat before applying backing laminate. Once the laminating is

complete then rise temperature up to 35°C before gelation. After gelation the temperature is increased up to 60°C and keeps under this temperature for 1 hour and then cool down under ambient temperature before removing from the mold.

Closed mold processes

Contact molding process remains dominant in composite manufacturing industry for long period of time, but they have many environmental and quality issues. Closed mold processes cover large area of these issues. Now a day closed mold processes cover wide range of production and have many advantages over the contact molding

Vacuum infusion

In this process open mold is used with little or no modification. In which dry reinforcement is placed between the rigid air tight mold and flexible vacuum bag. Then sealed the edges of the mold with the tape and placed this cavity under the vacuum in order to compact the reinforcement.

Then catalyzed resin is introduced into the mold through injection at the edge of the equipment as shown in the figure 1.4. When the resin is injected it follows through the parameters and at the end in the center. When the part is cured. Then remove the bag and the component from the mold. The resin used in this process is of low viscosity [7].

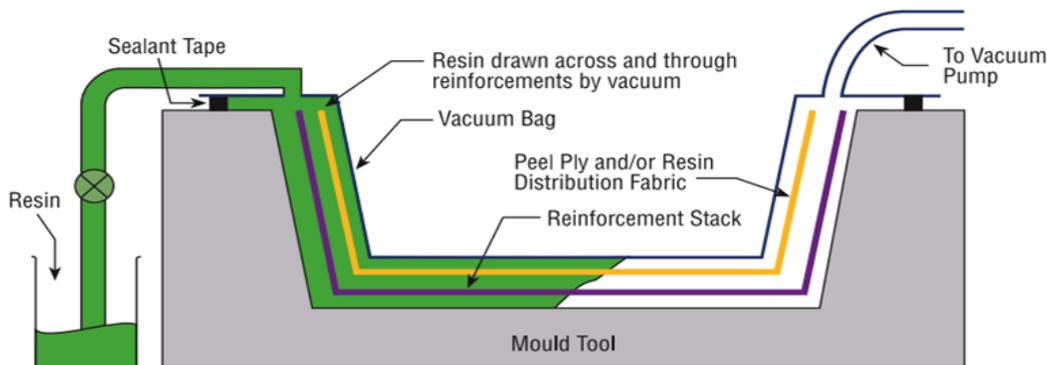


Figure1.4 Schematic diagram of vacuum infusion

Resin transfer molding: RTM

The basic of resin transfer molding is to spread the dry continuous reinforcement into the mold and then closed the mold boundaries and injected the catalyzed resin. When the resin is spread completely then allow for curing.

Continuous processes

They are used to produce to the composites component such as sheeting and pipes; they are suitable for the long continuous production. Some of the processes are describe below.

Pultrusion

This process is used to produce the components of uniform cross-section with exceptional properties. Earlier on this process is used to produce simple items but after lots of developments now this method is used to produce the items of complex dimensions [8],[9]. Pultrusion is some extent similar to the metal extrusion process. In the composite pultrusion process, continuous fiber reinforcements in structural sections can be manufactured by pulling the resin coated filaments by a die not just like the metal extrusion process, where hot metallic bars and rods are pushed through a die to manufacture extruded parts. Continuous fiber strands taken from a number of spools and consecutively pulled through a resin bath and a shaping guide/hot die as shown in the figure. The fibers are treated in the resin bath and the surplus resin is pressed out. When passing through squeezing rollers. The die guide delivers a

gradual change from a simpler to a more complex pre-formed shape near to that of the pultruded part. Constant component mats and woven fabrics can also be drawn along with filament strands to provide better transverse properties to the pultruded segments. The die is a very hazardous part in the fabrication process. It is typically made of chromium plated steel and should have an extremely flat surface. A smooth surface prevents sticking of the resin at the entrance segment, where only the gelation of resin, but not curing has been started.

Thermosets like epoxies and polyesters are normally used in the pultrusion process.

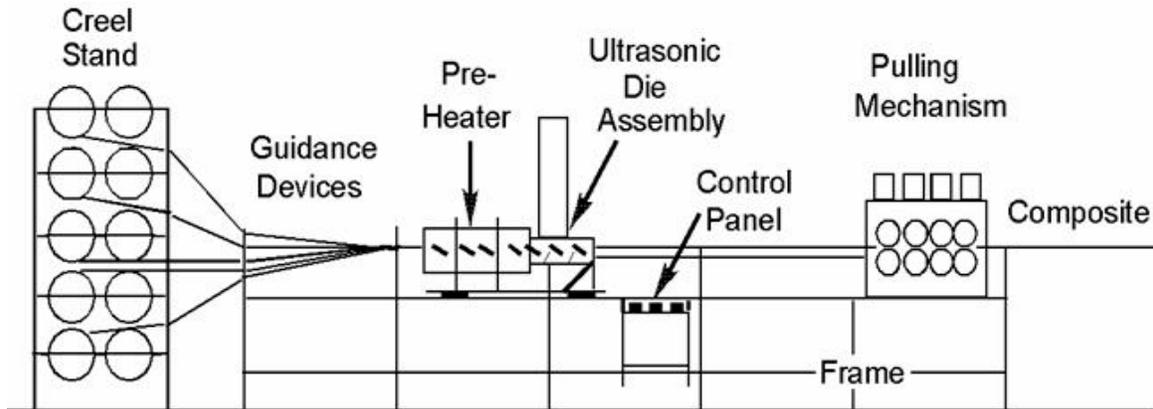


Figure 1.5 Schematic diagram of pultrusion

Filament winding

The filament winding process is active for fabrication of a continuous fiber reinforced composite structure having circular shape. Common examples are hoses, pipes, cylindrical tanks, pressure vessels, speed motor cases, etc. Continuous fiber strands or roving's are first coated with resin in a resin bath and then passed through rollers to squeeze out excess resin and finally wound, under constant tension, around a portable mandrel. The mandrel is typically prepared of steel. However, other materials like plastic foam and rubber are also used in fabrication of some mandrels. A steel mandrel can be so designed that it can be pull to pieces mechanically and removed part by part without damaging the filament wound composite part.

There are two types of filament winding patterns like helical winding and biaxial winding. In the method of helical winding, a constant angle, which is also known as helical angle, is maintained by controlling the rotational and axial motions of the mandrel. By reversing both axial and rotational motions, the filaments are wound with a minus helical angle.

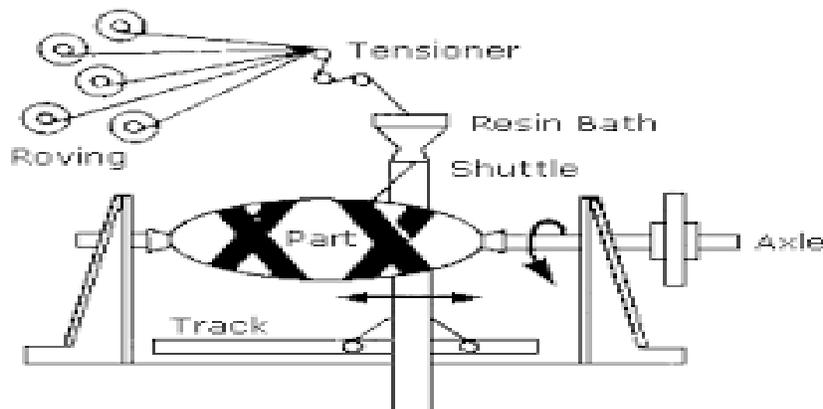


Figure 1.6 Schematic diagram of filament winding

Green composites

The fully green composites of natural fibers and biodegradable resin has attract many researcher to-ward this topic because of their low cost renewable resource usage and biodegradability. These composites have application in blended textiles, carpets; conveyer belt etc. green composites are made from flex, jute, hemp, pineapple leaf, sisal, ramie, banana fibers, corn stalk etc.

Advantages of Green Composite over traditional composites

- Less expensive.
- Reduced weight.
- Increased flexibility.
- Renewable resource.
- Sound insulation.
- Thermal recycling is possible where glass poses problems.
- Friendly processing and no skin irritation.

Fully biodegradable high strength composites or 'advanced green composites' were composing by using recycle protein base resin and high strength cellulose base fibers. For their comparison they use E-glass and aramid fibers and use recycled protein resins and then compare mechanical properties such as tensile strength and flexural rigidity etc. there comparison give the idea that they are used in primary structural based applications. That in future they will be replaced with petroleum based fibers and resins and at the end of their life they are easily dispose with-out harming the environment. To build advanced green composites, three things are essential: high strength fibers, resins with improved properties and good fiber/resin interfacial bonding [10].

Green composite were manufactured by using soy based bio plastic and pineapple leaf fibers using injection molding and compare their thermal properties, mechanical properties the improvement in the properties of the composites is just because of their combine effect i.e. resin and reinforcement [11].

As the environmental awareness and environmental risk are increases. Green composites have attained much more research consideration, as they have the potential to be attractive than the outdated petroleum-based composites which are poisonous and non-biodegradable. Just because of their lightweight, pleasant processing and acoustic protection. Green composites extensively used from aerospace applications to household use product. The green composites are not only replacing the traditional materials i.e. steel and wood but also replaceable with certain non-biodegradable polymer composites. This research has been conducted to classify the several types of green composites on the basis of their physical, chemical, and mechanical properties [12].

Mechanical behaviors of staple Kevlar fiber-reinforced thermoplastic polyurethane (TPU) have been studied with respect to fiber orientation. The strength of the composite is enhanced at higher fiber content with a minimum at 10 (PHR) pounds of the ingredient would be added to 100 pounds of resin. Anisotropic property in strength is obviously observed beyond 15 PHR fibers packing. Impact strength is reduced sufficiently at all fiber filling irrespective of fiber orientation [13].

A composite based on natural flax fiber and recycled high density polyethylene was made by a hand lay-up and compression molding technique. The mechanical properties of the composites were measured under tensile and impact loading. It is observed experimentally the changes in stress–strain characteristics, yield stress, tensile strength, and tensile (Young's) modulus, ductility and toughness, all as a function of fiber content. A substantial improvement of toughness of the composite can be qualitatively described in expressions of the principal distortion and failure mechanisms recognized. These mechanisms were controlled by delamination

cracking, by crack linking processes, and by widespread plastic flow of polymer-rich layers and matrix distortion around fibers. Developments in strength and stiffness with high toughness can be accomplished by varying the fiber volume fraction and governing the bonding between layers of the composite [14].

Much academic research and industrial improvement discovers new ways to create greener and environmentally friendlier chemicals and materials for a variety of applications. A significant part of this work focuses on the development, processing, manufacturing, recycling and dumping of green plastics, adhesives, polymer composites, amalgams and many other industrial products from renewable resources.

Natural fibers offer the prospective to deliver greater added value, sustainability, renewability and lower costs especially in the automotive industry.

Further research includes the fiber crop production. The ever-increasing volume of scientific literature refers with passion to the potential of natural fibers in technological, financial and environmental relationships. This keenness tends to enlarge the areas of human life and socio-economic development for the fiber crop farmers and their societies.

However, there is very little discussion or indication to support declarations about the assumed benefits for the affected population in rural areas. We claim that despite the projected new successful demand of natural fibers, it is doubtful that this will represent an actual development in the quality of life of crop fiber farmers and their communities.

The improvement of tough, high strength, high modulus fibers has controlled the use of fabrics and yielding composite laminates for a number of impact associated applications, such as turbine blade, fuselage safety and body shield. Plentiful studies have been accompanied to recognize material properties and system instruments that are significant to the performance of these ballistic textiles [15].

The stress–strain curves of kevlar49 aramid fiber packages under both quasi-static filling and high rate packing were attained. The strain rate ranges from $10^{-4}/s$ to $10^3/s$. Based on a bimodal Weibull scattering statistical model of strain-rate requirement of fibers and a test technique of defining mechanical properties and Weibull constraints of fibers from fiber bundle test, the rate dependence of kevlar49 fiber strength is planned. Experimental results displays that kevlar49 fiber has sensitivity to strain rate. Consistence of simulated and experimental results shows that the model is effective to clarify the mechanical behavior of kevlar49 fiber and the test method is possible and dependable [16].

Carbon fiber, Kevlar 49 fiber and carbon-Kevlar 49 hybrid reinforced epoxy laminates, containing 0° , 90° and 45° layers, were exposed to drop load and ball rifle impact at incident energies up to 18 J. Remaining tensile, flexural and shear strengths were measured after impact. It was revealed that a hybrid composite can have meaningfully better overall impact properties than laminates reinforced with only one type of fiber. Tests on one directional laminates presented that the stagnant mechanical properties of hybrid composites were not as good as all-carbon fiber reinforced composites; for multidirectional laminates the variance was less [17].

2. OBJECTIVES OF GREEN COMPOSITES

- Ecological results have caused in renewed attention in natural materials.
- Recyclability and environment friendly are becoming sufficiently important to the introduction of products.
- The resins and fibers used in green composite are degradable and decomposed when subjected to microorganisms.
- They are decomposed into water and carbon di oxide and absorbed by the plant system.
- To improve mechanical properties.
- To improve moisture resistance.
- To improve thermal properties.

- To improve process ability.

3. MATERIALS AND METHODS

Material

There are two types of materials are used.

- Virgin Kevlar fabric
- Regenerated Kevlar fabric
- epoxy

Virgin Kevlar fabric

Composites consist of two materials one behaves as a reinforcement and other behave as a resin. We used virgin Kevlar fabric as reinforcement. The fabric is made up of the warp and weft yarns having the count of 12 Ne. The fabric is made on the projectile loom. The G.S.M of the fabric is $104\text{g}/\text{m}^2$. The construction of the fabric is... the fresh Kevlar fabric is used as reinforcement in the composites. We cut the fabric pieces of $200\times 200\text{mm}$ for these composites samples. We made four composites samples from the fresh Kevlar fabric each having different numbers of fabric layers and different stacking sequence

Regenerated Kevlar fabric

The regenerated yarn is made from regenerated Kevlar bobbin in yarn manufacturing department, National Textile University, Faisalabad. Fabric manufacturing is done on sample loom at Sapphire Textile Mills, unit # 06, Sheikhpura. The warp and weft having the count of 20 Ne. The G.S.M of the fabric is $102\text{g}/\text{m}^2$. We use plan weave 1/1 for fabric manufacturing. The regenerated Kevlar fabric is used as reinforcement in the composites. We cut the fabric pieces of $200\times 200\text{mm}$ for the composites samples. We made four composites samples from the regenerated Kevlar fabric each having different numbers of fabric layers and different stacking sequence of these layers.

Epoxy

Epoxy is used as a resin. It is in the form of yellowish liquid having mild odor. Its flash point is greater than 250c^0 . It is partially insoluble in water. At 20c^0 its relative density is about $1.16\text{ g}/\text{cm}^3$. We add 50% resin by weight to the weight of the total layers of the fabric to whom we are going to make the composite sample. We use epoxy because of its resistant to environmental degradation, resistant to water degradation, low viscosity and easily process able. That is why it is uses in automobiles, air crafts, boats hulls etc.

Equipment

The equipment includes all the instruments and machines used for preparation and production of samples, testing of samples and confirmation of results.

Production of samples

Fabric samples were prepared on sample loom. That made the fabric from single cone using 1/1 plan weave. It uses a solid picking media like rapier for pick insertion. The specifications of sample loom and the process flow chat is given below.

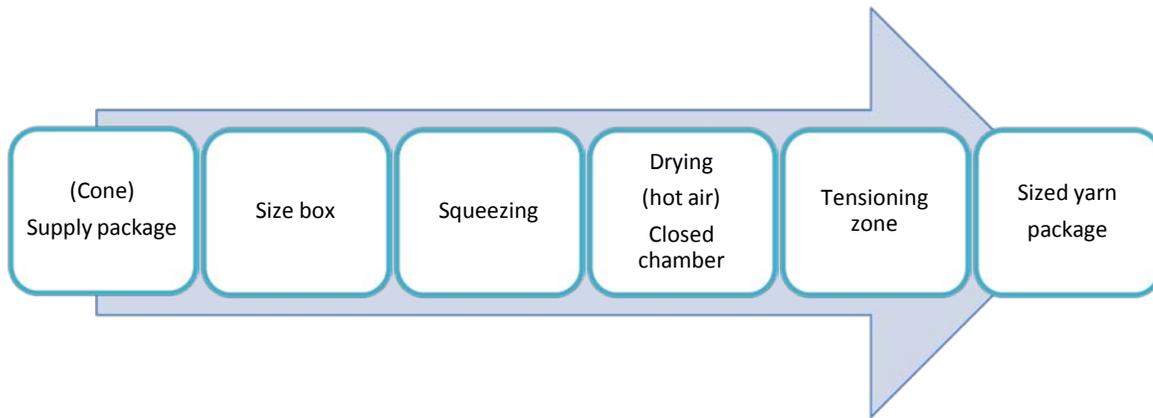


Figure 3.7 Process flow of sample sizing



Figure 3.8 Sample loom

Table 3.2 Sample loom specification

Part name	Specification
Working Width of warping	500 mm/ 20 inches
Warping Length	3.6m
Weaving Width	20 inches
Speed of loom	45 ppm maximum
Weft Selector	8 colors electronic weft selection device

Fabric Take-up	Electronically controlled. Weft density can be changed freely within the same weave
Warp Let-off	Positive electronically controlled. Digital display of warp, optional Second beam assembly is available.
Shedding	Computerized controller. 20 heald frames Driven pneumatically by air (1st & 2nd heald frames are for leno and selvedges)
Drawing-in	Heald frames can be separated from the loom for healds and reeds drawing-in
Design	Built-in SEdit2 design and editing software. It could be installed separately on other PC for design works
Air Consumption	880L/min. (500 mm Width) / 1400 L/min. (900 mm width), Air pressure 5-7 kgf/cm ²
Power	220V Single phase, 50-60Hz

Vacuum bagging for fabrication of composite

The fabrications of the samples were done on the vacuum bagging apparatus. The different parts of the vacuum bagging were:

Vacuum pump

The objective to use the vacuum pump to evacuated the air from bagging film. The suction pressure of about -30bar were applied. It removed the voids and helped to ensure an even distribution of the resin on the fabric reinforcement layers.

Bagging film

Bagging film was placed around the laid-up composite material and covered the fabric reinforcement layers. The material of bagging film was nylon.

Bagging tape

It binds the bagging film with the surface and provides good adhesion for suction. Bagging tape is a butyl-based vacuum bag sealant giving high elasticity and tenacity.

Peel ply

The first sheet that goes against the uncured laminate is a release film or a peel ply that is used as an obstacle between the laminate and the subsequent bleeder or breather layers. This layer can be non-porous or spongy material depending on whether or not resin drain is necessary. Often a perforated release film is used for a well-ordered resin bleed. The diameter and the spacing of the holes can differ depending on the amount of resin flow anticipated. It allows free passage of volatiles and excess matrix during the cure. It can be removed easily after cure of composite sample.

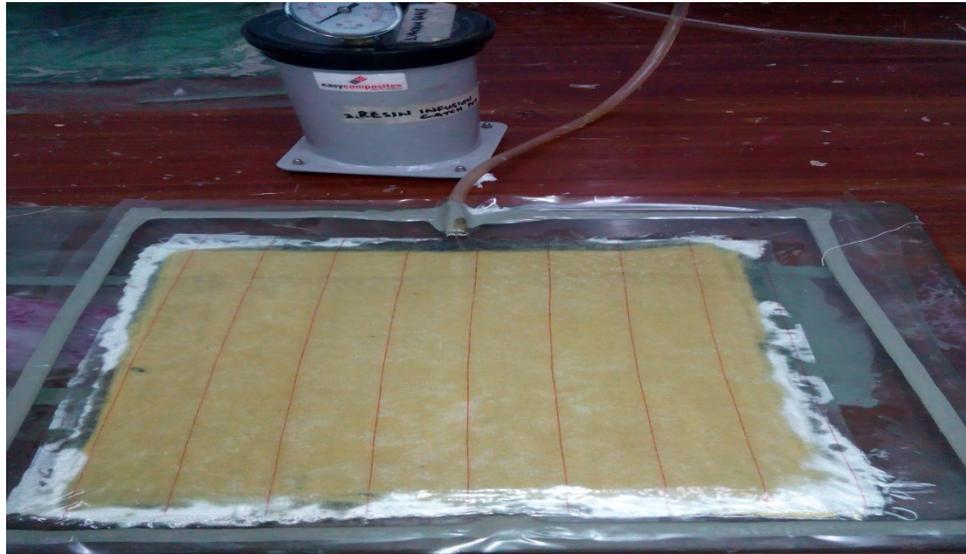


Figure 3.9 Vacuum bag molding technique

1.1 Production methods of composites

This section is used to describe the method for the fabrication of composites and the test that we perform on these samples.

1.1.1 Fabrication of composites

After it the samples were cut in to 200×200mm square shape. Eight and four layers were used for composite sample fabrication. Eighteen layers were cut at 0° and 90°. Six layers were cut at 45°. The layers were placed according to the below pattern.

1.2 Stacking sequence in composites samples

Stacking sequence in composite samples is given in the table

Table 3.3 Stacking sequences in composites samples

Sample ID	Stacking sequence	No of layers	Material
1	0/+90/-90/0	4	Fresh Kevlar fabric
2	0/+45/-45/0	4	Fresh Kevlar fabric
3	0/+90/-90/0	8	Fresh Kevlar fabric
4	0/+45/-45/0	8	Fresh Kevlar fabric
5	0/+90/-90/0	4	Regenerated Kevlar fabric
6	0/+45/-45/0	4	Regenerated Kevlar fabric
7	0/+90/-90/0	8	Regenerated Kevlar fabric
8	0/+45/-45/0	8	Regenerated Kevlar fabric

1.3 Laboratory and testing equipment

Two types of the composite testing were done:

1.4 Impact strength tester

Impact strength test was done in Steam Power Station Faisalabad. All the samples were cut in the 50×10mm dimensions. Manually bring the two sides on to the top as shown in the figure 2.3 and then set the reading at zero. Then insert the sample vertically in to the notch by pushing the notch. Then release the lever that automatically unclamps the two jaws and they cross each other and sample get strike and break and note the reading from the meter. The unit of the impact strength is foot pounds. One by one the samples were placed in balanced impact tester and readings were noted.

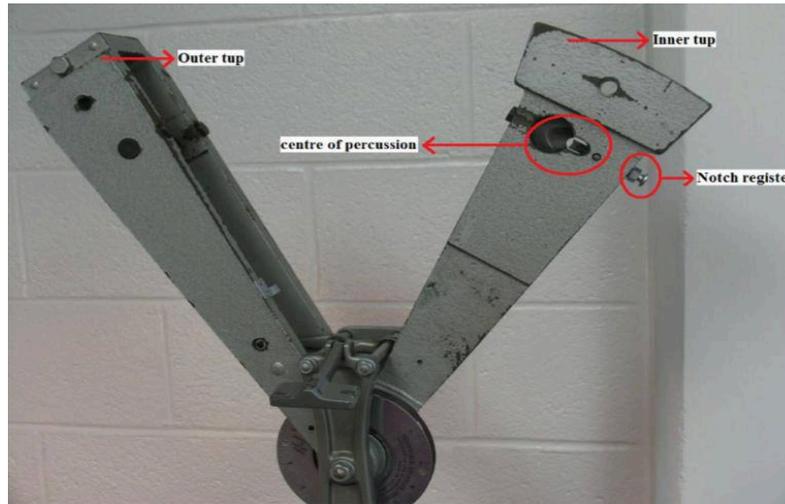
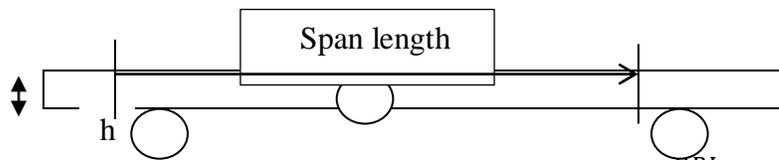


Figure 3.10 Impact strength tester

1.5 Bending strength tester

Bending strength test was done in NTRC of National Textile University Faisalabad. Bending strength the span to thickness ratio was done but commonly 32:1 used. This was three point bending strength while four point bending strength also used. The width of the sample was noted. It was 13mm. The thickness value was noted. Than multiply it with the 32 which give the gauge length of each sample. The five hundred Newton (N) load cell and hundred seconds per millimeter extension were noted. After it the corresponding maximum load force (N) value was noted. The bending strength was noted according to following formula. The samples are placed on the two jaws and start the machine. The machine start pushing the sample downward and automatically note the amount of load that is needed to bend the sample as shown in the figure 3.4



$$\text{Bending strength} = \sigma = \frac{3PL}{2bh^2}$$

Where L=gauge length

b=width of composite samples

P=maximum force applied (N)

h=thickness of composite samples



Figure 3.11 Bending strength tester

4. MATERIALS AND METHODS

Testing of composite samples

The composite consist of two parts mainly one is in the form of continuous phase known as matrix and the other is in the form of discontinuous phase known as reinforcement. In this project we two types of fabric for reinforcement i.e. virgin Kevlar fabric and regenerated Kevlar fabric and using epoxy as a matrix. We have done two types of testing on these composites i.e. bending strength and impact strength there results are discuss below.

Bending strength of 4 layers composites

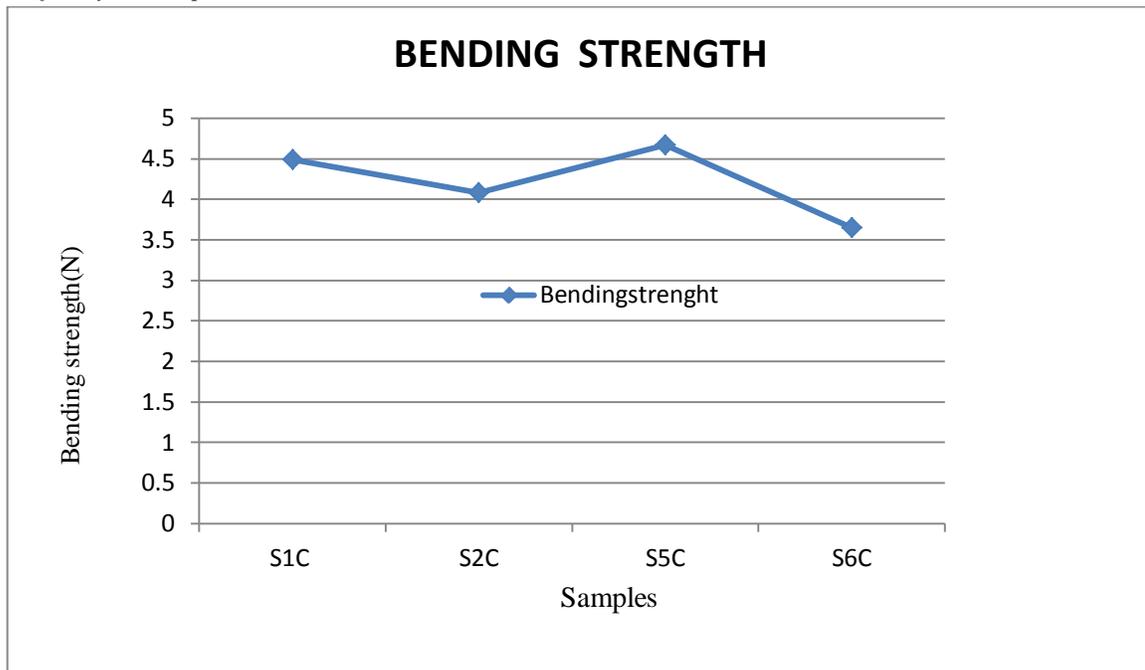


Figure 4.12 Bending strength of 4 layer composites

The figure represents the bending strength of the 4 layers composite samples. The sample S1C and S2C are made up of fresh Kevlar and S5C and S6C are made from the regenerated Kevlar fabric. Sample S1C and S5C have the stacking sequence of 0 ± 90 . The sample S2C and S6C having stacking sequence of 0 ± 45 . The bending strength of S5C is highest and S6C have lowest value. When force is applied on composite having stacking sequence of 0 ± 90 the force is distributed in two directions (x and y coordinate). The empty spaces are there between weft and warp yarns lie on x and y coordinates respectively and load is not distributed equally in all

directions. While in 0 ± 45 , the force is distributed along xy-plane and also in diagonal which is due to stacking sequence at 45° . There are warp and weft at perpendicular to each other and due to 45 angles there are no spaces between the fabric layers. So, when bending load is applied, the load is distributed to the whole structure of the fabrics so these composites are somehow flexible and bend easily so it has less values for bending load but 0 ± 90 have somehow rigid structure that's why it has greater values for bending load. If we talk about the material type used for the fabrication, we have used two types of materials i.e. fresh Kevlar and regenerated Kevlar. so if we check the results of bending test we will come to know that there are no such differences based on material types as values are much closer to each other and depends upon only on the stacking sequence we used.

Bending strength of 8 layers fabric

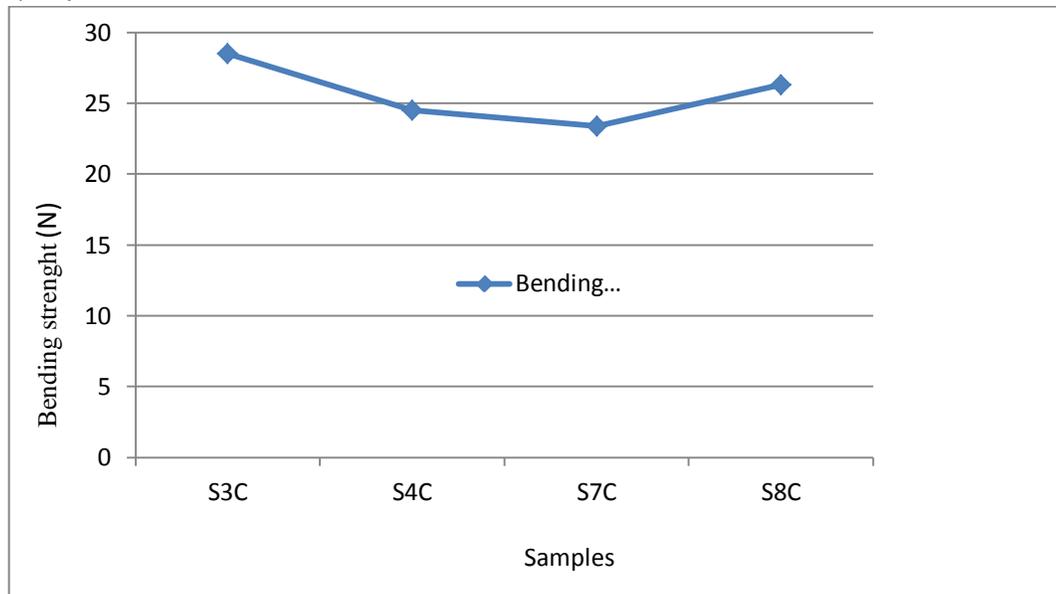


Figure 4.13 Bending strength of 8 layer composite

The figure represents the bending strength of 8 layers composites. S3C and S4C are made of fresh Kevlar fibers. S7C and S8C are composites made of regenerated Kevlar fibers. The stacking sequence of S3C and S8C is 0 ± 90 and for the composites S4C and S7C is 0 ± 45 . when load is applied on the composites having stacking sequence of 0 ± 90 , the force is distributed in two dimensions, show stiffness to bending and have higher values of bending strength as compared to the composites having stacking sequence of 0 ± 45 . The composites of 0 ± 45 have warp and weft along xy plane and having yarns at 45 angle which are in the diagonal of composites so, here applied load is distributed along three directions so it shows flexibility to the bending load and bent easily that's why these composites have lower values of bending strength as compared to composites having stacking sequence of 0 ± 90 . S3C has highest value and S7C has lowest value for impact strength as shown in figure 3.2

Impact strength of 4 layers composites

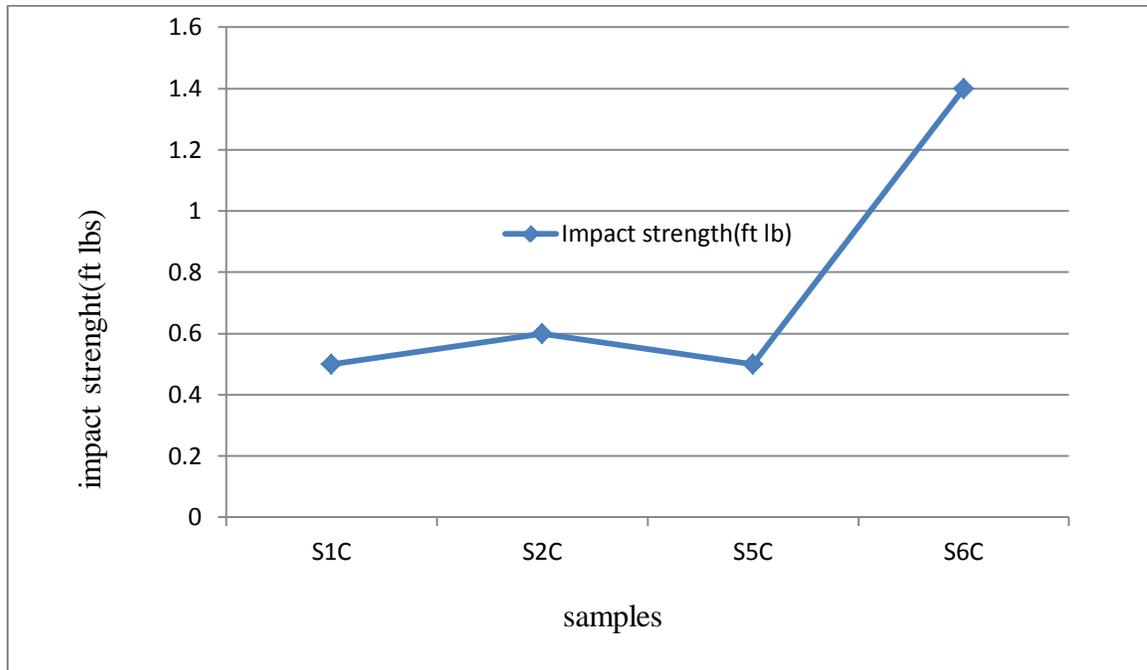


Figure 4.14 Impact strength of 4 layer composites

When we are dealing with impact strength, actually we have to study the behavior of the distribution of the impact force on entire structure. So we have to choose the materials which have greater force distribution properties, so we chose Kevlar fiber for its ballistic applications. The graph shows the 4 layers composite's impact strength values. S1C and S2C are made of fresh Kevlar. S5C and S6C composites are made of regenerated Kevlar. S1C and S5C have the stacking sequence of 0 ± 90 but the composites S2C and S6C have the stacking sequence of 0 ± 45 . S6C has the highest and S1C has the lowest value for impact strength as shown in figure. S2C and S6C has higher values as compared to S1C and S5C. The reason is that When impact force is applied on the composites having stacking sequence of 0 ± 45 , The force is distributed along xy-plane and also in diagonal which is due to stacking sequence at 45° . There are warp and weft at perpendicular to each other and due to 45° angle there are no spaces between the fabric layers. So, when impact load is applied, the load is distributed to the whole structure of the composites. In case of the composites having stacking sequence of 0 ± 90 , the applied force is distributed only in two dimensions so that it has less value of impact strength as compared to 0 ± 45 . It also shows some rigidity as compared to 0 ± 45 which is more flexible than 0 ± 90 composites.

Impact strength of 8 layers composites

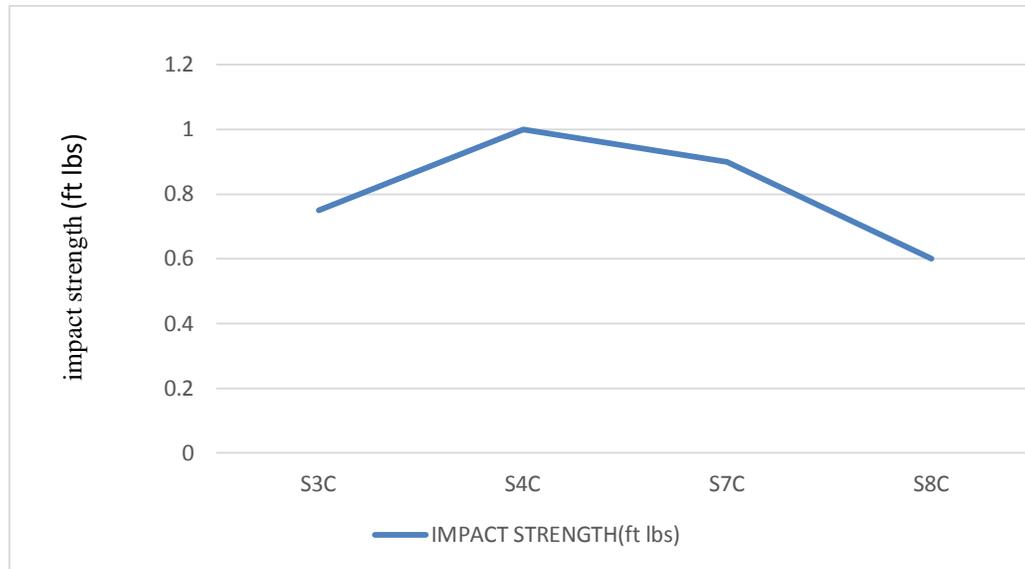


Figure 4.15 Impact strength of 8 layers composites

The figure shows the 8 layers composite's impact strength values. S3C and S4C are made of fresh Kevlar. S7C and S8C composites are made of regenerated Kevlar. S3C and S8C have the stacking sequence of 0 ± 90 but the composites S4C and S7C have the stacking sequence of 0 ± 45 . S4C has the highest and S8C has the lowest value for impact strength as shown in figure. S3C and S7C has higher values as compared to S4C and S8C. Actually When impact force is applied on the composites having stacking sequence of 0 ± 45 , The force is distributed along xy-plane and also in diagonal which is due to stacking sequence of 45° . There are warp and weft at perpendicular to each other and due to 45 angle there are no spaces between the fabric layers. So, when impact force is applied, the load is distributed to the whole structure of the composites. In case of the composites having stacking sequence of 0 ± 90 , the applied force is distributed only in two dimensions so that's why it has less value of impact strength as compared to 0 ± 45 .

5. CONCLUSION

It is concluded that the bending strength in 4 layers and 8 layers composites having stacking sequence 0 ± 90 is high this is just because when force is applied on composite having stacking sequence of 0 ± 90 the force is distributed in two directions (x and y coordinate). The empty spaces are there between weft and warp yarns lie on x and y coordinates respectively and load is not distributed equally in all directions. While in 0 ± 45 , the force is distributed along xy-plane and also in diagonal which is due to stacking sequence at 45° . There are warp and weft at perpendicular to each other and due to 45 angles there are no spaces between the fabric layers. So, when bending load is applied, the load is distributed to the whole structure of the fabrics so these composites are somehow flexible and bend easily so it has less values for bending load but 0 ± 90 have somehow rigid structure that's why it has greater values for bending load. If we talk about the material type used for the fabrication, we have used two types of materials i.e. fresh Kevlar and regenerated Kevlar. so if we check the results of bending test we will come to know that there are no such differences based on material types as values are much closer to each other and depends upon only on the stacking sequence we used.

The impact strength of the composites having stacking sequence 0 ± 45 is higher then those composites having stacking sequence of 0 ± 90 in both types of the composites having 4 layers and 8 layers. The reason is that the force is distributed along xy-plane and also in diagonal which is due to stacking sequence at 45° . There are warp and weft at perpendicular to each other and due to 45 angle there are no spaces between the fabric layers. So, when impact load is applied, the load is distributed to the whole structure of the composites. In case of the composites having stacking sequence of 0 ± 90 , the applied force is distributed only in two dimensions so

that it has less value of impact strength as compared to 0 ± 45 . It also shows some rigidity as compared to 0 ± 45 which is more flexible than 0 ± 90 composites.

6. FUTURE PERSPECTIVE

In future, the weave design of the fabric samples, made from regenerated Kevlar and virgin Kevlar could be changed from 1\1 plain weave to 3/1 twill and 4/1 satin and use as a reinforcement and phenol as a resin then compare their mechanical properties. Then find out the difference between their properties and conclude that how we can get results close to the virgin Kevlar composites for ballistic applications and auto mobile industries.

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A Novel Image Thinning Method for Signature Recognition System

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Abstract- Signature is considered to be an important behavioral biometric of a person and signature recognition is a relevant research area in the field of personal authentication. Hence signature recognition is a tedious process in the day to day life. Most of the signature recognition system is not efficient due to poor preprocessing, normally due to poor thinning methodology. In this work various thinning algorithms have been studied and comparisons among them were performed. But none of the thinning methods gives a convenient result. Hence a new method for thinning has been proposed, which gives an acceptable result compared to the existing algorithms.

Index Terms- Signature recognition (SR), Thinning, Skeleton, Morphological operation, Erosion

I. INTRODUCTION

Handwritten signature is one of the most widely authorized biometric features for authentication and identity of an individual. A signature is a handwritten depiction of someone's name and usually consists of combination of special characters or symbols. The writer of the signature is noted as the signatory or the signer. Signature recognition (SR) [1] is the process of identifying signature owner (the signer). The system is also capable of checking the authenticity of signatures [2]. That is to check whether the signature is forged or not. Each person has a unique handwritten signature written in his own style, but it can be differ at each time. Hence the signature recognition is a challenging problem in daily life [3]. Signature recognition system is applicable on many fields such as Bank cheque processing, Credit card transactions, Visa application, Academic certificates, and Governmental documents etc.

Thinning of signature image [4] is one of the major difficulties faced by the SR system. Thus the poor thinning strategy leads to misclassification of signatures. To thin an image various thinning algorithms [5], [6], [7] are used. But none of the algorithms gives a satisfactory result on the signature image. So the proposed work will focus on a new novel method for signature thinning. Thinning [8], [9] is normally a significant pre-processing step in signature recognition system to facilitate the structural analysis of an image. It is a morphological [10] operation commonly applied to binary images [11], [12] and produces another binary image as an output. The primarily use of thinning is to remove selected foreground pixels from the binary image by preserving overall structure of the image. Hence the output of thinning is a skeletonized image [13] with one pixel width. The processed skeleton possesses some of the characteristics such as connectivity preservation, single pixel

width preservation, Prevention of excessive erosion and conservation of important attributes of an image. In general thinning is a reduction process and its benefit in signature recognition system includes topological property preservation, morphological feature extraction, Data reduction, Complexity reduction etc. Hence in the day to day life thinning of signatures is a necessary criterion for proper classification of SR system. Signature Recognition system is classified into several phases. Fig. 1 shows the flow chart for SR system.

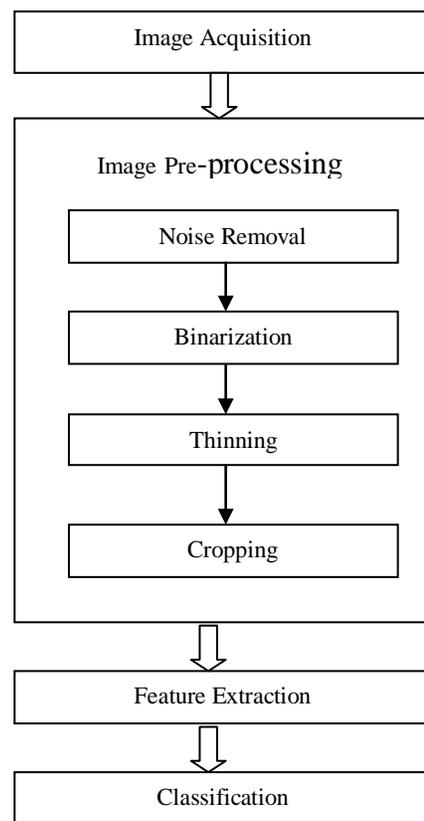


Figure1. Overview of SR system

II. RELATED WORKS

Thinning algorithms should perform thinning effectually by successive deletion of object pixels (changing them to background pixels) along the image until it becomes one pixel width. There is a collection of thinning methods including Hilditch, ZS, LW, Guo-Hall, WHF, Enhanced parallel and Arabic parallel.

The Hilditch algorithm [14] is mainly used to thin the image edges. The algorithm checks all the pixels and decides to change a foreground pixel to background if these conditions are satisfied: the number of nonzero pixels in the 8-neighbourhood of processing pixel P are in the range 2 to 6; the number of 0, 1 patterns in the 8-neighbourhood of processing pixel P is exactly one; the two pixel wide horizontal and vertical lines do not get completely eroded. The main problem of the method is that it is more concentrated on thinning the image edges; it is less effective to thin the whole image and also produce unwanted branches in the thinned image.

The zhang suen (ZS) [15], [16] algorithm is a parallel thinning algorithm, which is simple and fast to be implemented. The algorithm performs sub iteration twice on the corresponding pixels. Here new rules for unwanted erosion of two pixel width lines are introduced. The algorithm removes boundary points identified from the image pattern parallel. The drawback of this method is that slanting lines with two pixel width are appeared and also possess discontinuity in image due to loss of pixels in the slanting lines.

The LW algorithm is proposed in order to solve the problem of ZS. The LW [6], [17] is a modified form of ZS. Here only a single condition in ZS is replaced. Using the modified condition it can preserve the 8-connectivity. So that the slant lines are retained but they are of two pixel width. Sometimes it also suffers with the complete elimination of two-pixel wide horizontal and vertical lines.

Guo-Hall's [15], [18] thinning is a two sub-iteration thinning algorithm suggested to preserve the end points and also removes the redundant pixels. Compared to ZS and LW, the Guo-Hall algorithm produce thinner skeletons by deleting the redundant pixels but the resultant skeleton is very poor in nature. The algorithm gives results in less number of iterations but it does not preserve the structure.

WHF [17] algorithm is a modified form of LW algorithm. It will resolve the problem of LW algorithm. In most cases it can produce one pixel width but sometimes it makes needless trees in the image and does not preserve 8-connectivity.

Enhanced parallel thinning [17] algorithm is a modified form of ZS algorithm. Here some additional conditions are added into each pass of the algorithm. This may helps to erase the remaining lines with two pixel width. This algorithm can extract one pixel slim lines by removing the undesirable branches in the image. It can also preserve the connectivity in the image.

In the Arabic parallel thinning [17] algorithm the input pattern is scanned from upper left corner to lower left corner in each passes. The algorithm contains 4 sub-iterations instead of 2 in the previous algorithms. Here the pixel connectivity and end point pixel preservation are checked. Since the algorithm passes through multiple iterations the presence of unwanted branches

became reduced. This algorithm can gives one pixel width image but the image is not completely free with spurs.

Hence none of the above methods give an effective thinning on hand written signature images. So we proposed a new thinning algorithm.

III. PROPOSED METHOD

The proposed method is a new parallel thinning algorithm, which improves all of above existing algorithms. The new algorithm preserves all the characteristics of a skeletonized image. They include basic requirement like connectivity, one pixel width and end point preservation.

The proposed thinning algorithm uses a 3*3 neighborhood mask around the current pixel P. Fig. 2 shows such a mask for pixel removal. Thus a set of rules for deletion of foreground pixels are applied based on pixels in the neighborhood.

P ₈	P ₁	P ₂
P ₇	P	P ₃
P ₆	P ₅	P ₄

Figure2. 3*3 mask for pixel removal

The algorithm for the proposed method is as follows: Here in each pass of the algorithm contains four iterations and for each iteration the first two conditions are same.

Algorithm

1. $2 \leq N(P_i) \leq 6$ (The number of nonzero pixels in the 8-neighbourhood of processing pixel P are in the range 2 to 6)
2. $S(P_i) = 1$ (The number of 0, 1 patterns in the 8-neighbourhood of processing pixel P is exactly one)

First iteration

3. $P_2 * P_4 * P_6 = 0$
4. $P_4 * P_6 * P_8 = 0$

Second iteration

3. $P_2 * P_6 * P_8 = 0$
4. $P_4 * P_6 * P_8 = 0$

Third iteration

3. $P2 * P4 * P8 = 0$
4. $P2 * P6 * P8 = 0$

Fourth iteration

3. $P2 * P4 * P6 = 0$
4. $P2 * P4 * P8 = 0$

Fifth iteration

3. $P1 * P8 * P6 = 1$ & $P3 = 0$
4. $P3 * P4 * P6 = 1$ & $P1 = 0$
5. $P5 * P6 * P8 = 1$ & $P3 = 0$
6. $P4 * P6 * P7 = 1$ & $P1 = 0$

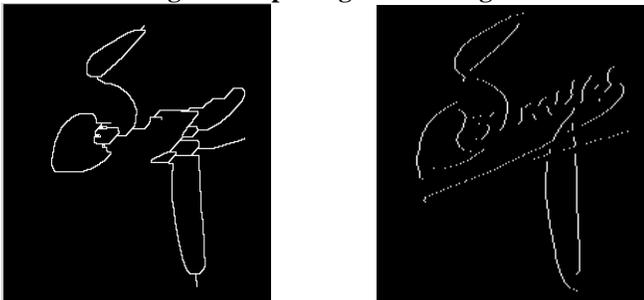
Here the first condition ensures that no end point pixel and no isolated pixel be deleted. The second condition provides a connectivity test, in which is no image pattern be disconnected. The remaining conditions perform removal of two pixel wide horizontal and vertical lines in all directions.

IV. EXPERIMENTAL RESULTS

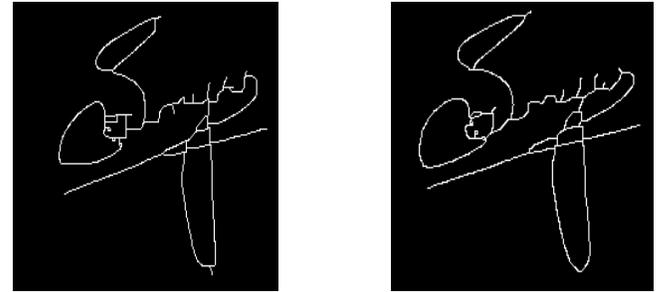
Various image thinning methods such as Hilditch, ZS, LW, Guo-Hall, WHF, Enhanced parallel and Arabic parallel has been performed in MATLAB 2014a platform on a sample of 325 input images collected from various persons in different situations. The results show that none of the above algorithm provides an effective thinning on signature images. In most cases the thinning is improper because which results discontinuities and unwanted branches in the thinned pattern. But the results showing that the proposed method gives an efficient thinning. Fig. 3 shows the input signature image and Fig. 4, Fig. 5 shows the results of existing and proposed thinning methods respectively.



Figure3. Input Signature Image



(a) (b)



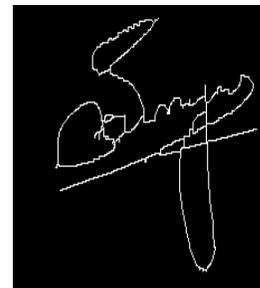
(c)

(d)



(e)

(f)



(g)

Figure4. Result of different thinning methods (a) Hilditch, (b) ZS, (c) LW, (d) Guo-Hall, (e) WHF, (f) Enhanced parallel, (g) Arabic parallel

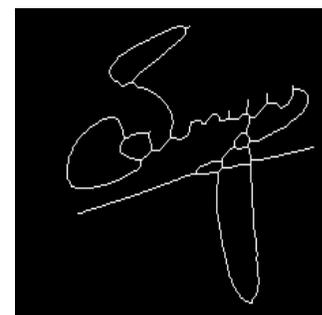


Figure5. Result of proposed thinning method

V. CONCLUSION

In this work different methods for thinning of signature images was studied and based on the information obtained from literature survey some of the thinning methods (such as Hilditch, ZS, LW, Guo-Hall, WHF, Enhanced parallel and Arabic parallel) have been implemented. But none of the implemented methods provide a proper thinning of signature images. Hence new thinning algorithm has been proposed, which gives an effective result. The proposed work preserves all the characteristics of signature image such as one pixel width, connectivity and spurs removal. It also helps to extract critical features for proper classification of signatures.

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Histogram Based Connected Component Analysis for Character Segmentation

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ABSTRACT- Segmentation is the major part of any character recognition system. The efficiency of recognition can be improved by imposing an effective segmentation method. In Malayalam handwritten character recognition system character segmentation is more complex due to the varying writing styles and conjunction between the characters. There is a vast no of researches have been done in this field of Malayalam handwritten character recognition. In this paper various existing methods are analyzed and a method is proposed for effective segmentation.

INDEX TERMS- Character Recognition, Segmentation, Projection Analysis, Connected Component Analysis.

I. INTRODUCTION

Character recognition has been a most active research area in the field of pattern recognition system. There is a large number of algorithms have been proposed for the same domain. What it matters is how efficient the algorithm and how feasible it is. A very good segmentation technique can improve the efficiency of recognition. There have been reported effective techniques in the field of other languages but it is more complex to find an efficient segmentation technique for Malayalam handwritten documents. Malayalam exhibits no inherent symmetry and thus making the segmentation task very complex.

Character segmentation is an operation that decomposes an image of a sequence characters into sub images of individual symbols. It is one of the decision processes in a system for character recognition. Segmentation can be broadly classified into three types.

1. Explicit segmentation.
2. Implicit Segmentation.
3. Holistic Segmentation.

In explicit segmentation the word image is partitioned into sub images of individual characters. The process of cutting the word images into character sub images is termed as dissection. This technique is used to find all the interconnection between the character images

and partition the image through the detected ligatures. The explicit features are likely to be occur within or between the characters in the form of ligatures. The properties of the segments obtained with those expected for valid characters are height, width, separation from neighbouring components, disposition along a baseline, etc.

Implicit segmentation approaches are applied as an alternative to integrate segmentation and recognition process. There is no complex dissection algorithm has to be built. Implicit segmentation based recognition systems searches the image for components that matches the class of alphabets. Hidden Markov Model (HMM) are become evident for this approach. The Markov model represents state-to-state transitions within a character. These transitions provide a sequence of observations on the character. Features are typically measured in the left-to-right direction. This facilitates the representation of a word as a concatenation of character models. In such a system segmentation is (implicitly) done in the course of matching the model against a given sequence of feature values gathered from a word image. That is, it decides where one character model leaves off and the next one begins, in the series of features analyzed.

Holistic approach is also known as segmentation free process, which recognizes the entire word as a unit. The method is usually restricted to predefined lexicon. Since they do not deal directly with the letters but only with words. This point is critical when training on word samples is required: a training stage is thus mandatory to expand the lexicon of possible words. This property makes this kind of method more suitable for applications like check recognition.

Malayalam is one of the south Indian Dravidian languages with about 35 million speakers. It is written in vattezhuthu. Modern Malayalam script is derived from grantha script. The character set consist of fifty three letters called akaras and 13 vowels, 2 left vowel signs, 7 right vowel signs, some appear on the both side of conj/constants, 30 commonly used conjuncts.

Features of characters

- Type of writing system: A consonants with an inherent vowel is a syllabic alphabet. Diacritics

can appear above, below, before or after a consonant which is used to change the inherent vowel.

- Vowels are written as independent letters appear at the beginning of a syllable.
- When certain consonants occur together, special conjunct symbols are used which combine the essential parts of each letter.

II. RELATED WORKS

There is a lack of efficient segmentation technique for Malayalam characters. For finding an efficient segmentation technique here we come across between certain methods. Dissection means decomposing an image into sequence of sub images using general features. In this method of segmentation which consider the method of whitespace and pitch (the number of characters per unit of horizontal distance), projection analysis (consist of a simple running count of the black pixels in a certain column), connected component processing (in which bounding box analysis and splitting of connected components are performed).

The basic idea of connected component analysis with a simple recognition logic whose role is not to label characters but rather to detect which components are likely to be single, connected or broken characters. Splitting of an image classified as connected is then accomplished by finding characteristic landmarks of the image that are likely to be segmentation points, rejecting those that appear to be situated within a character, and implementing a suitable cutting path.

Projection histogram [6] counts the number of pixels in specified direction. This approach can applied in three directions of horizontal, vertical and diagonal. The histograms are computed by counting the number of foreground pixels. In horizontal histogram the pixels are counted in row wise. In vertical the counting is done column wise.

The bounding box analysis is a method of connected component labelling. In this by testing their adjacency relationship to perform merging, or their size and aspect ratios to trigger splitting mechanism, segmentation can be performed.

III. PROPOSED WORK

Segmentation is an important part of any recognition system. The above methods alone will not provide an effective segmentation method for Malayalam characters. For an effective segmentation we can combine two methods (the connected components with profile method) can provide effective segmentation for Malayalam characters.

Algorithm

- Step 1. Find the size of the image document [p, q].
- Step 2. Calculate the column sum of pixel value, called Vertical Projection (VP) value for each column from 1 to q.

$$\text{for } i=1 \text{ to } q$$

$$VP(i) = \sum_{j=1}^p Image(j)$$

$$\text{end}$$

- Step 3. If the number of column with VP value zero, first coming column with the non-zero VP value is chosen as the segmentation point. The first column with VP zero value is chosen as last segmentation point.
- Step 4. Apply connected component analysis.

IV. EXPWRIMENTAL RESULTS

Here in this paper the different dissection methods are implemented. The result of each method is shown below.



Fig 1. Result of connected component method.



Fig 2. Result of profile method.

From the result we came to the solution as the conjoined characters cannot be segmented efficiently. The proposed method is implemented and the result is shown in the fig 3.



Fig 3. Result of proposed method.

V. CONCLUSION

In this paper different dissection methods are implemented and based on the experiment none of the method alone can provide an efficient segmentation technique. The projection analysis combined with connected component analysis can provide efficient method for segmentation.

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Physicochemical, microbiological and sensory properties of probiotic drinking yoghurt developed with goat milk

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Abstract- The present study was carried out to develop a drinking yoghurt made with goat milk using thermophilic yoghurt culture (YC-X11), *Bifidobacterium animalis* subsp. *Lactis* (BB-12) and *Lactobacillus acidophilus* (LA-5) and to evaluate physicochemical, microbiological and sensory properties. Three inoculation levels (0.2 gL^{-1} , 0.3 gL^{-1} and 0.4 gL^{-1}) of traditional yoghurt cultures and two probiotic cultures were separately used to develop drinking yoghurt. Drinking yoghurts were stored at 4°C for 21 days and analyzed for microbial counts, titratable acidity and pH on 0, 7, 14 and 21 days of storage. Sensory evaluation was done within four-day interval from day 1 to day 14 with 30 untrained panelists using five point hedonic scales. Titratable acidity and pH were significantly different ($P < 0.05$) with added cultures and culture levels. There was an interactive effect of treatment and storage time on pH for the developed product ($P < 0.05$) and developed product was within the acceptable range up to 14 days of storage at 4°C . Ash, dry matter, fat contents, brix value and density did not significantly differ ($P > 0.05$) with cultures and culture levels. Yoghurt made with LA-5 received the highest overall acceptability. The developed products were negative for pathogenic microbes up to 21 days of storage. In conclusion, 0.3 gL^{-1} inoculation level of LA-5 could be used to develop the probiotic drinking yoghurt using goat's milk with desired physicochemical, microbiological and sensory properties.

Index Terms- Drinking yoghurt, Goat's milk, Probiotic culture

I. INTRODUCTION

Goat milk is considered as a good source of fatty acids, proteins and minerals. In addition, it has been reported to be a functional food due to its high digestibility and reported nutritional properties. Furthermore, goat milk is recommended for individuals who are allergic to cow milk [1]. The basic nutrient composition of goat milk resembles cow milk, where both milks contain substantially higher protein and ash, but lower lactose content than human milk. However, goat milk differs from cow milk having better digestibility, alkalinity, buffering capacity and certain therapeutic values in medicine and human nutrition [2]. It has some technological advantages in comparison to cow's milk, such as smaller size of fat globules which provides a smoother texture in derived products, lower amounts of α s1-casein, resulting softer gel products, higher water holding capacity and a lower viscosity [3]. The flavor of goat milk is more intense in comparison to cow milk, which can restrict the acceptance of its derivatives by consumers [4].

Yoghurt is a dairy product made by adding live, active bacterial cultures to milk that cause microbial fermentation. Different types of yoghurt are available in the world such as traditional yoghurt, greek yoghurt, probiotic yoghurt, organic yoghurt, non-dairy yoghurt and drinking yoghurt. Main starter cultures used for the yoghurt production are thermophilic culture which are made with the 1:1 ratio of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* and in general they are used at 1:1 ratio [5]. Probiotic bacteria are defined as "live microorganisms when administered in adequate amounts can provide a health benefit on the host" (FAO/WHO, 2001). They can be used in single or mixed culture that have a beneficial health effects on the host. They have been used in both food and non-food applications. In dairy industry, lactic acid bacteria are widely used as probiotic bacteria. In addition, some bifidobacteria and yeast have been incorporated as probiotic organisms in various dairy products [6].

Probiotic bacterial species have been reported to improve physicochemical and sensory properties of different dairy products [7, 8]. *Lactobacillus acidophilus* and strains of *Bifidobacterium* spp. have been well researched with cow milk though there are limited published data on application of these probiotics in drinking yoghurt made with goat's milk. Therefore, this study was conducted to evaluate the effects of inoculation level of *Bifidobacterium animalis* subsp. *Lactis* (BB-12) and *Lactobacillus acidophilus* (LA-5) on physicochemical, microbiological and sensory properties of probiotic drinking yoghurt developed with goat milk.

II. MATERIALS AND METHODS

Identification of suitable incubation time for the development of drinking yoghurt made with goat milk

Bacterial cultures were provided by CHR Hansen Division, J.L. Morison Son and Jones (Ceylon) PLC. Goat milk was pasteurized at 95°C for 5 min. and inoculated at 37°C with thermophilic yoghurt culture (YC-X11), *Bifidobacterium animalis* subsp. *lactis* (BB-12) and *Lactobacillus acidophilus* (LA-5) starter cultures in three inoculation levels (2.0 gL^{-1} , 3.0 gL^{-1} and 4.0 gL^{-1}) respectively, for a sample size of 500 mL. The inoculated samples were incubated at $37 \pm 1^{\circ}\text{C}$ for about 4 hours. The pH changes of inoculated milk samples were measured at 1 hour interval during the incubation. The time required to reach pH of 4.5 was recorded.

Preparation of drinking yoghurt made with goat milk

Fresh goat milk was obtained from N.S.D. Agro Farm, Galewela, Sri Lanka. Drinking yoghurt made with goat milk was

prepared using a standard procedure at Dairy Processing Unit, Department of Animal and Food Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka. Three different starter cultures (YC-X11, BB-12 and LA-5) and three inoculation levels (2 gL⁻¹, 3 gL⁻¹ and 4 gL⁻¹) were used to prepare the drinking yoghurt. The prepared samples were stored in a refrigerator at 4 °C until used.

Physicochemical analysis of drinking yogurt made with goat milk

The pH of the samples was measured weekly during storage period up to 21 days using a pH meter (sensION+PH1, Hach, USA). Acidity was estimated by titration with 0.1% NaOH. Total solids, total soluble solids (brix value), specific gravity, crude protein, ash and fat of the developed yoghurt were estimated according to AOAC procedure [9].

Microbiological analysis

Prepared drinking yoghurt samples were analyzed for desirable (Lactic bacteria) and undesirable (*E-coli*, yeast and mould) microorganisms weekly using pour plate methods. Required amount of culture media (Lactobacillus MRS for lactic acid bacteria, PDA for yeast and mould, EMB agar for E-coli) was taken and sterilized by autoclaving at 121 °C for 15 min. One milliliter of drinking yoghurt was mixed with 9 mL sterilized distill water to make the 10⁻¹ dilution and repeated until 10⁻⁵ dilution. One milliliter samples of drinking yoghurt (dilution factor =10⁻⁵) was transferred in to the Petri dishes and 15 mL of prepared media was poured and allowed to solidify at ambient temperature. Then, dishes were transferred in to the incubator (For lactic acid bacteria, at 37±1 °C for 48 hours and E-coli, yeast and mould, at normal room temperature for 48 hours). Colony counter was used for the enumeration of microorganisms.

Sensory evaluation of developed drinking yoghurt

Sensory evaluations were carried out at 4 days intervals during storage period of 14 days to identify the best product. A total of 30 untrained panelists from Faculty of Agriculture, Rajarata University of Sri Lanka, Sri Lanka were used in the analysis. Yoghurt samples were served in randomized order in plastic cartoons coded with three random digits. The panelists were requested to evaluate the sensory properties including colour, odour, texture, and overall acceptability according to a five point hedonic scale.

Statistical Analysis

Parametric data were analyzed by one way Analysis of Variance (ANOVA) in Statistical Analysis Software ver. 9.0 [10]. Means were separated by Tukey's Studentized Range Test (TSRT). Sensory data were analyzed by Friedman non-parametric test in MINITAB 15 with 95% confidence interval. Microbial data were presented by comparing with SLS 824: part 2: 1989 yoghurt standards. Statistical significance was declared at $P < 0.05$.

Table 01 shows time required to reach pH 4.5 by different cultures and culture levels. The culture combination and level of inoculation had a significant effect on the rate of acidification. Yoghurt cultures showed the fastest growth and showed a high acidification rate than probiotic cultures. Thermophilic yoghurt culture reached pH 4.5 in 6 hr. whereas probiotic cultures spent 18 hr. to reach the same pH level. The observed longer acidification period with probiotic is related to the poor growth of probiotic bacteria in goat milk.

Table 01: Incubation time required for producing goat drinking yoghurt with Different Cultures and Culture Levels

Treatments		Optimum incubation (hr.)
Cultures	Culture levels (gL ⁻¹)	
YC-X11	0.2	6
	0.3	6
	0.4	6
BB-12	0.2	18
	0.3	18
	0.4	18
LA-5	0.2	18
	0.3	18
	0.4	18

Determination of time duration to reach pH 4.5 is important to identify the coagulum breaking point. The transformation of lactose in to lactic acid is the reason to reduce pH value up to 4.5, which is responsible pH to form casein coagulum which is called as iso electric point of milk casein. At pH of 4.5, negatively charged casein micelles neutralized by positive charges. Neutralized casein micelles accumulate in to the sole and form coagulum [11]. Therefore, incubation should be stopped before developing the pH value more than 4.5.

Nutritional composition of developed goat drinking yoghurt

Fat, protein, ash and dry matter contents of drinking yoghurt prepared with different cultures and culture levels were not significantly different (Table 02, $P > 0.05$). Therefore, three cultures that were used, might not involve in the nutritional composition changes in prepared drinking yoghurt from goat milk. Jenness [12] reported that difference in animal species, breed, weather, type of feed, age of animal, stage of lactation etc. are the major reasons of changing composition of raw milk and those changes may affect on the nutritional composition of prepared drinking yoghurt.

III. RESULTS AND DISCUSSION

Optimum incubation time required for producing goat drinking yoghurt

Table 02: Fat, protein, ash and dry matter (DM) contents in the drinking yoghurts made with goat milk

Treatments		Nutritional properties			
Cultures	Culture (gL ⁻¹) levels	Fat (%)	Protein (%)	Ash (%)	DM (%)
YC-X11	0.2	1.45	3.86	0.52	24.33
	0.3	1.24	4.08	0.52	24.09
	0.4	1.39	4.75	0.47	23.67
BB-12	0.2	1.10	4.08	0.48	23.35
	0.3	0.84	4.10	0.50	23.14
	0.4	0.97	4.65	0.44	24.03
LA-5	0.2	1.16	4.61	0.51	23.87
	0.3	1.31	4.15	0.49	23.71
	0.4	1.42	4.03	0.48	24.11
SE		0.24	0.55	0.03	0.84

Physicochemical properties of developed goat milk drinking yoghurts

Brix value and specific gravity in developed drinking yoghurts prepared with different cultures and culture levels were not significantly different ($P > 0.05$). The pH value in each product was significantly different ($P < 0.05$) among the treatments with storage (Figure 01). During the storage period,

pH of yoghurt gradually decreased in the treatments may be due to post acidification. pH of yoghurt can be decreased due to accumulation of lactic acid which has been produced by lactic acid bacteria and other living microorganisms during storage [13].

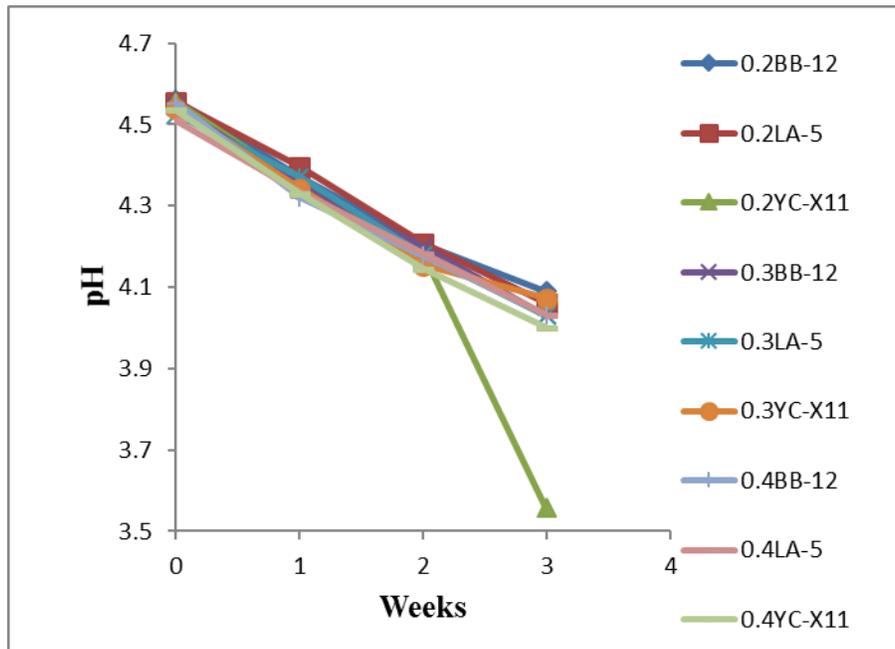


Figure 01: Changes of pH in developed goat drinking yoghurts with storage

Titrate acidity was significantly different ($P < 0.05$) among the treatments and increased during the storage (Figure 02). [Muhammad, Abubakar \[14\]](#) also observed that, gradual

increase in titrate acidity in cow milk yoghurts during storage period, due to the microbial activity [13].

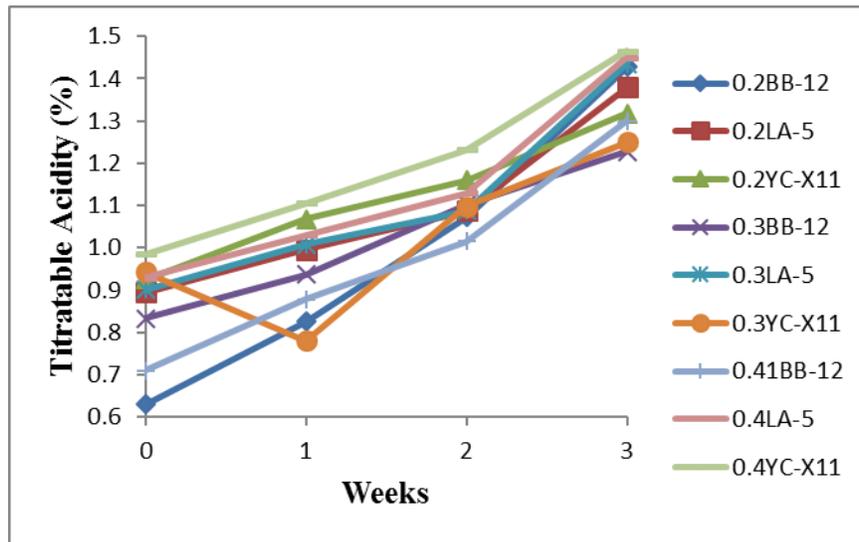


Figure 02: Change in titratable acidity of developed goat drinking yoghurts with storage time

Microbiological analysis of developed goat drinking yoghurts

Lactic acid bacterial counts were significantly ($P < 0.05$) different among the treatments. Yoghurt prepared with 0.2 gL^{-1} *Lactobacillus acidophilus* had the highest microbial counts at initial stage of production and yoghurt prepared with 0.4 gL^{-1}

Thermophilic yoghurt culture had the lowest microbial counts (Figure 03). Microbial counts were reduced with the storage time. Normal lactic acid bacteria (Probiotic bacteria) requires $37 \pm 1 \text{ }^\circ\text{C}$ for their optimum growth and survivability, but refrigerator maintains at $4 \text{ }^\circ\text{C}$ may be the reason to retard the growth rate and amount of microbial count with storage time [5].

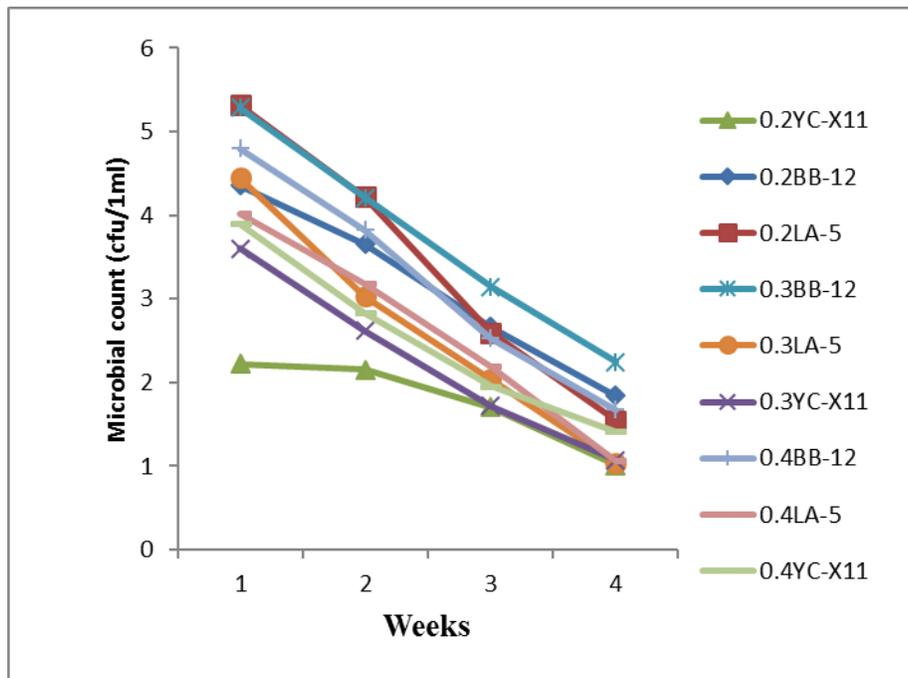


Figure 03: Change in microbial counts in developed goat milk drinking yoghurts with storage time

Yeast and mould counts in drinking yoghurt increased with the time of storage. *E-coli* counts were zero for all treatments

during storage period of 21 days, probably due to good hygienic practices adapted during manufacturing process. According to

the Sri Lanka Standards, E-coli, yeast and mould counts were within the acceptable level in the developed drinking yoghurt during the four weeks of storage.

Sensory qualities of developed goat drinking yoghurt

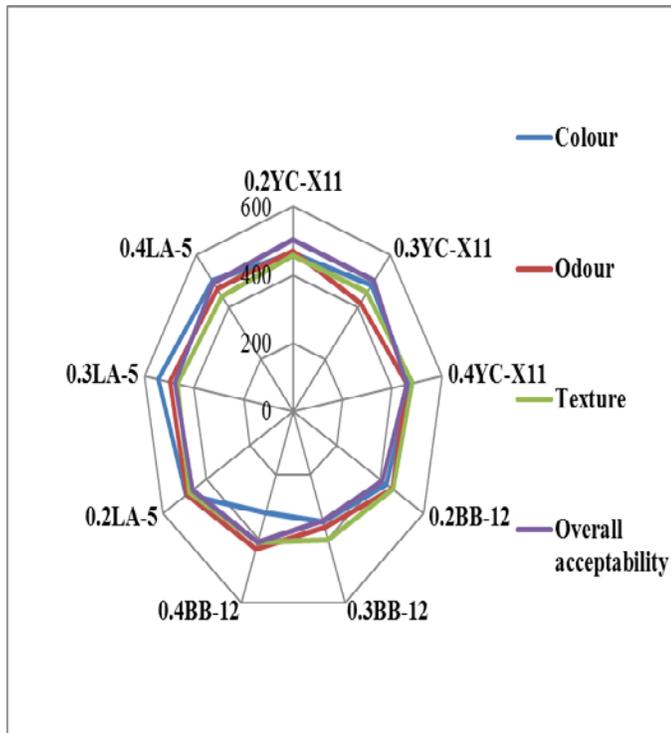


Figure 04: Sensory evaluation analysis of goat drinking yoghurt

The results of sensory tests for the colour, odour, texture and overall acceptability of developed drinking yoghurt are shown in Figure 04. The panelists were able to differentiate a significant difference ($P < 0.05$) for colour, odour and overall acceptability among different yoghurt types. A higher score for colour (545.5) and odour (498) was observed in drinking yoghurt developed from *Lactobacillus acidophilus* at 0.3 gL^{-1} culture level. However, texture did not differ significantly among developed drinking yoghurt ($P = 0.05$). The highest overall acceptability (503) was recorded in drinking yoghurt developed from regular yoghurt culture at 0.2 gL^{-1} culture level followed by *Lactobacillus acidophilus* at 0.3 gL^{-1} culture level (501). Type of starter culture and level of inoculation had an influence on the sensory properties of developed yoghurt samples. Drinking yoghurt developed from goat milk with starter culture, *Lactobacillus acidophilus* and 0.3 gL^{-1} culture level showed the best sensory qualities even though overall acceptability was not observed.

Shelf life of developed goat drinking yoghurt

Shelf life of developed drinking yoghurt was 14 days according to the pH variation. According to the yoghurt standard SLS 824 : part 2 : 1989, pH value should not be more than 4.2 in yoghurt. After the 14 days of production, pH value was not

within the acceptable range. However, undesirable microorganism counts were within the acceptable range.

IV. CONCLUSIONS

Three cultures; thermophilic yoghurt culture YC-X11, *Bifidobacterium animalis* subsp. *lactis* BB-12 and *Lactobacillus acidophilus* LA-5 and three culture levels; 0.2 gL^{-1} , 0.3 gL^{-1} and 0.4 gL^{-1} can be used to develop a goat milk drinking yoghurt with acceptable sensory and nutritional qualities. Drinking yoghurt prepared with 0.3 gL^{-1} *Lactobacillus acidophilus* culture shows the best sensory qualities. The shelf life of the final product is acceptable under normal refrigerated condition for about 14 days without any quality deterioration.

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A Conceptual Framework of the Implementation of E-Learning in University of Business and Technology (UBT)

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Abstract- This preliminary study discusses the implementation of an E-learning program at the University of Business and Technology (UBT) in Saudi Arabia – Jeddah. The program originally aimed to establish a virtual university which offers totally online courses but due to a number of reasons there had to be some changes in the implementation process as well as the changes and challenges faced by UBT in implementing its E-learning program from an Information System (IS) project management point of view. Findings suggest that implementing such projects needs careful consideration of a variety of issues to ensure that the objectives are achieved. The case provides rich insights to other educational institutions wishing to implement such projects. The outcomes will assist in its continuing implementation at other universities in the future.

Index Terms- E – learning, Information Systems / Information Technology (IS/IT) projects, project management phases, UBT.

I. INTRODUCTION

Higher Education Institutions (HEIs) in the era of knowledge revolution faces different challenges as a result of the enormous achievements in the area of information and communication technology (ICT), that led to the erosion of boundaries among countries and makes the world a small village in the context of globalization and economic openness. Quality of education leads to increased investment, and create a well – qualified human resources. As a consequence, governments and private sector takes various approaches to delivering e - learning services and technologies. Some manage e - learning services through central information technology (IT); others provide e-learning services and technologies centrally; some have blended learning programs in which face – to – face instruction is combined with electronic usage applications to deliver courses (1).

E-learning is a controversial phenomenon, thus, the need for and significance of a strategic approach to implement and utilize of e – learning in HEIs has been of attention of considerable researchers. But actually what is meant by "*e-learning*"? . It is very difficult to find a common definition of this term, however, we will mention some of those definitions, (Dublin, 2003: 2), e-Learning is "*the delivery of a learning, training or education program by electronic means, e-learning involves the use of a computer or electronic device (e.g. a mobile*

phone) to provide training, educational or learning material" (2). The European Commission (2001) describes, e-Learning is "*using new multimedia technologies and the Internet to improve the quality of learning by facilitating access to facilities and services as well as remote exchanges and collaboration*" (3).

Successful implementation of e - learning and the selection and delivery of e - learning services and technologies depend on factors such as university size, vision, mission, and the priorities of university top management. The significance of e - learning for evolution has paved the way for launching several programs at a whole levels of educational body in a number of developing countries at schools and higher education institutions (HEIs) alike.

These transformations of the learning patterns present several challenges when implementing e - learning environment, namely three main challenges: technology, content, and staff. These aspects require be managing and implementing effectively to fulfill the overall enrichment of the staff and students learning experiences, which are improved through the appropriate usage of technological blends.

According to (Donoghue et al., 2003) experience indicates that implementing e-learning programs is still facing a numerous difficulties such as, performance, cost, and technology access especially in developing countries, questioning the benefits obtained by students, role of teachers, information ownership, availability of resources (modern technology and information), social inequalities and the actual benefits of accessing education online (4).

Finally, this study explores the implementation of e – learning at UBT in Saudi Arabia – Jeddah. This study will follow a case study approach. It is argued to be the suitable approach if the questions being answered are how and why questions (5), this case study can be categorized as an "interpretive case study", the aim of which is not to tell the "reality", but to tell a narrative which consists of the researcher's ideas and thoughts in connection with the phenomenon in question (6).

In this study, we aim to analyze an e- learning project according to its phases, the obstacles facing its implementation and the changes that have to be carried out. In sum, this study highlights on the processes by which it is being implemented from a project management point of view in order to assess the e-learning project. This study is structured as follows: it starts by providing the theoretical foundations that will be used as a nucleus to analyze this case. Then, presents the case study and analysis related issues. Thereafter, discuss the case based on the

above theoretical framework. finally, conclusions of this paper are discussed, recommendations for future research is drawn in the last section.

II. PREVIOUS STUDIES

The e-Learning has become increasingly importance in HEIs. The development and presenting of a diversity of e-Learning tools has been bring out great modifications in HEIs, particularly with respect to their educational delivery and support processes.

The e – learning primary components include: The use of: online technologies (Internet and Web tools) in learning processes; learning technologies to promote the learning experience teachers and students alike; digital tools for assessment, curriculum delivery, ongoing professional development, collaboration and interaction.

For survival, higher education institutions'(HEIs) needs to consider cost – effective and efficient methods of operations. Certainly, the technology plays a key role in e – learning implementation in HEIs, but alone may not be answers to all of the universities problems. The benefits of utilising technology, particularly for developing online collaborative activities are well documented (7) . Relationships can also be fostered within the context of an online environment. Technology is a powerful medium particularly for part time work based students who find erratic attendance requirements and study difficulty (4).

Researchers believe that the goals of introducing e - learning process, either by facilitating many of the challenges that face instructors and learners daily; or by presenting opportunities that might have not existed before (8).Information and Communication Technologies(ICTs) are transforming the educational experience by affecting education in many ways (4).Therefore, the use of technology in the learning and teaching process is spreading widely at all levels of education both in developing and developed countries. The ease of access to education provided by ICTs makes it a viable option to provide better education to people who may have been otherwise deprived from such opportunities (9).

E – Learning is fully part of our learning environment and no longer an add-on to traditional pedagogies. It is integrated in the way we live, work, and teach and has been so since mid – 2000 as Web 2.0 – the Read Write Web[(10); (11)], acknowledged that in implementation of E – learning, institutions will bear the risk of destroying those processes that offer important forms of support to students. Ultimately, it is possible that standardising a number of informal support systems will create competitive advantage – exactly the opposite to what the process sets out to achieve. Thus, HEIs need to consider the implementations for everyone involve before implementing any new e – learning strategies.

E – learning is described as the use of electronic technologies in learning, teaching, and research.it provides a set of different tools to enhance the learning experience, such as LMS (Learning Management System), CMS (Content Management System), interactive courses contents, digital libraries, virtual classrooms – learning can be applied in classroom based, instructor lead learning or computer / internet

based learning, or both classroom and computer (blended education).

Recent literature in this area has discussed a number of issues related to e-learning. For example, indications of a bias show in student evaluation of teaching against online instruction compared to face-to-face instruction (12).Other studies discussed issues that are important for student satisfaction within online instruction such as: interaction among students, quality and timely interaction between students and professors, consistent course design across courses, technical support availability, flexibility of online courses (13), in addition to providing support for lecturers in implementing computer-supported learning strategies within their classes (14).

E- Learning will ideally be employed by higher education institutions for reasons of enhancing the individualization of instructions, improving educational quality, increasing access, reducing costs, and sustaining innovations (15).E- Learning is designed to create environment rich of interactive applications based on computer technologies and the World Wide Web (WWW) for information, and enables the learner to access learning resources at any time and from any location. Many proponents of E – learning believe that everyone must be equipped with basic knowledge in technology, as well as use it as a medium to reach a particular goal.

Now the word E – learning has transcended the traditional definition of "education through internet only". The E- learning process is like an umbrella, under which lots of things are arranged to make the global education system more uniform, cost – effective and quality – rich. Broadly speaking E- learning is a process of training for all types of learners in their required fields through Information Technology (IT) Techniques.

The E - learning process includes courses from technology to art of living. There is a number of e - learning companies working around the world, the scope and objective of E – learning for all these companies vary and it largely depends upon the types of service offered by the E – learning process. We are going to discuss some features of this process (16). As a result, institutions of higher education have taken positive steps to focus on electronic learning (E – Learning) technology to improve educational efficiency and effectiveness.

Because of the flexible nature of e-learning and since it provides the right information in right time and in right place, students are now more familiar and feel more comfort in this new education system. Saudi universities compete to provide a rewarding learning experience for their students, and some of them have set the path to include distance students as well. A long with the new regulated approach of approving online courses by the ministry of higher education, UBT has to adopt and apply e – learning to enhance the educational experience inside its campuses and outside as well.

III. THEORITICAL FRAMEWORK – PROJECT MANGEMENT PHASES

A project is a comlex,unique,one time effort,with specific limitations (budget , time, resources, and performance) designed to meet organizational goals or customer needs (17). Each project consist of a number of different phases that form what called the

project life cycle .Project management is concerned with providing project managers with new tools that improve their ability to plan, implement and manage activities to accomplish specific organizational objectives (18).

There are a number of different lifecycle models in project management literature, most have four or five phases, but some have nine phases or more (19) . A project is normally divided into a series of phases called the project life cycle model, which

could be conducted sequentially or in parallel.In this study, we utilized the simplest four – phase life cycle model of Gray and Larson (2008),namely (**Defining,Planning,Executing,and Delivering**) (20),which is shown in (**Figure 1**) and each phase is discussed briefly below.

Figure (1) : Project Life Cycle

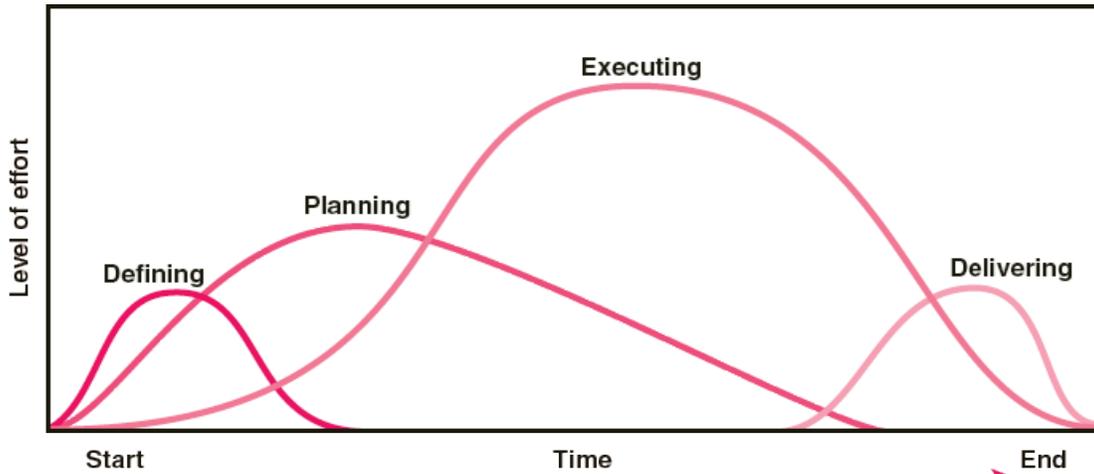


Figure 1: Project Life Cycle framework (Gray and Larson 2008)

DEFINING PHASE:This is the first phase of the project Life Cycle where it's evaluated, selected, and defined well. This phase is about identifying project vision, mission and goals; specifications; tasks; and responsibilities. In addition to that it includes establishing project initiation committee; plan; management procedures; project management environment; and developing project chart.

PLANNING PHASE:In this phase, the project concept is verified and developed in to a workable plan in order to start implementation. This involves Schedules; budgets; estimating resources and creating resource plan ; identifying and assessing risks and alternatives, feasibility, estimating staffing and also certain management activates are carried out to assure that the project established with clear reference terms and substantial structure.

EXECUTING PHASE:Executing consists of the processes used to complete the work defined in the project management plan to accomplish the project's requirements. This is the phase in which the deliverables are physically built and presented to the customer for acceptance. While each deliverables is being constructed, a suite of management processes are undertaken to monitor and control. These processes include many sub - phases \ activities such as management time, cost, changes, forecasts quality, risks issues, suppliers, customers and communication project status.

DELIVERING PHASE: The focus of this phase is to bring the project to a successful end and the formal acceptance, where the project process is completed and documented and the responsibility moved from the developers to owners and users. Administrative activities include the archiving of the files and documenting lessons learned for future projects. This phase

involves finalize all activities across all of the processes, terminating suppliers contracts; obtain approval to close the project. In addition to customer training, documents transfer, release resources, release staff, and lessons learned.

IV. CHANGE MANAGEMENT IN IS PROJECTS

Change management is a process that helps organizations in the implementation of an appropriately planned change (21).Change management of IS projects is understood as activities, processes, and methodologies that support employee understanding and organizational aspects during the IS projects (22).Change management refers to all activities associated with the interaction of technology, processes, and people (23).Academic research has shown that it is not the technology that provides an organization with a success, but the integration of technology into an organizational change management process (24). A successful IS project requires, among other things, a human resource strategy to improve the necessary employee skills and their engagement in the process of change management (25).

The management of change is an important discipline in today's ever changing environment. Change is never easy, and managing it in a large corporate environment is even more challenging. Based on the relevant literature, change can only be effectively implemented through proper planning and communications. Technological change can affect the learning experience in profound ways, but the direction of change depends more on the historical event technological invention, and the diversity of business needs and opportunities.

In order to implement the powerful and widely used learning management systems(LMS),and software systems for managing projects,we must have an integrated information models of those projects. An Information System – Technology (**IS / IT**) project has unique attributes that give such projects a different nature from other projects. **IS/IT** project can differ in terms of project size, project complexity, ambiguity in project requirements, products produced, environment, resource requirements, skills of project team, the cost and benefits sides of the project which usually include many intangible and unexpected costs and benefits, in addition to rapid change in the technology used within these projects which brings more ambiguity and uncertainty in the project outcomes. Consequently, **IS/IT** project managers need to consider different factors due to the unique environment of these projects (26).

Due to the above factors, change in **IS/IT** projects is a normal and complex organizational concept. It is argued that no matter how carefully the project is defined through the initiation phase, the scope of most projects is subject to considerable uncertainty and change (27).Furthermore, even if the project is well – planned by the project manager and team for implementation; it is almost certain to be changed before its completion. These changes may result in changing business processes and procedures, creating new roles and responsibilities leading to organizational restructuring, and needing new equipment, human resources, or new skills (28).

There are many basic causes for change in projects such as; project team characteristics (e.g. awareness, qualifications and commitment), rules and regulations, and technological uncertainty. Some changes occur because mistakes were made in the initial assessment as how to achieve given goals, or in choosing a clear vision and goals for the project (29). Technological change is a fundamental factor for uncertainty, or project risks. Other changes result because the users or project team's lack of awareness, qualifications and commitment to the project, in addition to the high turnover. Many of these changes involve people, who are the key to the successful implementation of any **IS/IT** projects. Therefore, managing change is primarily dealing with people issues and involving them at every stage of the project (30).

In order to implement the powerful and widely used learning management systems(LMS),and software systems for managing projects,we must have an integrated information models of those projects. An Information System – Technology (**IS / IT**) project has unique attributes that give such projects a different nature from other projects. **IS/IT** project can differ in terms of project size, project complexity, ambiguity in project requirements, products produced, environment, resource requirements, skills of project team, the cost and benefits sides of the project which usually include many intangible and unexpected costs and benefits, in addition to rapid change in the technology used within these projects which brings more ambiguity and uncertainty in the project outcomes.

For us, the aim of this study has been to shed some light on issues related to e-learning, education, **ICTs** and project management that have been apparent in the implementation of the e-learning project at **UBT**. Such crucial issues still need further research especially in developing countries where

valuable resources are being invested in **ICT** related projects given that education in particular for these countries.

V. UBT: E – LEARNING PROJECT

Before presenting the case study of this paper, it is useful to identify the context within which it is placed – Kingdom of Saudi Arabia – Jeddah City. Many countries realized the importance of **ICT** in developing life of an individual and society, and its role in boosting the economy and income for the individual and state.(31), the Kingdom of Saudi Arabia is witnessing noticeable growth and development in all aspects of life, which has led to its progress and prosperity .During the past few years, the Kingdom, has paid increased attention to rapidly growing and fast evolving sectors; one of which is **ICT** sector.

The wise leadership of the Kingdom has realized the vital role of **ICT** in building Information based society, characterized by the production, penetration, and processing information has led to the start of a number of e – learning initiatives both at school and university level. In view of this, came the kind directive to formulate a National Communications and Information Technology Plan (**NCITP**) for the Kingdome to implement it.

The e - learning project at **UBT** is placed within this context in which **ICTs** are becoming as an important means for change and development to eventually transform the kingdom into knowledge – based economy. **UBT** was the first private university to be established in 2012, with a pioneering role in providing private higher education in business and technology to students in the kingdom. In 2007, The College of Business Administration(**CBA**) started implementing its e - learning project.

The main objectives UBT e - learning project is:(a) to increase the learning and teaching efficiency and increasing flexibility to adopt the changes in the business environment; (b) improve students 'learning process by interactivity and boost their interest in learning where simulations, video projects, mobile learning, and such can be fruitful engagement;(c) enhance the assessment and evaluation process to evaluate students & faculties effectively in a timely manner;(d) provide lifelong learning resources for **UBT** graduates and alumni; (e) extend educational opportunities to those masses missing conventional education because of distance, disabilities ,or age; (f) balance educational opportunities for higher education by distance mode for a big amount of the population, including those in employment and others who wish to upgrade their educational level; and(g) serve the local community in general(Source: www.ubt.edu.sa).

For **UBT** the project is still ongoing and vision is still to establish 'virtual university 'despite the challenges. Currently established and future plans in **UBT** will help it in establishing full e - learning tools and services, through two phase strategy to implement e - learning project that is responsible not only for implementing the project but also offers opportunities for training, consulting, and development of other projects in the future.

Before stating an e - learning program, any institution needs to have a clear vision of what its aims are and the risks and challenges involved. In addition, human resources, their culture

and the ability to sustain resources once they acquire the necessary know – how is major issue that needs careful consideration. Moreover, many constraints related to higher education laws and regulations within each country need to be considered carefully because the especial nature of the educational process (32).

A very important part of the project for **UBT** was the establishment of the e-learning Centre of Excellence at the University which hosts the most recent technology. It aims to facilitate offering **ICT** enabled education, developing online courses, and in general providing the community with services. **Table (1)** and **Table (2)** summarizes the current and future plans.

VI. DATA COLLECTION

Data collection for case studies may come from a number of sources such as documents, archival records, interviews, and participant's observation (33). In this study primary data is collected through interviewing with some people involved in the project including: the president of **UBT**; and the former project coordinator and current project manager; and the general director of **IT** and communications department. Data collection took place between September and October 2014.

INTERVIEWS: Since the subject of this study deals mainly with human perception and knowledge, the interviews were needed to gain an understanding of chosen subject. In addition, the interviews had all the characteristics of the formal interview. Accordingly, they were arranged in advance; the respondents were contacted by researcher via e-mail prior to the interview. The interviews, therefore, were semi-structured, and the notes were taken which were immediately discussed and summarized afterwards with the permission of respondents. This kind of interview assisted in keeping track of and investigating specific issues about the e-learning.

Three face-to-face interviews were conducted for this study. The interviews with the president of **UBT**, and the general director of **IT** and communications were conducted at the main campus of **UBT**, Dahban – Jeddah, while interviews with the former e-learning project coordinator were held in Sari campus – Jeddah.

The interview with the president started by general questions about university such as, year of established, programs offered ...etc. This was followed by specific questions about e-learning project in the university.

Also, he added that the problems facing us in this matter is not only a technical, but also human and legislative, but the e-learning is coming inevitably and became an urgent need for some colleges and disciplines.

The vision and mission as expressed by the president of the university was: *"Our vision is to become a leading institution in e-learning for **UBT** students as well as to those who did not have a chance to continue their college education. and "Our mission is to provide quality e-learning system for interactive teaching process in classes, off classes, and beyond university boarders"*.

According to an interview with **UBT** e-learning project manager, said that "along with the new regulated approach of approving online courses by the Saudi ministry of higher

education, **UBT** has to adopt and apply E-learning to enhance the educational experience inside their campuses and outside as well". *"Our projet is promising due to the noevelty of the university, but we achieved a lot in few years. more recently we have established the virtual library to the teaching staff members, students and researchers"*.

Different forms of e-learning has been implemented at Saudi universities but at **UBT** the aim of this program was to develop courses that are "made at **UBT**, (*See Table 1 and Table 2*). " from scratch, and offer these courses to students online: *"Our ambition at the **UBT** to become the Leader University of e-learning education in the region as well as develop an e-learning world where teachers, learners, trainees, and researchers use technology to enhance the overall educational experience both in campus and off campus", according to (E-learning project manager at **UBT**).*

The interview with the general director of **IT** & communications department in the university, it took a longer time as the role of this department at **UBT** is very important; it is the basis for development and conducting the work at all sections and departments of the university, the most important department in the university when talking about e-learning.

According to general director, this department provides comprehensive applications development services to all **UBT** departments and managing all **UBT** applications, provides comprehensive infrastructure services to **UBT** and maintains a high expanding WAN network connecting all its campuses (Dahban, Jeddah, and MBA) providing services to all administrative and academic departments. With regard to e-learning, he stated: *"at **UBT**, we have a good history of campus collaboration in developing technology plans. Prioritization and coordination of technology planning and implementation will ensure that **UBT** students, faculty, and staff have the combination of skills, knowledge, and technology to thrive in a technology"*.

VII. DISCUSSION

In this piece of work we examines the nature of change in higher education with respect to the introduction and growth of E-learning. While the ostensible aim is to use E-learning to improve the quality of the learning experience for students, the advisors of change are numerous, and learning quality ranks poorly in relation to most of them. Those of us working to improve student learning, and seeking to exploit E-learning to do so, have to ride each new wave of technological innovations in an attempt to divert it from its more natural course of technohype, and drive it towards quality agenda. We have to build the means of e-learning to evolve and mature as part of the educational change processes, so that it achieves its promise of an improved system of higher education.

The original plan has been to offer online courses developed by **UBT** staff which lead to offering online degrees and ultimately achieve the vision of the 'virtual university'. Among Saudi universities, **UBT** is arguably the first university to follow such a methodology according to a market research.

This is what made the project more challenging. Therefore, for a number of reasons there have been many changes within the project as in the beginning in **CBA.**, and such changes had to be

managed so that the project could be continued to Moodle the current e – learning system in **UBT**.

In this section we will discuss a number of these changes that have been faced and consequently discuss these issues with the people related to this system in relation to a theoretical framework. **First**, Higher Education in Saudi Arabia is subject to laws and regulations of the Ministry of Higher Education (MoHE.) and according to these laws, offering online degrees are still not allowed. Therefore, the implementation of the original vision of “E-learning University “is still not possible. The non-accredited status of on – line courses over the internet in the Kingdom is the known major reason for not taking on – line courses, the other reason is the non – interaction with other students and faculty **(34)**.

The second issue that proved to be problematic is the development of a fully online course from scratch as this proved to be difficult, time consuming, and lacks some aspects such as the required interactivity between students and instructors **(17)**. These problems have resulted in making changes to the development methodology for the courses themselves, which has led to UBT to adopt a new methodology for developing its tools and courses using Moodle. The aims of this new methodology are to shorten development time, provide better interactivity, enhance collaborative learning, and meet the requirements of the MoHE in terms of blending online with face to face teaching is argued to be most successful approach for e – learning **(35)**.

Technological uncertainty is the **third** issue. The technology for the project had to be changed because the original specifications for that IT infrastructure were seen to be insufficient. The new technology infrastructure was with better specifications and the change in technology proved to be positive change in the project. **Fourthly**, the availability and sustainability of human resources involved in the project have been a major challenge and resulted in many changes within the project team, which has also been reflected on the implementation of the project.

The project also faced a number of challenges that have also affected its implementation. One of the major challenges is the culture related to e – learning among faculty members and students. For some faculty members, it was difficult to change the way of teaching for many years, as e – learning is a new trend that requires new teaching cultures **(36)** and for some students changing the way they were taught was also difficult, which has also been the case for students elsewhere **(4)**.

Higher education institutions face persistent challenges in the use of technology, with e – learning management systems being the latest technology challenge. Getting a new idea adopted, even when it has obvious advantages, is difficult. Accordingly, adapting new technological innovation, such as e – learning systems, in higher education requires faculty to change their ways of teaching; such change does not come easily **(37)**.

The reviewed literature identified some challenges for implementing- learning systems tools in the institutions of higher education, which are due to a number of different issues, the most common challenge are; faculty members hesitate to change; some faculty members do not have skills to use e- learning systems, and are not especially eager to learn; and there is an institutions reluctance to provide sufficient personal and financial

assistance to facilitate the use of such technology. .One of the other challenges for implementing e – learning systems in higher education is that some instructors may have felt threatened by change, so chose to resist e – learning systems **(17)**.

To overcome these issues, extensive training is needed but the problem is that training is costly, time consuming and of course sustaining the qualified faculty members is another problematic issue. Furthermore, appointing a qualified project manager who is able to translate the vision of the e – learning project into a workable plan has proven to be difficult. Changing managers in a short period of time meant that each project manager comes with different: vision; plan of action; management style; and this create confusion and uncertainty **(17)**.

VIII. CONCLUSION, RECOMMENDATIONS AND FUTURE WORK

8.1.CONCLUSION: E-learning technologies become increasingly utilized in UBT issues related to standardizations for reusability and interoperability, assurance of quality, and prevention of adverse effects, become crucial. Therefore, national standards for E-learning should be developed. Moreover, many constraints related to Higher Education laws and regulations within each country need to be considered carefully because of the special nature of the educational process.

The issue of E-learning itself is still problematic in terms of its definition and consequently the methods of implementation. Before starting an E-learning program, any institution needs to have a clear vision of its aims and the risks and challenges involved. In addition, human resources, their culture and the ability to sustain these resources once they acquire the necessary know-how are major issues that need careful consideration. Empirical examining for this study will be the subsequence phase .

8.2.RECOMMENDATIONS: with reference to the findings and conclusions of the study, the following recommendations are offered:

In order to promote E – learning, the government should come up with regulation and accreditation plans so that companies / universities willing to offer E – learning courseware can start planning for such courses.

Increase the educational community awareness of the importance of the E – learning.

Encourage the private sector to help in this kind of education and provide financial support.

Further researches need to be undertaken concerning the pedagogical methods that are employed in using E – learning tools.

Solve complex E- learning issues with Higher Education, government and corporate partners.

FUTURE RESEARCHES: In order to support the rapid exchanges in information and build on the experiences of different national and global academic institutions, further researches is needed to understand what is being developed, implemented in terms of e – learning activities, capacities, and

infrastructure. Finally, it could be argued that generalization in our case may be in drawing implications and contributions of insights that are useful for the e - learning project at UBT in the future.

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Table (1): E – learning current services at U.B.T.

Smart Classroom software	UBT campuses install smart software in each classroom and in each instructor computer. The smart software includes smart notebook and smart board software and such. It allows the teacher to customize and designs his/her own lectures to be interactive and animated and present it inside the classroom using the smart touch boards. It transforms a rigid text lecture into a creative, innovative interactive experience inside the classroom. The students enjoy smart board lectures and they get to experience the board when presenting their projects themselves or solve exercises on the board.
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Source: www.ubt.edu.sa/.../Applications-Development-Division/E-learning

Table (2): E – learning Projects

Phase (1): Interactive learning & communication and ease Of online process projects:
Video Conferencing
E – Mail Services: For staff e-mail Use your UBT e-mail account from any Web browser, Schedule meetings and appointments on your calendar, Save phone and address information for people you communicate with. Student Email services, Shared calendars, File sharing, One Drive cloud storage, Online conferencing, Screen sharing, Public website, Office Online: Create and edit Word, Excel, PowerPoint, and OneNote files via a web browser
LMS: learning management system (Moodle) enhancements; Moodle is a free and open source e-learning software platform, also known as a Course Management System, Learning Management System, or Virtual Learning Environment. E-learning system, Course materials , Presentations, Handouts, Projects , Quizzes, Assignments, Messages, Chat , Discussion Forums.
Interactive course contents
E- library (library department)
Online payment /Admission/Registration
Mobile connectivity
Phase (2) : Extended learning resources to distance students and facilitate distance learning projects :
Online admission
Virtual classroom
Website student E – learning
Online and contents
Exam proctoring

Source: www.ubt.edu.sa/.../Applications-Development-Division/E-learning.

Ethnobotanical survey of Medicinal Plants used as Hepatoprotective in Imphal east and west district of Manipur, India.

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Abstract- There is a long tradition of use of medicinal plants for treatment of liver disorders. Documentation and evaluation of hepatoprotective medicinal plants could provide an important role in development of novel drugs for treatment of various hepatic disorders. The present study was aimed to document and perform quantitative evaluation on the medicinal plants used for the treatment of liver disorders by the local traditional healers of two district of Manipur. Ethnopharmacological field studies were conducted by using semi-structured questionnaires during 2012-2014 among the Meitei community in Imphal East and West districts of Manipur. Disease Consensus Indices (DCI) were calculated on the compiled data. A total of 40 plant species belonging to 22 families are used as hepatoprotective medicinal plants by the traditional healers of some certain area of Imphal east and imphal west district of Manipur, India. The highest DCI value was found in *Andrographis paniculata* (Burm.f.) Nees. The study could document various medicinal plants used in the treatment of liver disorders and for support of liver functions. Application of quantitative methods could highlight the consensus information on the use of therapeutic application of different medicinal plants.

Index Terms- Hepatoprotective; Manipur; Traditional knowledge; Disease Consensus Index; Liver

I. INTRODUCTION

From time immemorial, traditional medicine has been practiced by various communities throughout the world for treating various ailments. Still today, about 80% of the world's population are relying on traditional medicines as their primary health care (Akerele, 1993). Large number of rural people in the developing countries are still depending on these medicine system as their first line of defense in health care practices (Goleniowski *et al.*, 2006). Knowledge of plant-derived drugs that form significant part in traditional healthcare treatments is also significant in bioprospecting programmes for production of novel drug entity. Focus on medicinal plants in drug discovery programmes has seen a resurgence with the appearance of disease-resistant pathogens and rapid increase of nonsocomial infection particularly from Eskape pathogens (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella apneumoniae*,

Acinetobacter baumannii, *Pseudomonas aeruginosa* and *Enterobacter* species)(Mitchell, 2011). In the last few years many scientists and research institutes are giving focus on plant-based natural products or their synthetic analogues as novel drug leads for treating various ailments (Heinrich *et al.*, 2012).

The liver is an important gland in human body responsible for various metabolism, such as regulation of glycogen storage, decomposition of red blood cells, plasma protein synthesis, hormone production and detoxification (Rouiller, 2013). Disorders in this gland create many serious health problems and constitute major cause of morbidity and mortality in many parts of the world (Mokdad *et al.*, 2014). Liver diseases has multiple origins ranging from those caused by toxic chemicals, excessive consumption of alcohol, infections and autoimmune diseases (Gutierrez and Navarro, 2010). Though various modern medicines are available, challenges still exist in production of effective and reliable drugs that can stimulate liver function, provide protection to the liver from damage and help in hepatic cell regeneration (Chattopadhyay, 2003; Subramoniam and Pushpangadan, 1999). As such, there is need to search for the alternative drugs for the treatment of liver diseases to replace currently used drugs of doubtful efficacy and safety (Madrigal-Santillán *et al.*, 2014). In such scenario, medicinal plants has seen as an important source of novel drugs apart from synthetic origin. It is because there is a long tradition of using medicinal plants for the treatment of liver diseases in India and China (Schuppan *et al.*, 1999).

The North East India, endowed with two biodiversity hotspots – Indo-Burma and Himalayan, has a rich tradition of using medicinal plant for healthcare practices. The region is the melting pot of various traditional medicine systems ranging from Indian Ayurveda, Traditional Chinese Medicine, Burmese Medicine and indigenous folk medicine. In spite of the availability of modern healthcare facilities, there is still relevancy of traditional medicine for treating various ailments in some areas of Manipur, one of the states of North East India (Ningthoujam *et al.*, 2013). Many people irrespective of ethnicity and religions are consulting traditional healers for the treatment of renal calculi, gynecological problems, bone fractures, psychological problems and hepatic disorders. Treatment of hepatic disorders, particularly those expressed as jaundice, has seen a wide diversity among the healers with each of them has their own specialized formulations. Some of these medications

are used as food, while other are prescribed as therapeutics in the form of decoction, infusion, extract powder or paste depending upon the assigned symptoms. Though there is long tradition of using dependency on medicinal plants for hepatic treatments, scientific validation of these practices in the state is fundamentally lacking. Therefore, an attempt has been made to document the existing knowledge of the hepatoprotective plants used by the Meitei community in Manipur for the treatment of liver disorder. It is anticipated that scientific validation of traditional practices could provide important information for drug development in bioprospecting programmes as well as providing standards of safety and efficacy in the herbal practices.

II. MATERIALS AND METHODOLOGY

Study site and ethnomedicinal survey

The study was conducted in the Imphal East and Imphal West district where there are pockets of traditional healers. Ethnopharmacological field studies were conducted in four villages of Imphal East district, viz., Bamon kampu, Wangkhei, Kongba and Naharup and four villages of Imphal West district, viz., Tera, Lamphel, Langol and Takyel. The study was confined to Meitei communities born and raised in the respective villages.

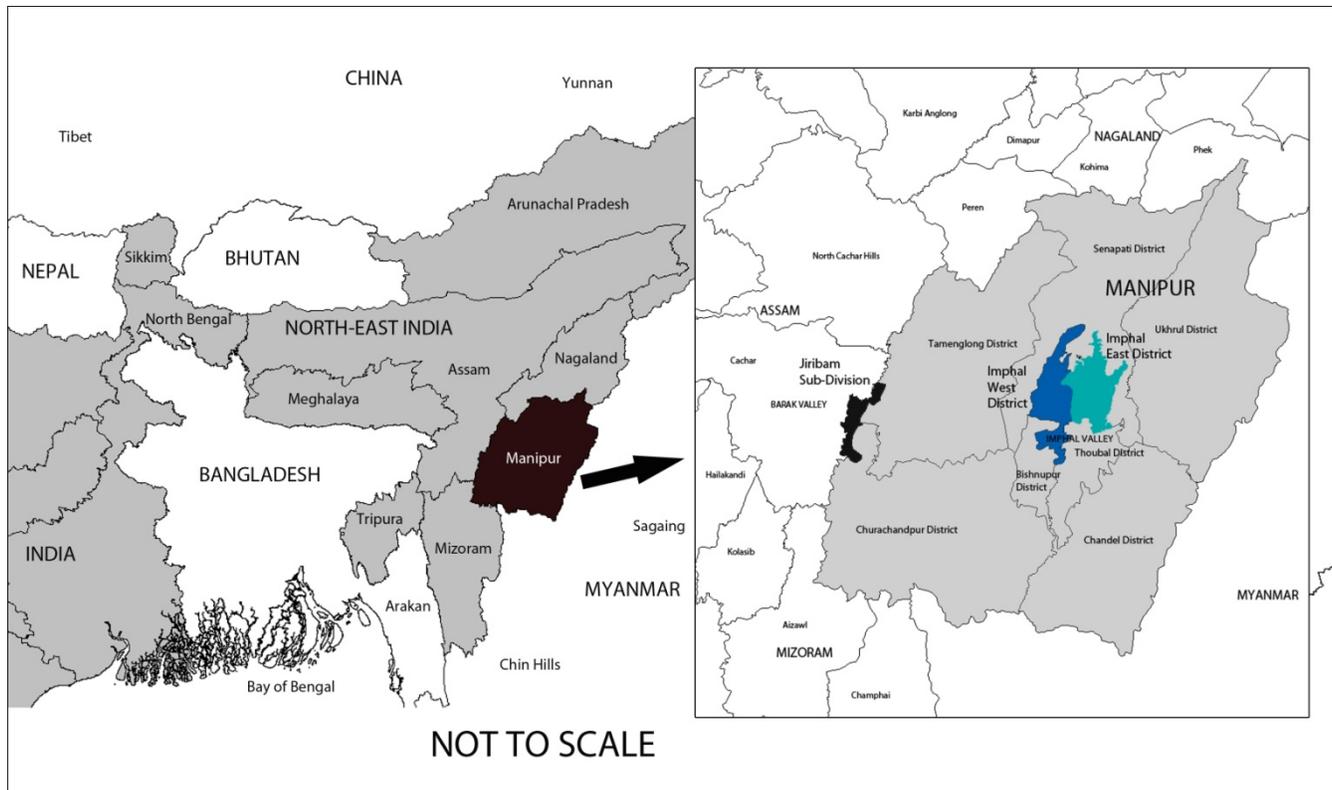


Fig-I : Study site (Imphal east and west district of Manipur)

Data collection

Field survey has been undertaken from 2012-2014, through interaction with 28 traditional practitioners (20 men and 8 women) belonging to Meitei community. The semi structured questionnaire containing 25 questions were used in the survey. Out of these questions, 15 were based on the personal perception of the disease, personal profiles including gender, age, address, educational level and mother tongue which are not directly related to DCI. The remaining 10 questions were used for calculating the Disease Consensus Index (DCI) and consists of (1) plant name in Manipuri, (2) general plant description, (3) mode of preparation, (4) way of administration during the treatment, (5) “organoleptic” characteristics, like flavor, odour, texture, (6) main symptoms after the plant consumption, (7) how often must the species be administered, (8) did the person feel better after consuming the species, (9) general knowledge about the region of gathering or information about how to grow the

species, (10) whether the patient has recommended the species to other members of the community (Andrade-Cetto *et al.*, 2006). Based on the information collected from the informants, 38 plants has been collected from the nearby forests, agricultural fields and home gardens of the healers. Collected plants were photographed in their fruiting and/or flowering stages. Plants were initially identified at the Department of Life Science and Bioinformatics, Assam University by consulting with Flora of Manipur (Singh *et al.*, 2000), Flora of Assam (Kanjilal, 1997, 2012; Kanjilal and Das, 1938), Flora of Mizoram (Singh *et al.*, 2002) and Flora of British India (Hooker, 1879). Herbarium specimens were deposited at the Department of Life Science and Bioinformatics, Assam University. Identified plants were crosschecked with the Botanical Survey of India, Eastern Regional Centre, Shillong. The plants names were standardized by cross-checking the scientific names through

(www.theplantlist.org) website. Plants were classified according to APG III.

Analysis of Data

Determination of One Plant Value

For calculation of Disease Consensus Index, value for one plant was determined. It begins with binary evaluation i.e., (1) or “yes”, which represents the knowledge or (0) or “no”, which represents lack of such knowledge. In each case, this refers to a single question, allowing a mathematical analysis of the results. The potential maximum value for one informant (about one plant, OP) is always 1. This calculation was based on 10 questions present in the questionnaire.

Disease Consensus Index

The index was based on the equation proposed on selection of potential medicinal plants in Mexico ([Andrade-Cetto et al., 2006](#)). The DCI is a comparison based on the mathematical aspects (limit theory), the ideal answers of informant reports (Cc) and the ideal answers for each species (Vx). It is calculated as follows:

$$DCI = \left(\frac{\sum_{i=1}^n V_{xi}}{C_c} mV_x \right) P_m^{-0.1}$$

where (x) is an species, ($\sum V_{xi}$) the sum of the individual values obtained for one species within the community; (mV_x) the statistical mean of the individual values, for one plant; C_c the Correlation coefficient, defined as the maximal number of informants whom refer a plant; $P_m^{-0.1}$ is the compensation factor, and analyses the dispersion for one plant, considering the mode of preparation and parts used.

III. RESULTS AND DISCUSSION

In the present survey, a total of 38 plant species belonging to 21 families were reported by traditional healers for treating various hepatic disorders in Manipur. Associated recipes are tabulated with scientific name, vernacular name, type of ailments, plant parts used, mode of uses, similar usage reports and Disease Consensus Index (DCI) (Table 1). Highest number of plants was reported in Leguminosae (5 plants) followed by Compositae and Rutaceae with 3 plants each.

Table1 : List of Plant used for the treatment of hepatic disorders among Meitei community in Manipur

Family	Botanical name	Vernacular name in Manipuri	Parts used	Mode of preparation and use (Pm)	$\sum V_x$	mVx	DCI
Acanthaceae	<i>Andrographis paniculata</i> (Burm.f.) Nees	Bhubati, Chirota	Aerial parts	One form: decoction	14.2	0.5	0.25
	<i>Justicia adhatoda</i> L.	Nongmakhaangouba	Leaves	One form: decoction	10	0.58	0.21
Amaranthaceae	<i>Achyranthes aspera</i> L.	Khujumpere	Aerial parts	One form: infusion	11.1	0.46	0.18
	<i>Chenopodium album</i> L.	Monsaobi	Aerial parts	two form: decoction, leaf extract	11.4	0.43	0.17
Apiaceae	<i>Eryngium foetidum</i> L.	Awa Phadigom	Whole plant	Two form: decoction, paste	11.1	0.55	0.22
Bignoniaceae	<i>Oroxylum indicum</i> (L.) Kurz	Shamba	Stem, bark	One form: decoction	3.2	0.4	0.04
Caryophyllaceae	<i>Drymaria cordata</i> (L.) Willd. exSchult.	Tandanpambi	Aerial parts	One form: decoction	10.4	0.41	0.15
Clusiaceae	<i>Garcinia xanthochymus</i> Hook.f. ex T. Anderson	Heirangkhoi	Fruit	Two form: decoction, fruit	9	0.39	0.12
	<i>Garcinia pedunculata</i> Roxb. ex Buch.-Ham	Heibung	Fruit	One form: Fruit extract	6.2	0.41	0.09
Combretaceae	<i>Terminalia arjuna</i> (Rox. Ex DC.) Wight & Arn.	Mayokpha	Bark	Three form: decoction, powder, paste	7.2	0.37	0.09
Combretaceae	<i>Terminalia chebula</i> Retz.	Manahi	Fruit	Three form: decoction, powder, fruit	5.5	0.36	0.07
Compositae	<i>Elephantopus scaber</i> L.	Shamunapi	Whole plant	One form: decoction	7.9	0.41	0.11
	<i>Eclipta prostrata</i> (L.) L.	Uchisumban	Aerial parts	One form: decoction	7.1	0.41	0.1

	<i>Carthamus tinctorius L.</i>	Kushum lei	Inflorescence	One form: infusion	2.9	0.41	0.04
Convolvulaceae	<i>Cuscuta reflexaRoxb.</i>	Uri Sanamachu	Whole plant	Two form: decoction, infusion	12.9	0.46	0.19
Cucurbitaceae	<i>Benincasa hispida (Thunb.) Cogn.</i>	Torbot	Fruit	Two form: decoction, fruit	11.6	0.46	0.19
	<i>Mukia maderaspatana (L.) M.Roem.</i>	Lamthabi	Whole plant	One form: decoction	6.6	0.388	0.09
Juglandaceae	<i>Engelhardtia spicata blume</i>	Limpop	Bark	One form: decoction, bark	2.5	0.125	0.01
Lamiaceae	<i>Vitex negundo L.</i>	Urikshibi	Flowers	One form: decoction	10	0.38	0.13
Leguminosae	<i>Bauhinia purpurea L.</i>	Chingthraoangangba	Leaves	One form: decoction	10.4	0.47	0.17
	<i>Cajanus cajan (L.) Millsp.</i>	Mairongbi	Leaves	One form: decoction	8.6	0.43	0.12
	<i>Mimosa pudica L.</i>	Kangphanikaithabi	Whole plant	One form: decoction	6.2	0.41	0.09
	<i>Cassia fistula L.</i>	Chaohui	Leaves, fruit	Two form: decoction, fruit	5.2	0.44	0.07
	<i>Sesbania sesban (L.) Merr</i>	Chuchuramei	Leaves, fruit	Two form: decoction, fruit	4.2	0.38	0.05
Menispermaceae	<i>Tinospora sinensis (Lour.) Merr.</i>	Ningthoukhongli	Stem	One form: decoction	10	0.4	0.13
Moringaceae	<i>Moringa oleifera Lam.</i>	Sajana	Bark	One form: decoction	10.6	0.4	0.15
Oxalidaceae	<i>Averrhoa carambola L.</i>	Heinoujom	Fruit	One form: Fruit extract	11.8	0.47	0.19
Phyllanthaceae	<i>Phyllanthus urinaria L.</i>	Chingheikhru	Whole plant	One form: decoction	9.2	0.38	0.12
Poaceae	<i>Saccharum officinarum L</i>	Chu	Stem	One form: Fresh juice	11.6	0.41	0.17
	<i>Coix lacryma-jobi L.</i>	Chaning	Fruit	One form: decoction	7.5	0.46	0.12
Rubiaceae	<i>Spermacoce hispida L.</i>	Langbankoukha	Whole plant	One form: decoction	9.5	0.33	0.11
	<i>Pavetta indica L.</i>	Nongmakhaasinba	Leaves	One form: decoction	7.9	0.41	0.1
Rutaceae	<i>Aegle marmelos (L.) Correa</i>	Harikhagok	Leaves, fruit	Two form: decoction, fruit	11.6	0.42	0.17
	<i>Glycosmis pentaphylla (Retz.) DC.</i>	Yong komla	Leaves	One form: Leaves extract	8.7	0.51	0.14
	<i>Zanthoxylum armatum DC.</i>	Mukthubi	Leaves	Two form: decoction, paste	5.7	0.43	0.08
Saururaceae	<i>Houttuynia cordataThunb.</i>	Toningkok	Whole plant	One form: decoction	6.7	0.51	0.12
Zingiberaceae	<i>Curcuma longa L.</i>	Yaingang	Rhizome	Three form: decoction, powder, paste	9.2	0.48	0.15
	<i>Curcuma caesiaRoxb.</i>	Yaimuachouba	Rhizome	Three form: decoction, powder, paste	6.5	0.5	0.11
	<i>Curcuma leucorrhizaRoxb.</i>	Yaingangangouba	Rhizome	Three form: decoction, powder, paste	6.8	0.48	0.11

The study also revealed the diversity among plant parts used for medicine against hepatic disorders. Whole plant (21%) are found to be the most dominant plant parts followed by leaves and fruit (16%), aerial parts (13%), rhizome and leaves, fruit (8%), stem and bark (5%), inflorescence and stem, bark (3%) and flowers (2%) (Figure II).

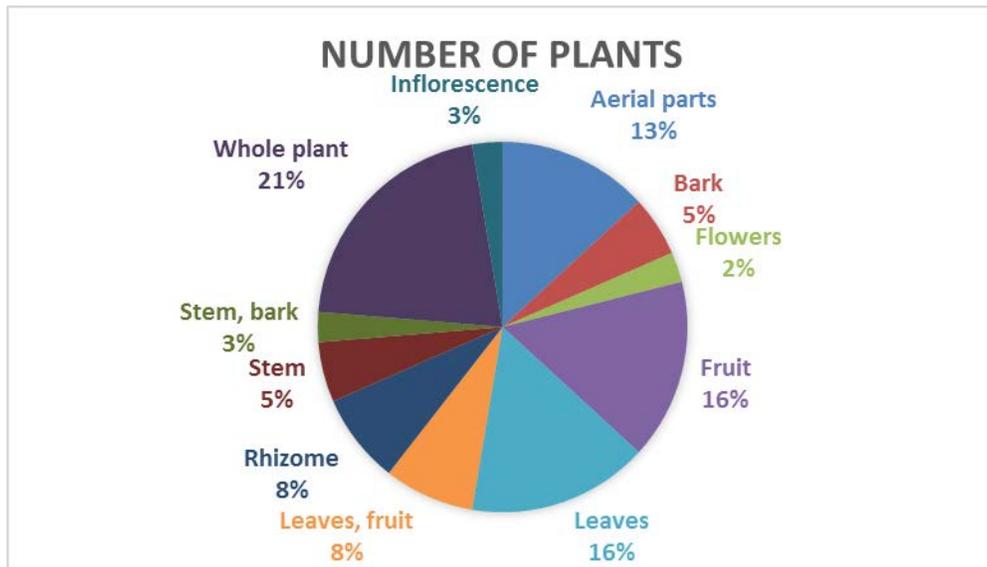


Figure II: Percentage of plant parts reported in the study

These medicinal plants are administered by the local healers in various combination of recipes. Highest form of recipes was observed in use as decoction (47%) followed by use as decoction or fruit (13%). Lowest combination was observed in plants used as leaf extract or fresh extract or whole plant (3%) (Figure III).

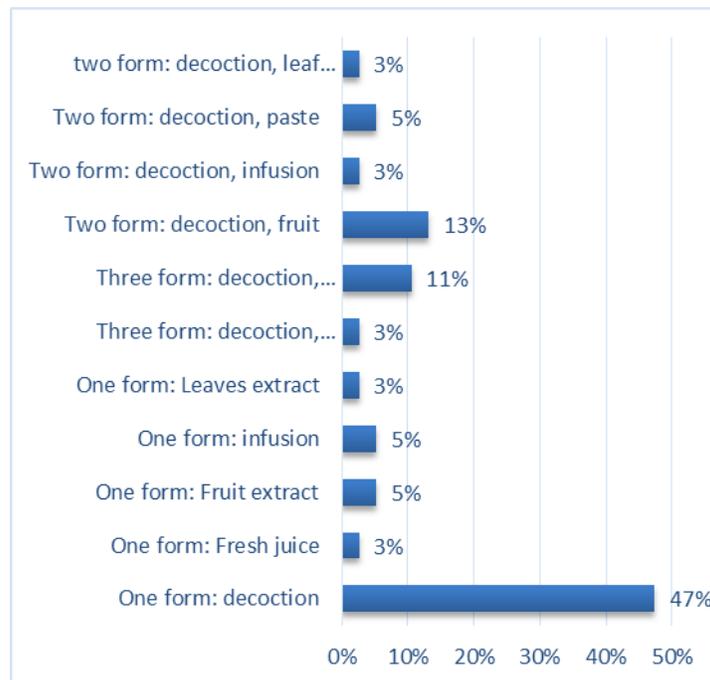


Figure III: percentage of preparation of herbal recipe in the survey

Mode of preparation and dosage of the recipes were found to be dependent on the patient's age, sex and health. Adult were prescribed with higher dose as compared to children. DCI are reported for the calculation of the medicinal plant species used by the informants. DCI values are found to be the highest in

Andrographis paniculata (Burm.f.) Nees (0.25) followed by *Eryngium foetidum* L(0.22), and *Justicia adhatoda* L. (0.21).

At the present condition, traditional knowledge of medicinal plants are slowly eroding among the Meitei community in Manipur. Practices of the traditional medicines are still observed in some rural areas of Manipur. In the survey,

concepts of ailments and symptoms of traditional medicine were observed to be different from modern scientific viewpoints. According to traditional Meitei medicine system, jaundice is considered as disease. However, in modern medicine concept, jaundice can be seen as set of symptoms expressed as yellow pigmentation of the skin, conjunctivitis membranes of the sclera and other mucous membranous caused by high level of bilirubin level in the blood (Click *et al.*, 2013; Roche and Kobos, 2004). The International Classification of Diseases Version 10 of WHO categorized jaundice into that of digestive system and abdomen or neonatal jaundice. Traditional healers provide medicinal recipes only to the jaundice related to digestive system disorders. They considered such disorders was caused by improper dietary habits that affect liver. With regard to neonatal jaundice, they did not provide medicinal recipes rather provide incantations or non-herbal treatments.

Some of the medicinal plants reported in the study have similar usage reports in other countries. For instance, use of *Cuscuta reflexa* is also reported in other parts of India and China (Patel *et al.*, 2012). There have been some reports of scientific validation of traditional uses. Methanolic extract of *Cuscuta reflexa* were observed to improve the liver function by decreasing the serum ALT, AST and ALP levels in hepatotoxic rats (Balakrishnan *et al.*, 2010). Use of sugarcane juice in the treatment of jaundice are also observed in other parts of the world such as Equatorial Guinea (Akendengué, 1992). This juice has been reported in other countries as dietary regimen possessing hepatoprotective properties (Ri-ming, 2011).

In the study *Andrographis paniculata* has the highest DCI value indicating its high consensus among the traditional healers. This plant contained two important compounds andrographolide and neoandrographolide, both possessing hepatoprotective functions (Trivedi *et al.*, 2007). Second highest DCI value is observed in *Eryngium foetidum* having many medicinal properties (Paul *et al.*, 2011). However, information on its usage for hepatoprotective activities in other parts of the world is very limited. *Justicia adhatoda* also have similar usage report in hepatic disorders (Maurya and Singh, 2010; Scientific *et al.*, 1992). The combined extracts of leaves and fruits of *Averrhoa carambola L* is used by the Tai-Khamyangs, Dimasa and Hmar tribe for the treatment of jaundice and gastric problems (Das *et al.*, 2008; Nath and Choudhury, 2010). *Cuscuta reflexa* Roxb. contain a number of α -glucosidase inhibitory compounds (Anis *et al.*, 2002); 2-(3-hydroxy-4-methoxyphenol)-3,5-dihydroxy-7-O- β -D-glucopyranoside-4H-1-benzopyran-4-one (Chemesova, 1990); 3-(4-O- β -D-glucopyranoside-3,5-dimethoxyphenyl)-2-propen-1-ol (Kelley *et al.*, 1976); 7'--(4-hydroxy, 3'-methoxyphenyl)-N-[(4-butylphenyl)ethyl]propanamide (Kelker *et al.*, 1984) have been isolated from *Cuscuta reflexa* along with five known compounds, 6,7-dimethoxy-2H-1-benzopyran-2-one (Cooke, 1908). *Benincasa hispida* (Thunb.) Cogn used as a laxative, diuretic, tonic, aphrodisiac, cardiogenic, urinary calculi, blood disease, insanity, epilepsy, jaundice, dyspepsia, fever and menstrual disorders (Rachchh and Jain, 2008). Phytochemical review indicates the presence of triterpenes: alnusenol, multiflorenol, iso-multiflorenol, flavones, iso-vitexin, sterols, lupeol, lupeol acetate and beta-sitosterol (Yoshizumi *et al.*, 1998). *Achyranthes aspera L* is used for skin eruption by decoction of leaf (Munuswamy *et al.*, 2013). This plant is reported

to be used as immunostimulant, antioxidant, diuretic, antipyretic, hepatoprotective, antiproliferative, anticancerous, cytotoxic and anti-inflammatory agent and also used for treatment of renal dropsy and ulcers (Edwin *et al.*, 2008; Vasudeva *et al.*, 2002). *Bahunia purpurea L* has been reported for antioxidant and hepatoprotective effects (Chaturvedi *et al.*, 2011). Recently the hepatoprotective activity has been reported in *Chenopodium album Linn* (Nigam and Paarakh, 2011). *Aegle marmelos* (L.) Correa fruit contains volatile compounds like hexanal, isomyl acetate, limonene, β -phellandrene, p-cymene, acetoin, (E)-2-octenal, (E,E)-2, 4-heptadienal, dehydro-p-cymene, linalool; 3,5-octadiene-2-one, α -cubebene, trans-p-metha-2,8-dienol, citronellal, cineole, p-cymene, citronella, citral, cuminaldehyde, β -cubebene, carvone, carvyl acetate, dihydro- β -ionone, (E)-6,10-dimethyl-5, 9-undecadien-2-one, β -ionone, caryophyllene oxide, humulene oxide and hexadecanoic acid (Charoensiddhi and Anprung, 2008). *Saccharum officinarum L* leaves contains leteolin-8-C-(rhamnosyl)glucoside as major compound with radical scavenging activity (Vila *et al.*, 2008). These are some of the plants species having highest DCI values. These plants are used as the highest degree in hepatoprotective activity used by the people of Manipur.

IV. CONCLUSION

On the basis of the study, 11 plants viz., *Andrographis paniculata* (Burm.f.) Nees, *Eryngium foetidum L.*, *Justicia adhadoda L.*, *Cuscuta reflexa* Roxb., *Benincasa hispida* (Thunb.) Cogn., *Averrhoa carambola L.*, *Achyranthes aspera L.*, *Chenopodium album L.*, *Bauhinia purpurea L.*, *Saccharum officinarum L.*, *Aegle marmelos* (L.). *Correa* have been observed to possess high DCI values among the Meitei community in Manipur. These plants can be shortlisted for future phytochemical programmes for hepatoprotective activities. Though some of these plants have known bioactive components, though phytochemical investigations on these plants are yet to be performed. Information on traditional hepatoprotective medicines, retaining among the traditional communities of Manipur may be a valuable input in the scientific investigation.

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Social Justice in the Public Sector: The Sierra Leone Police in Focus

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Abstract- The paper presents social justice issues affecting public servants in the course of their duties with focus on the Sierra Leone Police (SLP). It highlights ethical and social justice issues that confront Public Administrators and Organisations. Challenges facing the public servants and strategies that could be employed by the public servant to maintain responsible conduct in the exercise of public duties are also discussed in this paper. Recommendations are drawn from factors that hindered the adherence of public servant in addressing social justice issues of human rights, equality, liberty and justice.

Index Terms- Social Justice, Public Servant, Ethics, Public Administration and Sierra Leone Police.

I. DESCRIPTION OF CASE STUDY

The Sierra Leone Police (SLP) was established in 1808 by the British when Sierra Leone was declared a British Crown Colony. Since its inception, the SLP has as its primary responsibilities the protection of lives and property, maintaining law and order, investigate and prosecute offenders, regulate traffic flow and above all prevent the occurrence of crime. Since the introduction of multiparty democracy in the late 90s, the institution has strived to position itself within the framework of the legal and social systems as dictated by the tenets of a democratic system of governance. The administration of the SLP is decentralised with established police regions and districts. The operations of the SLP in the regions and districts remain the sole responsibility of the Regional commanders and the Local Unit Commanders (LUC) who are equally responsible to the Executive Management Board (EMB) and by extension the Inspector General of the Police.

The SLP Policing Charter mandates the EMB of the SLP to establish police presence in all towns and villages across the country in a bid to ensure that peace and security are assured at all times in the communities. In discharging their duties, the SLP is expected to observe human rights irrespective of race, colour, religion, political and other social belongings. The policing charter further mandates the SLP to reduce or eliminate corruption entirely and make the SLP a corrupt free force especially in the discharge of their duties. To achieve these mandates, the SLP has also established the Community Policing Partnership Boards with the hope that consultations are done with community members on the types of policing activities needed in the communities. The extent to which this has helped in shaping policing routine duties is yet to be determined. Though there seem to be enormous challenges in meeting the demands of the public, the police culture of training quality

manpower is seen as a way forward in bringing solutions to policing problems facing the state. It is, therefore, obvious that the SLP culture is about serving the public interest by way of providing security for the lives and property of both citizens and non-citizens of the state. Achieving its mandate has not been without challenges when one considers ethics and social justice issues facing a public institution. Some of these challenges that officers and the institution as a whole face are presented in this paper.

1.1 Ethical Issues

Ethics and social justice issues confronting organisations are not new in the management of public entities. Identifying what is right and wrong as argued by Menzel, is essential for pursuing ethical behaviour of employees (2009). In national institutions, civil servants are responsible for the day to day running of the institutions. Upholding institutional ethics become the responsibility of the public servant in the interest of the public. Social Justice on the other, occurs when institutions or the state works towards eliminating injustices (Barusch 2009). National organizations are to ensure that activities are done in line with equality where there is a proportionality of balance in the distribution of resources, and opportunities must be accorded to all within the ambits of the law.

The SLP since the end of the war in 2002 has been confronted with ethical and social justice issues in a range of areas directly linked to the discharge of policing duties. Those ethical and social justice issues among others include human rights, corruption, prosecution and police response to distress calls.

The right to police bail of suspects in detention has and continue to be a concern to the public. The public is of the opinion that there is unnecessary detention of suspects especially for minor offences that require self-bail. Treatment of suspects in custody and cell conditions violates individual rights to dignity and decency (Lamin, T. 2013). Corruption is perceived by the public to be endemic especially with the Traffic Division of the SLP whose personnel are in the practice with drivers (IGR Report 2015). Arrest and prosecution of offenders seem to be violating the principle of equality before the law where few are prosecuted and other with the same offence committed are left to go free. The public also believes that police response to distress calls seem to be sluggish, and response sometimes on many occasions do not come on time which has resulted in instances where clients have suffered loss of lives and property. These ethical and social justice issues present themselves in the face of the organisational culture of the police that places emphasis on the maintenance of law and order, and by extension providing security for the people in the communities. The EMB, the

administrative body of the SLP, is caught in the middle of all these ethical and social justice issues. Addressing these challenges falls within the professional responsibility of the EMB members who are by policy required to enforce institutional ethics in the interest of the institution and the public.

II. ETHICAL ISSUES AND THEORETICAL IMPLICATIONS

The EMB wanting to improve on policing activities across the country decided to introduce a model referred to as "Police Distress Calls" as demanded by the political authorities. With this facility, the public is required to call the police at any time when they are in danger or a crime is about to be committed or already committed. The implementation of the policy started and was welcomed by the public. It became ineffective because of so many factors including general misconception of the facility. Unnecessary calls by members of the public who would give information on activities that warrant police interest, only for the police to discover the location to be a fake one and the police not equipped enough to trace callers. Also, the terrain, especially in the cities where most communities are not motorable, pose a challenge. Inadequate vehicles and manpower, the absence of synchronised communication system between the public, men on the field and control room receivers of distress call all reduce the effectiveness of the policy. Local Unit Commanders whose responsibility is to EMB executives could not explain the constraints faced by their officers in implementing the new policy. This is in line with the principal and agent theory where the agent refused to inform the principal of the need for additional resources for the implementation of a programme (Hall and Sutton 2003). The Local Unit Commanders who were charged with the responsibility of implementing the programme could have come back to management and report about the challenges in implementing the programme and request for resources that would address implementation. Hall and Sutton argued that when public servants act in this manner, they serve both the public and institutional interest (2003). Consequently, their failure to report and ask for support indicates negligence and could not be attributed to discretionary powers vested in public administrators (Hand and Sutton 2003, Alexander and Richmond 2005). The public interest becomes paramount in the discharge of duties as public administrators. Public managers have an ethical responsibility to the principal, in this case, the government and client (public). Delay in responding to distress calls promptly must have resulted in loss of life and property of the clients. The corporate image of the institution gets damaged and credibility of the organization destroyed. In a similar manner, failure to effectively and efficiently implement programme or policy would lead to unnecessary tension between the principal and the agent. The SLP has institutional codes of ethics that guide the professional conducts of its personnel. Failure of programmes and policies as a result of staff negligence would warrant investigation and punishment levied accordingly. This could bring change in the ethical behaviour of the personnel. In some other instances, it lowers staff morale and could lead to tension between frontline commanders and lower ranks of the force.

Abuse of human rights by police is not a new phenomenon in the 21st century. Human rights are those civil liberties enjoyed

by people no matter their nationality, religion, age, sex, etc. It encompasses measures taken to ensure that there is a peaceful atmosphere where security is assured for all human beings (Olivier 2012). In his work on human right issues, Olivier (2012) believes that human rights as dictated by the United Nations charter could be enjoyed by all when the individual material and economic rights are unhindered, his physical and civil security assured and not prevented from pursuing his political and civic engagements. Any action by any entity that violates any of those three basic principles amounts to the violation of the rights of persons within a jurisdiction. Freedom from intimidation and injustices are fundamental human rights that need to be observed by the state and law enforcement agencies. The SLP by law is to ensure that the basic human rights principles are observed in the discharge of their duties no matter the gravity of the crime committed. Any action that falls short of human rights observance by the police negates professionalism and ethical standards just like any other civil servant. Overcrowding in police custody, detention beyond time limit for certain crimes and failure to prosecute offenders amount to violation of human rights. The SLP continues to face these challenges and public trust in the force stands at the centre of public debates.

Similarly, the protection of traditional and cultural heritage and property becomes a human rights issue for all states including land and minerals found in those localities (Twiss 2011). Depriving landowners, especially in the African settings, amounts to an abuse of human rights. The land serves as a source of livelihood for the indigenous people. Taking it away is like depriving them of what humanity has kept in stock for them especially when the political landscape proves to be uneven. Public administrators, therefore, have the moral responsibility to ensure that the rights of citizens are assured at all times. According to Benjamin (2010), violations by public servants could be tried internationally since human rights is a global public good. Land grabbing in the provincial villages of Sierra Leone has not been dealt with to the satisfaction of the indigenes. In some instances, those affected are arrested for embarking on a peaceful demonstration, their rights to free and fair trial violated and jailed as the political will might dictate. The SLP is used as a state machine in effecting such arrests even when such actions are not in line with institutional ethics and public interest.

Freedom of assembly is one of the liberties enjoyed by people in a democratic state. It provides a convenient means for aggrieved persons to come together to express their dissatisfaction on issues affecting their existence or lifestyle. In recent times, one could hardly hear about assemblies. Some argued that the advent of the social media and freedom of speech is gradually replacing the public assemblies (Inazu 2010). Though the social media has proved to be an outlet for people to vent out their grievances and the entire world informed, it still has its limitations. The intimacy and social interactions that assemblies bring are lacking in the use of social media. Assemblies, as evolved over the years, has been only associated with political underpinnings. But freedom of assembly is not only limited to unanswered questions bordering on political and socioeconomic interests. Individual's right to religious gathering, social gathering and even attending club meetings are all part of public assemblies (Inazu 2010). Therefore, if the police force could allow these gatherings'; for example, religious ceremonies

to take place and disallow other forms of gathering, then the ethical responsibility on the part of the public servant regarding equity in the discharge of duties is perverted and not in the interest of the public. Religious gathering to an extent tend to admonish its members of their sacred responsibilities to humanity while social evenings are meant to relax the brains after tedious days work. The social interaction when peers meet strengthens bonds and exchange of new ideas and reassures individual commitment to group objectives. Similarly, political assemblies try to express freely the individual beliefs with respect to governance and socioeconomic activities not satisfactory to its citizens. Preventing such assemblies goes against the liberal theory that gives individuals or group the freedom to go about their lives the way they want it.

The right to freedom of assembly in Sierra Leone is a constitutional right that allows groups to assemble freely for a common good. It could be for a good not necessarily of interest to the political elites but one that promotes the group or national interest. Freedom of assemblies help to prevent violence and in many instances challenge norms that are not acceptable to the generality of the group, individuals or public. However, one should not also lose focus of the fact that assemblies could also lead to violence (Inazu 2010). But it depends on the way it is conducted and the methods used by the security forces in policing such assemblies. For the past decades, the issue of public safety has consistently been the common excuse for the police not granting permission for public assemblies requested by individuals, groups and or organisations. The judiciary that is supposed to create a level plain field for the hearing of matters bordering on denial of civil liberties by the police is deemed to have been compromised because of dictates from the ruling class. Opposing political parties are seen as enemies of the state instead of partners in governance, and they are denied justice when there is an infringement of laws that support liberty (Wilik 2005). This has hindered public assemblies in Sierra Leone for decades, and the SLP is used as an instrument by all political parties whenever in power. Ethical and professional conducts of the force stands at the centre of daily debates and to many the unanswered question is when will public safety be assured by the police so that public assemblies would be part of the democratic system of governance.

The liberty to self-expression is still being prevented by the police even though national constitution allows freedom of assembly. The police force is therefore seen to be executing its duties that seem to be at variance with national laws. It flouts the ethical rules governing the responsibilities of the public servant in not implementing national policies (Inazu 2010). The public servant should not be seen to be involved in a policy shift or twist. The failure of the SLP in allowing public assemblies especially one bordering on political and economic rights while allowing religious and social assemblies is a demonstration of a policy drift. This could be hidden under the concocted motive of discretion. The misuse of discretionary powers in itself amounts to ethical issues and dampens professionalism of the public servant. Any action by the public servant that is in contrast with national laws and institutional ethics undermines public trust in the institution.

It is obvious that the mandate of the SLP is about public safety through the maintenance of law and order. Equally so, the

right to hold public assemblies should not be hindered in the exercise of police duties. By not allowing freedom of assemblies of groups or institutions violates Article 55 of the United Nations (UN) Charter on human rights. The UN charter place emphasis on state responsibilities to support political, economic and social rights of people within its jurisdiction. Political will becomes a necessity therefore for a state to ensure that assemblies are allowed and people express their views unhindered. This prevents conflicts that would lead to violence that could threaten state security. In as much as groups have the right to freedom of assembly, it is also a duty of groups or individuals to ensure that their activities should be in the interest of the general good. Public security, therefore, becomes paramount and a responsibility on both public servants and members of the public. Inazu believes that peace and stability of the state is a matter not only for the public servant (the police) but other stakeholders including ordinary members of the public (2010). Otherwise, the state would equally frown at public assemblies since state security is paramount in a bid to ensure governance functionality. The SLP is therefore caught in the web of an ethical dilemma; serving the state based on constitutional mandate or the political class (the Principal). Addressing these issues requires the SLP to reflect on their discretionary powers in line with the public interest and the quest to implement national laws.

III. ETHICAL CHALLENGES AND CONFLICT OF RESPONSIBILITY

Ethical values manifest itself in the form of honesty, competence, diligence and discretion. The SLP faces the challenges of cubing corruption within the rank and file of the police force as at the moment. This has a negative impact on institutional image and service delivery is challenged by the resistance of people in giving the necessary support and cooperation to the police. The required training seems to be out of the way in some instances when it comes to specific policing duties. Allowing public assemblies are denied either deliberately or in the absence of any other explanation; one could conclude that competence and diligence are lacking thus violating the rights of people in a democratic dispensation. Even where the political will is not there, the SLP has the powers of discretion, and the implementation of policies should be aligned to the uncertain environment where they execute their duties (Hall and Sutton 2003). The use of such discretionary authority must be seen to promote the interest of the public and not individuals or the political authority. Discretionary powers of public servants should be used to remedy problematic policies that require implementation by their institutions or agencies. The appropriate and timely use of such discretions would support the organisational culture of the SLP by providing unhindered access to policing services by the general public.

Delay in the timely response to distress calls would leave the public to conclude that they are treated unfairly. This would cause the public not to have faith in policing operations thus damaging the client-agent relationship. It would further hinder future implementation of policies even when it would be in the interest of the public. Above all, concealing information that is supposed to be shared with the law makes constitute ethical challenges on the part of the SLP.

Conflict of responsibility arises when the public servant is unable to create a balance between his ethical behaviour and professional responsibility. Both are determined by external factors. The SLP is required to implement laws enacted by state actors. The ethical behaviour is guided by these laws and institutional policies. But equally so, doing the wrong things not in the interest of the public is against professional responsibility. The interest of the client must not be ignored in the execution of public duties. Otherwise, the client would resist at some point as in the case of SLP "operation free flow". The operation was designed to clear the major streets of Freetown of market men and women to allow the free flow of traffic. Professionally, the interest of the client was not taken into account; limited market facilities and the level of unemployment among the citizens. Traders resisted the ethical behaviour of the SLP and the operation failed. The question then is when and how do public servants create a balance between his ethical behaviour and professional responsibility? In answering this question, the public servant must prioritise the interest of the public.

IV. STRATEGIES BY ORGANISATIONS TO MAINTAIN RESPONSIBLE CONDUCT

Organisations are obliged to ensure that responsible conducts in the execution of their duties are maintained at all times. Where policies and programmes seem to be problematic in their implementation, public servants should endeavour to work with law makers and interest groups to get more resources for implementation or sometimes influence the review of such policies. Inazu argued that for the public servant to be able to do so, it is necessary to identify the interest of the power brokers or politicians. They usually have the urge to create impact in the execution of their constitutional mandate and sometimes would want to be seen pushing public policies. The satisfaction they derived adds value to their political portfolio. The essence for some is to create a political platform for future political endeavours. Working with these politicians would help to redirect policy focus. Lobbying the law makers to enact or amend policies in the interest of the client (public) should be part of the administrative skills of the public servants.

Interest groups are also key players that public administrators could work with in promoting public policy. Resource mobilisation for supporting the implementation of public programmes could be supported by interest groups instead of relying on government support. Advocacy for public cooperation and the maintenance of laws could be disseminated by interest groups. The establishment of the Local Policing Partnership Board (LPPB) in the SLP is yet to contribute to the above. Old laws guiding routine policing duties not applicable to 21st century policing are still in the books. The LPPB could facilitate review of such laws by working with law makers and even mobilise resources to support policing operations. Contrary to the functions of the LPPB, members of the public seek to be members of the LPPB in an effort to secure police connections for their businesses or other activities, thus influencing the ethical and professional behaviour of the police.

The effectiveness of public policy in Africa therefore remains a big challenge. This is as a result of the fact that those affected by policies are many a time left out in the design and

implementation process. The SLP as in this case should lobby interest groups to have their contributions into national policies that would require their inputs regarding its implementation. Isolating the public inputs has always resulted in resistance in the implementation of policies by public administrators.

Adherence to the implementation of national policies and programmes by civil servants are guided by the laws. The strict observance of those laws without prejudice is a must for the public administrator. It will foster security and peace in the community. The professional responsibility of the public servant should be grounded in honesty, diligence and competence are supposed to be the bedrock of the service delivery of the civil servant. In all of these, the discretionary authority of the police should be used with caution. Inazu believes that those discretionary powers must be used to promote the public interest by way of opposing discrimination, respect for all and privacy of people, strictly observe the principle of confidentiality and above all whistleblowers must be allowed and not restricted (2010). The non-compliance of public servants in promoting these basic institutional ethics would infringe on the professional character of the public servant (SLP), and the consequence would be felt by the public.

Public Organisations must ensure that constitutional principles are promoted in the discharge of their duties. It requires fairness, equality, appropriate and timely response, allow participation and follow due process. By doing so, citizens' right will be assured and national interest felt by all within the society. The stability of the state depends on the exercise of constitutional mandate. Selective justice undermines democracy and implicitly the fundamental principles of human right, and the right to justice.

V. CONCLUSION

The paper concludes using three strands of arguments. What happens if the public servants use the legal-institutional model or the implementation model or uses the principal-agent theory in responding to the demands of the public while maintaining professionalism and institutional ethics?

The legal-institutional model supports ethical principles of organisations which are guided by national laws. At the national level, laws are made not only to be obeyed but to limit bureaucrats regarding authority granted them by their institutions (Inazu. 2010). If left to themselves, bureaucrats would take unilateral decisions with no respect for subordinates and the client. This will lead to a policy zigzag and institutional mandate not fulfilled. In the absence of legal framework, the public servant would convert the essence of a public entity into a household business that would lead to the establishment of a guerrilla government in the work place. The inadequacies in programme or policy implementation would create a situation where employees that do not believe in policy actions of their agencies, would take a twist by way of promoting policies that are not compatible with institutional policies (O'Leary 2014). The legal institutional framework should therefore be explicit, and employees made to understand the ramifications of policies. Where possible the expected outcomes should be clearly defined and employees allowed to contribute to either the methodology

of its implementation or its design. This will allow ownership and institutional culture reinforced in the interest of the public.

In the case of the SLP, the right to free speech is muzzled, and personnel are not given the opportunity to bring out their grievances. The appalling conditions of service could be one of the reasons for corruption which in its self is an ethical problem. The public bear the brunt of the anomaly in which arrest, detention and bail conditions are illogical with the aim of soliciting bribes. The institutional image is and continues to be damaged which reflects on the EMB members even though some might not be involved in the practice. Newswander (2014) argues that employees have their fundamental rights to free speech especially if their intentions will in no way damage managerial practices of the institution which they serve. Allowing free speech would help to identify problems affecting staff welfare and the involvement of the other ranks would help in shaping the image of the institution and hence restore public confidence. Therefore, institutional laws must indicate the need for policy actions that are driven by legal instruments and public servants must comply accordingly. Feedbacks must be reported to the law makers if there are problems affecting implementation.

While the legal framework emphasis institutional ethics, Implementation model holds that there is a need for bureaucrats to exercise the authority of discretion because of the difficulty in predicting the environment in which they live. The professional behaviour of the public servant is normally induced by the cultural environment. Kurtz (2003) reiterated the point that the public servant is conscious of propriety which is normally driven by the quest to see himself part of ownership. Public policies should not be seen as property for just the elites, and the agent's role only imbued in the implementation phase. Where this is the case, then the policy design must indicate that the public servant has the right to discretion in the exercise of implementation. Limitation as to the use of discretion must be clearly defined, and it must be in line with Waldos' decision-making model that focuses entirely on the interest of the state and the institution. Also, discretion must be used, so that the vulnerable are not subjected to unnecessary suffering and liberty and equality must be assured for citizens and non-citizens.

The SLP discretion of not allowing public assemblies for some section of the society goes against the principles of liberty and equality. The ethical responsibility of the public servant is to dispense justice with no boundaries. These are guided by institutional and national policies.

The effective implementation and adherence to the legal and implementation models would be effective if the Principal-Agent theory is put into operation. There is a need for the public servant (SLP) to give feedback where there are problems and request for additional resources for implementation. The failure of the public administrator to do so amounts to negligence and disregard for institutional ethics and national laws. The SLP should follow procedures and use appropriate tools in implementing national laws as prescribed by the legislature. Failure would breach the peace and usher in violence that would result in instability. This could be avoided by working with both internal and external actors in the implementation of policies. Internal actors would include the lower ranks who are charged with the responsibility of implementing or operationalising policies. They are found to be in constant touch with the public in whose interest the

institution was established. External actors are the law makers and the politicians who design policies and provide resources for its implementation. The cooperation of the EMB and other stake holders will help in the effective and efficient delivery of policing services while institutional ethics, professionalism and social justice are upheld.

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An empirical investigation of the Human Resources Nexus to Frauds in the Nigerian Banking Sector

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Abstract- The study investigated the phenomenon of banking sector frauds in Nigeria, staff involvement and the role of the human resource function in evolving curtailment strategies. It sought, particularly, to determine whether there is a relationship between the amounts of fraud losses in the banking sector and the cadre levels of employees. Using secondary data, estimated losses (EL) to fraud was regressed on number of fraud cases, total amounts and the categories of staff involved. The estimation of the model was based on the ordinary least squares (OLS) method after the necessary pre-testing of the annual time series data using the augmented Dickey-Fuller (ADF) and the Philips-Peron (PP) tests, taken side by side with the related descriptive statistics. The study revealed that the contribution of officers and accountants to fraud losses was the highest compared to the other categorized staff. The study model, considered good for prediction ($DW=1.93$), revealed that seventy seven percent of frauds are attributable to insiders and about 23% of fraud losses are attributable to non-insider related frauds and forgeries ($R^2=0.77$). Based on the findings, it is recommended, inter alia, that the recruitment process be strengthened through a robust, IT-enabled selection, referencing and personnel lifestyle tracking system. Further, the work environment and job content must be enriched to curtail the opportunity to commit fraud presented when employees are allowed to have wholesome access to assets and information that allow them to both commit and conceal fraud.

Index Terms- Financial Fraud, Financial infrastructure, Financialization, Financial stability, Forensic audit, Profit mining, Money laundering, Systemically Important Financial Institution (SIFIs).

I. INTRODUCTION

The upsurge in the number of banks is, itself, a positive development because more people access and become aware of banking services than before. However, this rapid expansion has stretched regulators to the hilt, weakened the effect and scope of regulatory oversight and eased the standards of accountability and corporate governance (Ikpefan and Odularu, 2007). This has opened up the sector to insider abuses, undesirable practices and executive self-indulgences such as corrupt diversion of capital of banks by boards and top managements, earnings management, staff defalcations, procurement frauds, etc. Anya (2003) states that financial fraud (popularly called 419 in Nigeria) and other economic crimes involve intentional use of deceit, asset theft/misappropriation by company directors and others in fiduciary positions or an employee, to deprive another of money, property

or a legal right, for their own benefit. These fraud acts, not only incapacitate the banks' effective delivery of their economic functions but, also, pile pressure on the nation's scarce foreign exchange resources with no visible economic benefits being transmitted to the productive sector of the economy and the general public. According to Kelly (1976), corporate fraud is an illegal act "characterized by deceit, concealment, violation of trust and not dependent upon the application of threat of physical force or violence" (p.53). Fraud refers to the act or course of deception, an intentional concealment, omission, or perversion of truth, to (1) gain unlawful or unfair advantage, (2) induce another to part with some valuable item or surrender a legal right, or (3) inflict injury in some manner. Willful fraud is a criminal offense which calls for severe penalties, and its prosecution and punishment (like that of a murder) is not bound by the statute of limitations. However incompetence or negligence in managing a business or even a reckless waste of firm's assets (by speculating on the stock market, for example) does not normally constitute a fraud. Nigeria's predominantly underdeveloped economy is often attributed to the scourge of corruption that has corroded it (Adeyemi, 2012) and heightened beyond the imagination of regulatory initiatives and capability. Corruption denies the ordinary citizen the basic means of livelihood, it worsens unemployment and erodes the image of a nation and its citizens and thus, undermines banking sector's potential contribution to economic growth and development. Idolor (2010) and Ogunleye (2010) believe that, perhaps, no where are frauds more serious and more pronounced in Nigeria than in the banking sector where, according to him, they are one of the biggest single causes of bank failure and distress in the Nigerian banking system that led to the closure of many banks in the 1990s and 2008/2009. Bank frauds may be the after-effects of global corruption, but they impinge on the banks' financial health (Kroll, 2014).

Bank frauds have taken new dimensions with bank operators being at the root of it all. Also the bank's Chief executives have become reckless in spending to rent for themselves buildings in the name of official accommodation, acquire fleets of expensive cars/jets and employ a retinue of domestic servants or staffs. Bank executives have in pursuit of high personal financial rewards, acquisition of promotions or status and inordinate strategies to get ahead of competition thrown ethics into the dust. They have taken sufficient advantage of a society engendered with lax regulations, enforcement, secrecy and lack of ethical restraints. Their salaries and fringe benefits cannot, obviously, be supported by the present level of the national economy. The competitive operational environment, in which the banks function, more so with the 'new generation'

ones, is characterized by the existence of under-exposed key management personnel drafted into service from some other institutions or under ‘casualization’ schemes, motivated only by the drive for deposit targets. It therefore, appears that the manpower resource base available to the banking industry has not been developed and professionalized at a sufficient rate to match the growth and sophistication of the industry. The depreciation of managerial quality has led to weak internal control, contravention of statutory regulations, bank portfolio problems, unethical credit policies and other unacceptable practices with catastrophic consequences on the industry and the economy at large.

The long-term survival, stability and development of the banking system depend on how frauds and fraudulent practices in the banks are handled. Along with this, none of the repeated regulatory warnings, financial penalties or occasional investigations has proved sufficient to curtail violation of rules, anti-social behaviour and other unethical malpractices exhibited by bank managers and employees in their pursuit of wealth. Globalization and the growth in e-payment systems offer bank fraudsters enticing opportunities to understand and exploit differences in national security standards. Therefore, the need to isolate the factors disposing bankers to fraudulent mindsets and indulgences is worthwhile, underlining the need for an empirical investigative study of the nexus between the phenomenon and human resource factors to contribute to knowledge in this area. This, the study hopes, will inform appropriate actions by regulators and human resource practitioners to avert the unwholesome leakages of the scarce investible resources by internal economic agents and their networks. Consequently, the objective of this study is to investigate the factors disposing the Nigerian banks and their personnel to fraud and fraudulent practices as well as empirically assess the relationship between the amounts of fraud losses in the banking sector and the cadre levels of employees involved in frauds.

In order to achieve these objectives, the paper is divided into five sections. Section one is the introduction, section two is on literature review, while the third section is on research methodology. Section four discusses data presentation and analysis and section five presents the summary of findings, conclusion and recommendations.

For the purpose of this study the following hypotheses are to be tested.

Ho: There is no significant relationship between the level of frauds losses in the banking sector and the cadre levels of employees involved.

The significance of this study is that it goes beyond the usual search for a relationship between fraud and deposits of banks to empirically determine whether there is a relationship between the amounts of fraud losses in the banking sector and the cadre levels of employees involved. This should assist regulators locate within the human resource management (HRM) function appropriate strategies for stemming the tide of frauds in the sector. The unique contribution of this paper is its emphasis on building upon the methodology and findings of some previous studies in the area of bank fraud (in Nigeria), by conducting statistical test of significance which adds statistical validity and flavour to the findings. Such findings should further advance

understanding in the areas of fraud causation, detection and prevention and raise interest for research in the area.

II. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 THEORETICAL FRAMEWORK

This investigation was conducted against the framework set by a number of theories including Cressey’s Classical Theory of Fraud (better known as the Fraud Triangle), the fraud diamond theory and the Potato Chip Theory. Acknowledging that the costs of fraud are passed on to society in the form of increased customer inconvenience, opportunity costs, unnecessary spikes in the prices of goods and services, and succeeding criminal activities funded by past fraudulent gains, the study will also draw from the Fraud Management Lifecycle Theory (Wilhelm, 2004). This is to seek effective solutions that would significantly reduce the losses and societal costs associated with fraud (Abdulraheem, Isiaka and Muhammed, 2012). Understanding the likely theories behind the growing incidence of frauds and where these theories need to be further developed is crucial for properly addressing the current challenges and designing appropriate fraud curtailment systems for the future.

2.1.1 The Classical Theory of Fraud (better known as the Fraud Triangle):

Cressey (1919 – 1987) propounded the classical fraud theory, hypothesizing that: “Trusted persons become trust violators when they conceive of themselves as having a financial problem which is non-sharable, are aware this problem can be secretly resolved by violation of the position of financial trust, and are able to apply to their own conduct, in that situation, verbalizations which enable them to adjust their conceptions of themselves as trusted persons with their conceptions of themselves as users of the entrusted funds or property” (Cressey, 1953). Simply put, the propensities for fraud is a triangle of perceived non-sharable financial need (pressure), perceived opportunity to secretly resolve the financial pressure and perceived rationalization (ability to rationalize the illegal conduct and justify crime in their mind).

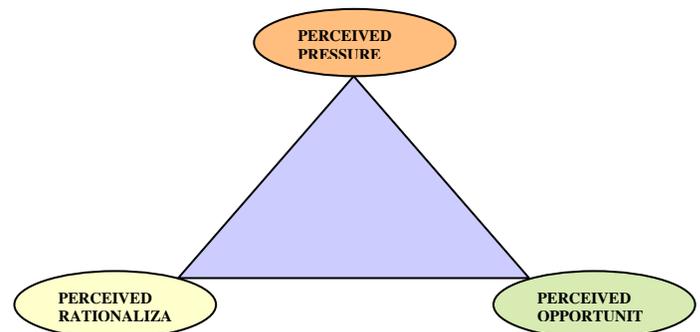


Figure 1: The Fraud Triangle (Cressey, 1953)

The most fundamental statement of this theory is that all three elements must co-exist for the violation of trust (fraud) to occur. In support of the fraud triangle view, the theory of fraud scale acknowledges that, when situational pressure and perceived opportunity are high and personal integrity is low, fraud is much more likely to occur. Although perceived pressure is generally

financially driven, it may also be non-financial, while opportunities to act unethically may arise from the very structure of the organization or through employees' manipulation of the internal control systems. Further, rationalization sprouts from the perception that, although the action may not be socially acceptable, some unique, extraneous circumstances move the fraudster to justify it (Onanuga and Oshinloye, 2012). According to Chiezey and Onu (2013), pressures that move individuals to commit fraud are financial pressures (greed, high medical bills for self and dependents or debts), peer pressure vices (drugs, gambling and alcoholism), work-related pressures (high expectation for good results/targets at work or a need to cover up someone's poor results or to report results that are better than actual performance compared to the competition). Other pressures include frustration with job content or even a persistent urge to beat the system, as well as the opportunity and attitude to commit fraud. Perpetrators of fraud must believe that they can commit the fraud without being caught (or if caught, nothing untoward will happen): severity and probability of punishment relates to commission of fraud in the manner represented in Fig. 2 below.

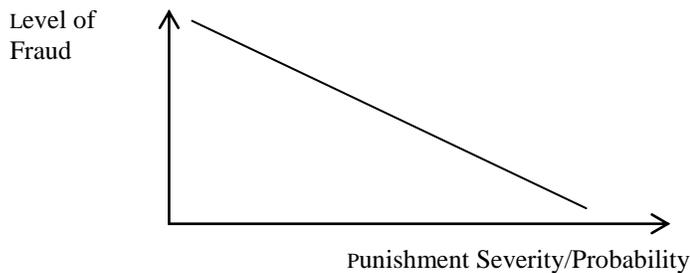


Fig. 2: Fraud–Punishment Graph (Source: Author)

The opportunity for fraud presents when employees are allowed to have access to assets and information that allow them to both commit and conceal fraud. Such perception is helped by weak internal control practices and various other factors such as apathy, ignorance, weak/ineffective sanctions regime and inadequate work infrastructure (Chiezey and Onu, 2013). The human resource function must grasp that when people are given a sufficiently powerful motivation (hyper motivated) to commit an act of fraud, they are generally more than capable to rationalize the act as not in fact conflict with their own ethical precepts and, therefore, go on to get stuck in the “rut”. Accordingly, the need to balance the hyper-motivation to be successful at work and modest personal lifestyle/consumption must be emphasized as the orientation for action (Koslowski, 2009).

2.1.2 Theory of fraud diamond

Providing an improvement on the Cressey’s model, Wolfe and Hermanson (2004), in their theory of fraud diamond, theorized that an individual's capability, personality traits and abilities can play a major role in determining whether fraud may occur. They noted that, while opportunities can open the doorways to fraud and incentive with rationalization will attract people to it, such an individual must have the capability to recognize the open doorway as an opportunity and should be able

to take an undue advantage of it. The introduction of the element of capability by Wolfe and Hermanson modified Cressey’s Triangle into a diamond comprising the four inter-related, mutually reinforcing elements of pressure, opportunity, rationalization and capability. Agreeing with the theorists, I represent this new thinking in a diamond-shaped diagram as follows (Fig. 3):

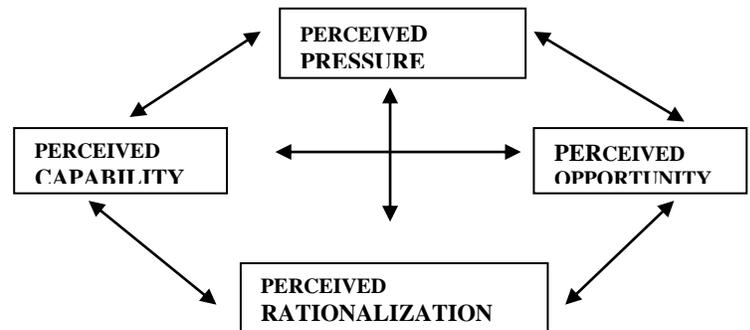


Fig. 3: The Fraud Diamond (Conceptualized By Author)

2.1.3 The Potato Chip Theory of Fraud

Another theory on which this study will rely is the Potato Chip Theory of Fraud. This theory shows that once an employee starts stealing, he tends to continue because he cannot stop at just one fraud because fraud has the potential of becoming sticky and addictive. The theory, therefore, likens fraud perpetrators to a person that eats a potato chip, but is never satisfied. So he gets bolder, keeps sipping and sipping, with the amounts getting larger and/or the occurrence more frequent, until he eventually slips, gets exposed and is caught or volitionally terminates his services from the bank (Barr, 2007). This theory supposes that if a bank officer nibbles a customer’s account to pay off personal debts and perceives that he can continue without getting caught, he would ultimately become addicted to this source of extra income. As he matures in this indulgence, he starts larger and more frequent defalcations to satisfy luxury acquisitions, vacations, and other non-essential items. According to Onanuga and Oshinloye (2012), this indulgence may have begun from a non-sharable financial pressure but, would continue, even after the underlying problems have been sorted out. As a result, he becomes a predatory employee with thieving becoming the norm for him to the point where he would not have to rationalize it any longer, until finally caught. That is, once they have taken the first step towards unethical behavior, subsequent steps into deeper levels of malfeasance get progressively easier; getting the fraudster into a visceral state that leads him into acts that he would normally have deemed unacceptable.

2.1.4 The Fraud Management Lifecycle (FML)

The study also draws from the Fraud Management Lifecycle theory, which describes a network made up of eight interrelated, interdependent, and independent actions, functions, and operations (stages) which do not, necessarily, occur in a sequential or linear flow (Wilhelm, 2004). *Deterrence*, the first stage, is characterized by actions and activities targeted at stopping or preventing fraud before it is attempted by making the

attempt to commit fraud unattractive, dreadful or career/life threatening. The second stage, *prevention*, involves actions and activities to prevent fraud from occurring. In *detection*, the third stage, actions and activities to uncover or reveal the presence of fraud or attempt, such as statistical monitoring programs are used to identify and locate fraud prior to, during, and subsequent to the completion of the fraudulent activity. The goal of the fourth stage, *mitigation*, is to stop losses from occurring or continuing to occur and/or to hinder a fraudster from continuing or completing the fraudulent activity, by blocking an account, for example. In the next stage, *analysis*, losses that occurred despite deterrence, detection, and prevention activities are identified and studied to determine the factors of the loss situation, using methods such as root cause analysis. The FML's sixth stage, *policy*, is represented by activities to create, deploy, evaluate and communicate policies to reduce the incidence of fraud. Balancing prudent fraud reduction policies with resource constraints and effective management of legitimate customer activity is also part of this stage. An example of a policy in this stage is the requirement of the Special Control Unit on Money Laundering (SCUML) that any cash transaction over N1,000,000 or its equivalent should be reported. *Investigation*, the seventh stage, requires obtaining enough evidence and information to stop fraudulent activity, recover assets or obtain restitution as well as provide evidence to support for the successful prosecution and conviction of the fraudster(s). Covert electronic surveillance is a method used in this stage. The final stage, *prosecution*, is the culmination of all the successes and failures in the FML. There are failures when the fraud succeeds and successes when the fraud is detected, a suspect identified, apprehended, and charges filed. This stage aims at asset recovery, criminal restitution, and conviction with its attendant deterrent value (Wilhelm, 2004). The hypothesis of this study is that fraud detection is but a single component in a comprehensive Fraud Management Lifecycle that includes all of the eight elements discussed above. When these stages are not successfully integrated and balanced, the benefits of advancements in fraud detection and overall fraud management technologies are muted (McRae, 2001; Ernst and Young, 2000).

2.1.5 Other theories relevant to the study

Additionally, this work is premised on the theses of other theories considered germane to the human capital-fraud nexus. These theories include, but not limited to: The social control/bond theory, the Social learning theory, the Rotten Apple theory, theory of work place deviance, theory of hyper motivation, tip-of-the-iceberg theory, addition-by-subtraction theory, the cognitive theory and the 'American' dream theory.

The *social control/social bond theory*, developed by Travis Hirschi in 1969, is that exploiting the process of socialization and social learning helps to build self-control in individuals; thus, reducing the inclination to indulge in behaviors recognized as anti-social. The theory proposes that an individual's relationships, commitments, values, norms, and beliefs foster a lawful environment and encourage him not to break the law (Hirschi and Gottfredson, 2002). The human resource imperative here is that the work environment must be woven around inter and intra staff relationships that internalize moral codes to foster long term personnel commitment and bonding to the organization and its values. Without doubt, if moral codes are internalized

with individual employees tied in and having a stake in their wider community (i.e. organization) then, they will voluntarily limit their propensity, and be less likely, to commit deviant or criminal acts. According to Schubert (2015), there are four canons for this theory: attachment to other individuals, commitment to following rules, involvement by typical social behaviours and belief in a basic value system. The *Social learning theory* on fraud holds that, if deviant behaviors are reinforced and alternative behaviors are not reinforced as strongly, then an individual is likely to engage in fraudulent/deviant behaviors. The *Differential Association Theory* put forward by Edwin Sutherland (1883 – 1950), states that the development of criminal behaviour arise from association with those who commit crime, learnt like any other subject or trade, involving all the mechanisms that are involved in any other learning (Sutherland, 1947; Sutherland and Cressey, 1960). Further that such learning takes place in a process of communication with other persons within intimate personal groups, particularly peers (Scarpitti, Nielsen and Miller, 2009). The thesis of the *Rotten Apple theory* is that good and bad conducts within corporate organizations are infectious, such that fraudulent actions by supervisors and top management can easily be emulated by their subordinates in the same way their good conducts would be emulated. The human capital management challenge, given this theory, is that whenever a "rotten and fraudulent apple" is identified in the organization, it must be quickly plucked off to ensure it does not contaminate the other good fruits on the tree. The *theory of work place deviance* postulates that employees steal primarily as a result of workplace conditions, and that a lowered rate of employee theft is a by-product of a management team that is responsive to employees' plights. The *theory of 'a tip of the iceberg'* posits that whenever fraud is discovered, it must be fully investigated and probed to its foundation, no matter the size because a massive fraud may be underneath disguised as a minor one and even as an innocent error. The *theory of low hanging fruits* describes a situation of frauds of minor value but with high frequency. The temptation of managers, in such cases, is high to overlook frauds of low amounts in the cause of investigations, which can be dangerous because frauds of low amounts and high frequency can equally be devastating to the going concern status of the entity ultimately. The *addition by subtraction theory* posits that whenever any person is found guilty of fraud, he or she must be fired, irrespective of the amount involved and his or her position within the organization. The *cognitive theory* asserts that fraudsters are naturally intelligent and are imbued with high intelligent quotient, requiring managements to watch out for those staff that are categorized as 'smart', 'wiz-kid' or 'indispensable' in their organizations. Last, but not least important, the *'American' dream theory* notes that in the corporate environment, a strong pressure to succeed is mounted on executives to pass through a narrowly defined way, in order to post an impressive level of accomplishment. Accordingly, desperate managers pass through the fraudulent path to achieve a measure of success when others could not. This theory places a burden on corporate managers to ensure that performance targets on employees are responsibly and realistically set.

2.2 REVIEW OF RELATED LITERATURE

Although senior employee alertness and audits are essential to combating fraud, these mechanisms become weaker when senior employees themselves are the culprits (Kroll, 2014). This, perhaps explains why repeated warnings, financial penalties or occasional investigations, by the regulator, is insufficient to curtail violation of rules, anti-social behaviour and other unethical malpractices exhibited by bank managers in their pursuit of wealth. Without doubt, internal audits are less likely to be able to uncover fraud or criminal indulgences when senior or middle management is involved. Therefore, whistle-blowing and forensic audit must be embraced as important means to expose wrongdoing by the human resources function.

2.2.1 Major Causes of Frauds

The causes of frauds in banks have been classified under two generic factors namely: institutional or internal factors and environmental or societal/external factors. Institutional causes of frauds include excessive workload, poor staffing – in terms of technical competence and staff strength, inadequate or lack of staff training, poor management culture, frustration, inadequate financial infrastructure, poor accounting and internal control systems (Usenideh, 2014). Environmental causes of frauds, on the other hand, include poor and warped social values, the get-rich-quick disposition, slow and tortuous legal process, lack of effective deterrent or punishment and at times reluctance on the part of the individual bank to report frauds due to the perceived negative publicity it could create for the image of the institution. Generally, therefore, frauds come by three elements, namely: the *will* to commit the fraud, the *opportunity* to execute the fraud and the *exit* (escape) from sanctions against successful or attempted fraud or deviant behaviour (Hur-Yagba, 2003), very much in sync with the Fraud Triangle Theory. In their investigation of the factors that could be critical in strengthening fraud prevention systems in electronic banking, Usman and Shah (2013) found that frauds in e-banking services are caused by various compromises in security ranging from weak authentication systems to insufficient internal controls. That means, beyond technology, internal controls, customer and staff education need to be considered. Lannacci and Morris (2000) believe the causes of vulnerability to financial crimes include the lack of good record keeping in the country. It is believed (CBN, 2014) that bank managements embark on unethical acts and frauds to enable their banks, at least temporarily, hide capital deficiency; evade sanctions for breach of the regulatory lending limits; hide or disguise the telltales of illiquidity; minimise payment of premium to NDIC, cash reserve obligation to the CBN and tax to the relevant Tax Authorities. Other reasons are to present healthy credit portfolio and hide the weaknesses which the risk assets surreptitiously harbour; meet up with peer standards and industry performance benchmarks and paint rosy pictures of their state of affairs before the investing public and potential depositors. Furthermore, it affords the opportunity to shrink deposits and reduce their loan portfolio; and obtain arbitrage income from round-tripping of foreign exchange which are acquired from the CBN with fictitious documentation.

2.2.2 Typology of Frauds

Three forms of fraud conceptually present in Nigerian banking industry and indeed in every organization (Adebisi,

2009). These are the internal, external and a combination of internal and external frauds. *Internal fraud*: This is a fraud made against an organization by an insider- say a staff. If the staff is not capable of starting and concluding the whole process, he may carefully put together a select fraud ‘syndicate’ within the organization. *External Fraud*: This is a fraud perpetrated by outsiders. This is the exact anti-thesis of the first form (internal fraud). *Combination of Internal and External Fraud*: Usually through collusion, this form of fraud in a bank can be committed by a bank customer, bank staff or a combination of staff and customer or third parties; very common (CBN, 2014) and comes with a higher success rate than the first two. In 2014 alone, out of the 10,621 fraud cases reported Nigerian deposit money banks, 465 cases were linked to staff representing a decline of 31.82% in fraud cases perpetrated by staff members when compared with 682 in 2013, while losses arising from this class of frauds rose marginally by 4.1% from N3.04 billion in 2013 to 3.17 billion in 2014 (NDIC, 2014). According to Kanu and Okorafor (2013), fraudulent transactions in organizations such as banks could equally be classified into three broad categories, namely flow, victims or Act (Olaoye, 2009). *Flow fraud* refers to the value and frequency of a fraud and could be a *smash and grab* type in which the frauds are infrequently committed, but of high value over a short time period or a *drib* fraud which is a repetitive, high frequency occurrence, involving small amounts. *Victims fraud* classification refers to the people affected or incurring a loss as a result of the fraud and is also divided into two, namely: against the company and against outsiders. ‘*Against the company*’ frauds are perpetrated against the organization (e.g. the bank), meaning that the resultant loss is borne by the bank. On the other hand, the ‘*against the outsiders*’ fraud has its victims as the outsiders (customers, etc.) who transact business with the bank. Finally, the *Act frauds* class describes the action that takes place during a fraud: the people involved in the act and the methods used or the manner by which these people perpetrated the fraud. The perpetrators could be either bank employees, executive management or board members, armed robbers or other outsiders, sometimes in collusion with insiders (NDIC, 2013). Notwithstanding their categorization, frauds in the Nigerian banking sector were executed through diverse means, including fraudulent withdrawals from customers’ accounts, suppression and conversion of customers’ deposits, theft, illegal funds transfer, cheque defalcations, and fraudulent ATM withdrawals. In most cases, these frauds were perpetrated by outsiders, “although there were instances where bank employees were also culpable” (CBN, 2014; 19). While the aforementioned frauds are perpetrated for personal gains, the role played by companies in promoting fraudulent practices, to increase their pecuniary gains at the expense of both the government and the populace, cannot be overemphasized (Sikka, 2005; Otusanya, 2011).

2.2.3 Means through which Frauds are perpetrated in Nigerian banks.

The most important and common means, according to NDIC (2013), Benson and Edwards (2006), Nwaze (2009) and Adebisi (2009) through which frauds are perpetrated in the Nigerian banking industry are: *Mail fraud*, which is a process whereby the content of a duly authorized mail originated in a bank is converted to the benefit of illegitimate recipient.

Teller frauds involve the act of stealing from counted cash by a bank staff. This could come in the form of pilfering, teaming and lading and deposit suppression. Others include unauthorized withdrawals, vault/till cash manipulations and the manipulation of foreign currency in tellers till or vault. *Advance Fee ("419") Fraud* operates to trick prospective victims into parting with funds by persuading them that they will receive a substantial benefit, in return for providing some modest payment in advance. This usually involves an agent approaching a bank, a company or an individual with an offer to access large funds for services purportedly rendered or contracts executed or to be rendered/executed. The collaboration of an accomplice is sought through the agent who must receive a fee or commission "in advance". As soon as the agent collects the fee, he disappears, and the funds or the underlying assets never get to the target bank or individual. This is popularly known as "419" in Nigeria, in reference to the section of the criminal code covering such criminal activities. Over the past years, Nigeria has become notorious for financial crime as "advance fee fraud has brought the nation into disrepute" (Adeyemi, 2004:103). *Cheque Kiting* involves the unauthorized use by depositors of undeserved credits in their accounts. The purpose of cheque kiting is to falsely inflate the balance of a checking account in order to allow written cheques that would otherwise bounce, to be cleared (Idowu, 2009; Lundin, 2013). This way, the cheque 'kiter' uses the collected funds interest-free for a short time to overcome a temporary cash shortage or to utilize the funds permanently. Cheque kiting can be described as 'paper hanging' – where the account is not replenished, or 'playing the float/payday loan' – where it is covered by payday (The Free Dictionary, 2013). *Account Opening Fraud* involves the deposit and subsequent cashing of fraudulent cheques, with the fraudster asking to open a transaction (current or savings) account with false identification but unknown to the bank. The person opens the account with a small initial deposit of cash or cheque. Generally, within a few days, the person will deposit a number of dud cheques and obtain cash in return, either by cashing the fraudulent items outright or by withdrawing cash as soon as funds are available with the connivance of bank staff. In the last few years many banks have lost money through corporate and personal account opening frauds, due to banks' laxity in applying their standard account-opening controls, including the KYC methodology. *Letters of credit Fraud* arise when forged or fraudulent documents (e.g. bank drafts, etc.) are presented to the confirming or issuing bank with fake endorsements against which payment is demanded and procured. Also frauds in this category are effected through suppression of an underlying settlement instrument so that at the expiration of the applicable clearing period the collecting bank gives value as though the paying bank had confirmed it good for payment. Accompanying banker's cheque or draft and shipping documents may also be substituted to enable the fraudster divert the fund to a wrong beneficiary or account. At the basic level, a letter of credit fraud is a type of scam in which the executor attempts to make money via a spurious business transaction or tells victims he would ship goods to them in exchange for payment, only to disappear after receiving the payment (Buckley and Gao, 2002). *Money Transfer Fraud*, on the local or international platforms, e.g. Money gram, Western union etc could include identity fraud and fake confirmation, resulting

from a deliberate fraudulent request initiated purposively to defraud or by illegally altering a genuine funds transfer request (Ojo, 2008). A genuine request can be altered by changing the beneficiary's name or account number or changing the amount of the transfer. *Loan Frauds* underlie the fact that loans are the commonest type of credits granted by banks in Nigeria and experience shows that their vulnerability to fraudulent manipulation begins as soon as the first requests are made. However, most loan frauds are perpetuated with the active collaboration of bank employees (CBN, 2014). The commonest types of loan frauds are: manipulation of properly granted facilities, granting of unauthorized facilities, excess above approved limits/expired facilities and swapping of credit facilities. Others are the selling of bank draft or certified cheque against insufficient funds, giving of false financial accounts by some deceptive customers, as well as giving of false guarantees and presentation of false collaterals, etc. Also, loan frauds occur when credit is extended without due authorization or to a borrowing customer who has exceeded his credit ceiling or who has, *at initiation*, misinformed the bank of his true contact details and personal financial circumstances. Some fraudulent staff in a bid to conceal such transactions could present falsified statements and documents to Examiners or feed such accounts with fictitious entries to portray them as being serviced. Other categories of loan fraud include granting of credits on the strength of overvalued or non-existent, multiple pledged, stolen or counterfeit collaterals and extension of credits in violation of regulatory stipulations. Loan fraud could also be perpetrated by bank customers where loan is obtained on the strength of false financial statement or where the loan proceeds are diverted. Other fraud channels include *Counterfeit Financial Instruments* perpetrated through illegal counterfeiting of commercial and financial instruments. Modern photographic and printing equipment have greatly aided criminals in reproducing good quality forged instruments. This involves the use of total counterfeits or copying, forging or altering genuine documents (e.g. stock or bonds, treasury notes, cashiers' cheques, bankers acceptances, or certificates of deposits, even legal tender) as to amount, pay out date, payee or terms of payment. *Cheque/Clearing frauds* are perpetrated through stolen cheque books/leaves and subsequent forging of account holder's signature or alteration of payee or amount payable; substitution of clearing cheques, et cetera. Because cheques have become a major vehicle for the operation of the payment system worldwide, notwithstanding the growing use of cash-less channels, fraudsters have found a haven in it through which millions of naira is lost annually.

Most clearing frauds are perpetrated through suppression of payment instruments so that at the expiration of the clearing period applicable to the instrument the collecting bank gives value as though the paying bank had confirmed the instrument good for payment and, accordingly, credit the fraudster's account and is immediately withdrawn. *Money Laundering* is the process by which proceeds of illegitimate businesses are channeled into the financial system in order to conceal their true origin. This fraud scheme ensures that the sources or use of money illegally obtained are concealed by converting the cash into untraceable transactions in banks. At times, in a desperate effort to disguise such transactions, the funds could be moved between several

institutions and across boundaries. According to Hopwood, Leiner and Young (2012), money laundering fraud goes through three stages of placement, layering and integration. *Telex Fraud* involves the alteration of the transfer instructions (message), though often coded, to enable diversion of funds to an account not originally intended. The rapid development in information technology and globalization has had serious impact on banking practice in the country, driving the way banking businesses are conducted in the country as more and more banks move to automate their back office and clients' services. The rapid development carries with it the risk of *computer/cyber* fraud (Helsby, 2014) as there seemed to be no longer discernable boundary nor perimeter along which to erect the defenses to keep corporate data within and inaccessible to computer hackers outside. *ATM Frauds/Skimming* involves installing surreptitious surveillance equipment on ATMs that allowed the fraudster to record customers' account information and PINs, create their own bank cards, and steal from customer accounts. In addition, skimming, that some experts believe costs banks hundreds of millions of Naira annually, typically involves the use of a hidden camera, installed on or near an ATM, to record customers' entry of their PINs into the ATM's keypad or scoops information from a bank card's magnetic strip whenever a customer uses the machine (FBI, 2011). It may also involve the banks' staff deliberately not dispensing money on the ATM, but registering same in the electronic Journal (NDIC, 2013). Another area of staff complicity if financial fraud is in *Earnings Management/Financial statement fraud*, defined as the practice of companies manipulating their earnings in order to match a predetermined object and variously called income smoothing, aggressive accounting, financial reengineering, creative accounting and window dressing, etc. Earnings management involves intentionally recognizing or measuring transactions and other events and circumstances in the wrong accounting period or recording fictitious transactions both of which may constitute fraud (Atu, Gbenga and Atu, 2011). Earnings management also, according to Schipper (1989) and Healy and Wahlen (1999), involves the purposeful intervention in the external financial reporting process, with intent of obtaining some private gain and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers. NDIC (2014) reports that the increase of 7.6% in expected/actual loss from frauds and forgeries reported by deposit money banks in 2014 was mainly due to the astronomical rise in the incidence of web-based (online banking)/ATM and fraudulent transfer/withdrawal of deposit frauds, attributed to the weak IT infrastructure signaling a need for the banks to improve electronic payments controls and security. In Nigeria, the regulatory authorities - the Central Bank of Nigeria (CBN) and the Nigerian deposit insurance corporation (NDIC) - have identified and reported frauds and forgeries routinely under-listed fourteen (14) prevalent modes through which deposits are frittered away in Nigerian banks. This includes:(1) ATM fraud, 2) Fraudulent transfers/withdrawal of deposits, 3) Suppression of customers deposits, 4) Internet banking fraud, 5) Fraudulent conversion of cheques, 6) Presentation of stolen cheques, 7) Unauthorized credit, 8) Presentation of forged cheques, 9)

Outright theft by staff, 10) Diversion of bank charges (commission and fees), 11) Lodgment of stolen warrants, 12) Foreign currency theft, 13) Non-dispensing of money but registered by the electronic journal, 14) Outright theft by outsiders/Armed Robbery attacks, (NDIC, 2013). The data on this fraud types are used in this study.

2.2.4 Enablers of Fraud

There are many causes of fraud, depending on the enabling environment (legal, social control systems, organizational structure, etc.), but this are generally classed into social, technological, personal, management and legal (Nwaze, 2009; Adebisi, 2009; Benson and Edwards, 2006), which are briefly discussed here.

Social Enablers/Causal dimensions of banking sector fraud: Social circumstances around the organization of employee space could dispose the bank to fraudulent activities. Such enablers could include, but not limited to: Disproportionately high value placed by the wider society on accumulation of wealth without regard for the source (Ayozie, 2012) and the growth of financialization world wide (Epstein, 2002); a reward system that favours dishonest staff such that honest staff are regarded as slow and less valuable to the system; official nepotism enabling only 'highly heeled' people or staff related to people with high net worth and sensitive political positions (with high deposit potential) to be favoured and non recognition of professionalism, making the possession of relevant professional qualification meaningless. This way some very intelligent staff get aggrieved or dissatisfied and, in venting their dissatisfaction, constitute a doorway and threat to the organization's ethical framework.

Technological causal dimensions: The growing use of technology by banks has made their operations (and also fraud) easier and therefore, a critical disposing factor in execution of financial fraud. This is because, among other externalities: technology has substantially reduced the cost of perpetrating fraud; documents replication/cloning and identity theft are perfectly facilitated by technology and its derived applications; ICT has removed physical boundaries such that banking sector fraud can be perpetrated across far flung nations, over the 'cloud'; technology has substantially reduced the time it takes to initiate and conclude fraud, so proceeds from fraudulent activities can be obtained real time with ease, e.g. via cash-less or e - money transfer channels; e-frauds are difficult to detect or prevent and post-event tracking of perpetrators and/or proceeds could prove daunting, requiring special skills to unravel; ICT evolves quickly such that once an ICT-based fraud method is detected and an antidote developed, new methods are perfected and deployed; and the ICT appreciation gap between today's eclectic youth and the older generation (seen as the resource holders) as well as the pressure from successful peers, has disposed them to ICT-based fraudulent acts for financial gain or 'vendetta'. *Legal causal dimensions:* The Nigerian legal system is weak in its processes and sanctions for fraudulent behaviour and so conduces the environment for fraud. This is because fraud causes are treated lightly as 'bailable offences' requiring the 'due process of law'. The very long 'due process' of investigation before the culprits are even brought before the law and booked often provides an alibi of 'want of evidence' by the court to discharge the fraudster, to the detriment of the society. This slow

and tortuous process causes delays in the prosecution of fraud cases, such that the party frustrated by long adjournments and delays might likely abandon a case, and this will lead to miscarriage of justice (Ayozie, 2014). This is helped, according to Alashi (1994), by the corruption and decay in the legal, law enforcement and judicial system evidenced by fraudulent activities of prosecuting officers and connivance with judges to assist fraudsters and, in most cases, procure their release.

Personal causal dimensions: The following are personal issues that have been found to cause, influence or encourage fraud: professional corporate criminals, who not only perpetrate fraud themselves, but go around recruiting interested people with impaired character; insatiable appetite for adventure -criminal or otherwise, which drive people to steal if they have opportunities, notwithstanding their status or material possessions; employees, who are brought up with varying standards of moral at home; wrong choice of friends or mentors that link an employee to fraudulent people who entice them with generous cash or material gifts before the "subject" is introduced to them; persons, who are from good homes, attend good schools and have very good or refined religious backgrounds, but have weak minds/self-confidence and can easily be convinced; existence of backers or crime fathers: Some fraud-minded employees believe in the capacity of their "crime fathers", friends or parental influence to slow down investigation. These "backers" are usually influential and may call on their big friends in high places to rescue their children or "boys" from justice and in the process, the entire syndicate members are usually let off the hook (Ibor, 2015).

Management causal dimensions: Management actions or inactions that could cause or create a fertile ground for fraud in banks include: management failure to institute rigorous character checks during recruitment of staff from reliable sources such as schools attended, previous employers, etc; inadvertent placement of high premium on paper qualification over performance, causing certificate manipulation and other fraudulent acts; low remuneration package when the organization is perceived through its publications and utterance of key officials to be capable of paying better than current package; weak internal controls, untimely checks and un-reconciled accounts/books; delay or total neglect of regular internal and external audits and their exceptions. Others are the use of inexperienced or casual workforce in strategic positions to save or reduce costs; near total neglect of staff training and retraining; lack of serious penalties on culprits, such as prompt dismissal when fraud takes place and the fraudsters are found; substandard or lack of security equipment, like fireproof safe, to keep security items and secured telephone, fax and e-mail or internet facilities to contact third parties; loose or generous approval authorization limits in an organization; unrestricted access to the computer room/database and placing of higher or multiple responsibilities and confidence on one staff, perceived by management to be efficient or competent. Such individual often have so much authority vested on him, widening the opportunity window available to him should he want to commit fraud. It is noteworthy that habits "die hard" and so, frauds that could be attributed to personal causes are the most difficult to correct. The social system can be modified, technological solutions may be devised, the law can be adjusted and corporate management can include

ethical standards in their operating manual, but human personal traits are difficult to control.

2.2.5 Extent/Effect of Frauds in the Nigerian Banking System

According to Adebisi (2009), whenever there is a successful fraud incident, certain things happen in quick succession that will leave considerable social and psychological effects as painful memory or lasting scars on the organization, staff, government and the society at large. The incidence of frauds in our banking system has continued to be of grave concern to the Regulatory Authorities going by the magnitude of loss recorded by the system to the fraudsters over the years (see Appendices 1-3). The experience with those banks that were closed between 1994 and now clearly showed the trends as well as the damaging impact of frauds on the affected banks and the entire Nigerian financial services industry. In one of such closed banks, over N1.6 billion was outstanding in its books as frauds/unauthorized lending distributed among its several branches. Also, in another failed bank, the sum of over N461 million was outstanding in its book as amount lost through fraud. Many of the banks-in-liquidation as well as many still in operation had suffered a great deal from the impact of frauds. For example, between 1994 and 2014, there were 36,918 fraud cases reported, involving over N303.9 billion, out of which over N80.31 was lost with 9090 staff involved (NDIC, 2014). The actual or expected loss amount of the reported cases of frauds and forgeries represent those whose probability of recovery was low as well as those not fully covered by Fidelity Insurance Bond. Balanced against the argument that perhaps only a fraction of such incidences are reported, the heavy toll frauds have had on the vibrancy of the banking system is no longer in doubt. It is noteworthy that as Regulatory Authorities are busy exploring and fashioning out strategies to curtail the strangle-hold of frauds on the banking system, the fraudsters are busy "engineering new methods and tricks" to further wreak havoc on the system through fraud; a situation that human resource managers would need deliberately to seek redress to. There is no gainsaying the fact that just as most banks engage in legitimate activities, some of them are known to indulge in illegal and unauthorized activities. Such behaviours, no doubt, have the potential of increasing risk to depositors' funds. Jafaru and Iyoha (2012) citing Aikhorin (1994) state that the effect of sharp practices (notably frauds and forgeries) on banks is a loss resulting in depleted profit and, depending on the size and strength of the bank, it could be forced to close down if the frequency and size of the frauds are high and persistent.

2.2.6 The Recent dimensions in Bank Frauds

The CBN is empowered, under the Banks and other financial institutions Act (BOFIA) to supervise and regulate the activities of Nigerian banks and financial institutions under to section 61, as well as other routine or special examinations of banks to assess their financial health (Idigbe and Kalu, 2010). Beside the traditional fraudulent malpractices that could occur as a result of weak internal control and inadequate computer securities there has been a new dimension to bank frauds in the recent years, "management fraud", characterized by lack of transparency in financial reporting and in transactions on the part of Board, management and officers banks with their clients and

unsuspecting members of public (Wilks and Zimbelman, 2004). Indeed, some of the banks whose Foreign Exchange Authorized Dealership Licenses were suspended by CBN recently were found to have used the accounts of some customers to bid for foreign exchange without the knowledge or consent of such customers. Such fraudulently acquired foreign exchange was subsequently round tripped and sold in the parallel market (CBN, 2015). Reports of on-site examinations of banks have continued to reveal the growing trends in unethical balance sheet management by banks. These days, end of month or end of year “financial engineering” involving window dressing through earnings management by banks, is common place (Schipper, 1989). Healy and Wahlen (1999) say that earnings management occurs when managers use judgment in financial reporting and structuring of transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers (Atu, Gbenga and Atu, 2011). Banks were also known to have financed their recapitalization through short term funds such as Commercial Papers (CPs) raised from the money market. In another breath, some related banks have evolved the strategy of “cross dealings” transactions to conceal their violations of single obligor limits and/or forestall loan loss provisioning by bringing the outstanding balances on the affected accounts within prescribed limit to be reversed to the status quo soon after the exit of the Examiners or the turn of the reporting period. The manipulation and spread of bank frauds, unethical and professional conducts presently in the commercial banks and within all cadres of bank staff (directors, managers and staff of all levels) is gradually eroding the public confidence in the Nigerian banking system (Ayozie, 2014). The challenges/negative impact posed by the growing trends in frauds on our banking system is no doubt enormous and would require the genuine endeavour of all concerned to curtail. Compliance must be grown to drive awareness of the banks that they are vulnerable to the presence and complexity of regulatory breaches, conflicts of interests and market collusion, including the rise in sophistication of cyber fraud. To this end, information sharing amongst all the stake-holders and the current on-site supervision approach - Risk Based Examination - (Kumar and Sharma, 2011) remain a welcome development. Recognizing that no meaningful achievement could be recorded without the collaborative efforts of all concerned, collaborations to facilitate understanding and reduce areas of distrust on the one hand and nurture opportunity for information sharing on the other hand as well as incorporating forensic skills into the current audit model seem more urgent at this time, than ever, to avert the confusion of corporate fraud (Uthman, Abdul-Baki and Iyanda, 2013).

2.3 EMPIRICAL REVIEW OF EARLIER STUDIES

Notable among the studies carried out in the area of fraud is that by the Financial Institutions Training Centre, Lagos (FITC: 1985), which investigated the relationship between sizes of bank frauds and the ages of such banks. The study concluded that experienced staff swindles the bank of larger sums of money compared to their relatively inexperienced counterparts and that falsification of accounts and suppression of entries was the commonest methods employed to defraud banks. Iyiegbuniwe

(1999), carried out a study of frauds on Nigerian banks using a 10 year sample data set, collected from NDIC annual reports and analyzed without resort to econometric methodology. The failure to apply the necessary econometric tools has the possibility of producing spurious results (Kanu and Okorafor, 2013). Akinfala (2005) studied the relationship between job involvement/experience factors and fraudulent behaviors amongst serving and convicted bankers. He found the level of job involvement to be a function of three factors: motivation, identification and a feeling of pride that people achieve in their jobs. Nwude (2006) did a study on bank frauds, involving an interaction with bank staff of various cadres with structured questionnaire to identify the fraud forms and characteristics in the banking industry. In a different study, Otusanya (2008) investigated the role of Bank CEO's in the perpetration of corporate executive frauds in the Nigerian Banking sector. The study showed that recent banking crises in Nigeria have exposed the corrupt and fraudulent activities of bank executives in practice. The study placed the actions of corporate executives within the institutional anomie theory called American dream theory, under which the pursuit of monetary success has come to dominate society. Given the strong and relentless pressure for everyone to succeed, in terms of an inherently elusive monetary goal, people formulate wants, targets and desires that are difficult, if not impossible, to meet within the ambit of legally permissible behavior. The standard multiple linear regression model's ordinary least squares (OLS) method earlier employed in the work of Tillman and Pontell (1995) was used by Onanuga and Oshinloye (2012) to examine the impact of categorized employees of Nigerian banks on expected fraud losses for the period 1991 -2008. They found, among others, a positive relationship ($p < 0.05$) between the number of bank officers involved in frauds and forgeries and expected fraud losses, but a negative relationship between expected losses and cashiers/clerks. Further that, from the descriptive statistics, the number of officers involved in frauds was about two and a half times the number of Cashiers/clerks and supervisors/managers. Idolor (2010) sets out to find the common types of bank fraud that are frequently carried out in the banking system, the underlying causes, level of staff involvement, consequences and possible means of ameliorating the problem. Studying a sample of 100 respondents taken in Benin City, capital of Edo State, Nigeria by means of field survey questionnaire and testing the responses for significance using the “t-test”, he found that respondents did not view unofficial borrowing and foreign exchange malpractice as forms of bank fraud since they were common and an industry wide practice. It also revealed that there was an equal level of staff involvement in initiating and executing fraud, with the concealment of fraud coming last in their agenda. Also, among the factors hypothesized to encourage bank fraud; the major individual based factors were greed, infidelity and poverty, while organizational factors were inadequate staffing, poor internal controls, inadequate training and poor working conditions. Respondents also viewed greed, lack of personal ethics and weak corporate governance as managerial factors that help propagate frauds in banks. Ajayi (2003) studied the contributory factors to the actual/expected loss, using the multiple regression analysis to determine the significance and extent of relationship in two models. The first model regressed actual/expected losses associated with fraud on

total amount involved in fraud, number of bank staff involved and branch network. The second model related actual losses to four categories of staff involved in fraud between 1989 and 2001. The study revealed that the number of staff, branch network of commercial banks and categories of staff involved in frauds have significant impact on the level of actual/expected financial loss.

III. RESEARCH METHODOLOGY

The study employs the ex-post facto design on annual data for the period 1994 to 2014 on the study variables, namely, expected/actual fraud losses and the various categories of staff involved in the reported fraud cases. The data used are presented in absolute values and the different analytical techniques of the ordinary least square (OLS) regression and descriptive statistics are employed in this study. The augmented Dickey-Fuller unit root test, along with the Philips-Peron test, was used as a comprehensive pre-testing procedure to investigate the characteristic of the time series variables.

The study used secondary annual data that covers the period from 1994 to 2014 obtained from the NDIC Annual reports for various years and the Central Bank of Nigeria (CBN) Annual reports/statistical bulletins. To check for and control for probable sources of errors and spuriousness of results as well as maintain stochastic stability, data are compared from at least three different sources before acceptance and subsequent use in the study.

The desk survey method was used to collect time series data for the period between 1994 and 2014 on frauds and forgeries. The data on the variables were extracted from the publications, bearing in mind the study objectives and hypotheses. Nonetheless, the study acknowledges the position of Eboh (1998) that the collection of data on its own is of limited value unless the data so collected is preserved and presented in a manner that makes it highly comprehensive, informative and usable.

Model Specification

The study is adopts, in a modified form, the multiple regression model previously used by Ajayi (2003) as well as Onanuga and Oshinloye, (2012). In the log linear functional notation, the model is specified as:

$$EL = f(SM, OA, CC, TO), \text{ expressed in the explicit form as:} \\ \ln EL = \lambda_0 + \lambda_1 \ln SM + \lambda_2 \ln OA + \lambda_3 \ln CC + \lambda_4 \ln TO + E \dots\dots\dots (1)$$

On a priori, $\lambda_1, \lambda_2, \lambda_3, \lambda_4 > 0$,

Where,

EL = Expected/Actual losses from frauds and forgeries; SM = Total number of Supervisors and Managers involved in fraud cases; OA = Total number of Officers, Accountants and Executive Assistants involved in fraud cases; CC = Total number of Clerks and Cashiers involved in fraud cases; TO = Total number of Typists/Others involved in fraud cases; ln = Natural logarithm, and E = the stochastic error term

Estimation Techniques and Validation

In view of the dynamic nature of the study, a model equation was adopted, on the basis of which the relationship between the stated variables was determined. The estimation of

the model was based on the ordinary least squares (OLS) method after the necessary pre-testing of the annual time series data, due to its properties of efficiency, consistency and unbiased-ness. Accordingly, the statistical criteria include the correlation coefficient or the adjusted R^2 , standard error, students't-test and the F-statistic. The R^2 gives or measures the extent or degree to which the explanatory variables are responsible for the change in the dependent (endogenous) variables. The standard error of estimate or the standard error (S.E.) of the regression is the summary measure of the 'goodness of fit' of the estimated regression line or the test of significance of the parameter estimates. The t-test or, t-statistic, which is an offshoot of the standard error test, estimates the sample value of the "t" by determining the critical region in a two tail test n-k degrees of freedom. If our "t" falls within the critical region, we reject the null hypothesis, otherwise we accept it. The F-statistic performs joint tests of hypothesis and makes joint confidence statements that the true slope coefficients are simultaneously zero. Under this criterion, therefore, if the F value computed exceeds the critical F value from the F table at 5 per cent level of significance, we reject H_0 ; otherwise we do not reject it (Koutsoyannis, 2006).

The *Econometric criterion (second order test)* employed in the study ensured the exclusion of non-spurious results, arising from uncertainty, parameter fluctuations and contamination in the research design to enhance the validity of the conclusive statements based on them and guarantee existence and uniqueness of solutions proffered (Samad & Khammash, 2000). Further, the Durbin Watson (D.W.) statistic is employed to test the validity of the assumption of non-auto correlated disturbances, by comparing the empirical "d" value calculated from the regression parameters with the values observed from the Durbin Watson tables.

IV. DATA PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.1 DATA PRESENTATION

The annual data points for the total estimated fraud losses, number of fraud cases attributable to the various cadres of staff, namely managers/supervisors (SM), clerks/cashiers (CC), Officers, Accountants and Executive Assistants (OA), typists/technical, messengers/security and temporary staff (TO), covering the twenty one (21) year period, 1994 to 2014, were tabulated and are shown in Appendix 2.

4.2 ANALYSIS OF DATA

The Descriptive Statistics of Variables, decomposed into maximum, minimum, mean and median values in Appendix 2 shows that, out of the frauds and forgeries committed across all cadres of staff, the cadre of managers and supervisors (SM) contributed 3,385 cases (or 26.24%), followed by the cadre of Officers, Accountants and Executive Assistants (OA) with 2,402 (26.42%). Clerks and Cashiers (CC) were involved in 2,088 cases, representing 22.97% of the total during the period, while Typists, Technicians and others accounted for the balance of 2,215 (24.37%) of the cases. Furthermore, the highest amount of fraud losses experienced in the study time period was N17.54 billion (minimum N288 Million), with 234 officers, 218

supervisors and managers, 220 clerks and cashiers, indicating the highest amount of frauds occur in the cadre of officers/accountants. Average of 3.82 billion is lost to frauds annually while an average of 113.57, 114.38, 99.43 and 105.48 supervisors/managers, officers, accountants and Executive Assistants as well as clerks/cashiers and other staff respectively commit frauds annually. The lowest amount of fraud losses in the entire period was N228 million, involving 16 supervisors and managers, 41 officers/accountants, 13, clerks and cashiers as well as 7 other categories of staff. The descriptive statistical result tends to indicate that more officers and accountants are mostly involved in contributing to fraud losses in comparison to the other categorized cadres of supervisors and managers, clerks and cashiers, etc. This is confirmed in 2014, where the highest percentage of frauds and forgeries was perpetrated by the cadre of Officers, Accountants and Executive Assistants constituting 37.85% of total staff involved. Temporary staff (a part of TO cadre) contributed 27.10% of the fraudsters, while clerks/cashiers accounted for 16.77%. These three cadres of staff (OA, TO and CC) recorded the highest incidences of frauds and forgeries in 2014. Appendix 3 shows the prevalence of the various types of frauds in 2014 and 2013 alone, generally confirming the trend over the years (CBN, 2014). It confirms that ATM fraud is the most rampant contributing 7181 (67.61%) and 1,739 (i.e. 46.03%) of the total cases in 2014 and 2013. In terms of actual loss sustained, web-based (internet banking) fraud was the highest (and second in terms of frequency) in 2014 at N3.20 billion representing 51.60% of total actual loss (2013: 29.23%), indicating an increase of 90% over 2013 (N1.68 billion). Further, ATM/Card-related frauds rose from 1739 in 2013 to 7181 in 2014 while they contributed N1.24 billion in amount lost to frauds and forgeries, representing 20.06% of the total industry loss in 2014 against 10.16% in 2013. Year-on-year, there was a reduction in unauthorized credits, perhaps indicating better corporate governance practices and good internal control processes. Also, foreign currency theft declined by 46% from 41 (and N0.049 billion loss) in 2013 to 22 (and N0.033 billion loss) in 2014. Further, outright theft by outsiders/customers also waned from thirty four cases (and N0.037 billion loss) in 2013 to fourteen cases (and N0.021 billion loss) in 2014. This probably suggests that frauds were mostly insider-related. Fraudulent transfer and withdrawal of deposits followed internet banking and ATM frauds in terms of frequency (1099 cases) and loss sustained (N0.583 billion) in 2014 ahead of suppression of customer deposits at 483 cases (2013: 324) representing 4.55% (2013: 8.63%) of total cases and 5.04% of the N6.19 billion lost in that year (2013: 8.37%). Curiously, there was no case of non-

dispensing of money but registered by the electronic journal, a 100% decline from thirty nine in 2013. The top ten deposit money banks contributed N21.90 billion (or 85.50% of the industry's fraud amount in 2014 as against N18.86 billion (or 86.54%) in 2013. This same class of banks posted a total contributory loss of N5.17 billion representing 83.46% of the banking industry total loss in 2014.

The regression results: The pre-testing procedure results, based on the augmented Dickey-Fuller (ADF) and the Philips-Peron (PP) tests are presented in Tables 1, below.

**Table 1:
Results of ADF and PP unit root test**

Variable	ADF	Decision	Philip Perron	Decision
EL	-	I(2)	-	I(1)
SM	3.75744*	I(1)	5.13789**	I(1)
OA	-	I(2)	-	I(1)
CC	5.85739**	I(1)	11.03923**	I(1)
TO	-	I(1)	-	I(1)
	5.73656**		5.51571**	
	-		-	
	5.73078**		8.07211**	
	-		-	4.
	3.96753**		08540**	

Source: Researcher's computation.

Note: Critical values, ADF test: 1 percent = -3.85739, 5 percent = -3.04039 and 10 percent = -2.66055. Philips-Peron: 1 percent = -3.85739, 5 percent = -3.04039 and 10 percent = -2.66055. *significant at 5 and percent; **significant at all confidence levels (See full analysis in Appendix)

The results as presented in Table 1 show that the variables EL and OA are integrated of order two – I(2), while the remaining variables (SM, CC, TO) are stationary at order one – I(1) under the augmented Dickey-Fuller (ADF). However, the tests show all the variables signed in the model are stationary at order one – I(1) with the Philips-Peron (PP) test.

**Table 2:
Correlation Matrix**

	SM	OA	CC	TO
SM	1	0.366658	0.532417	0.185729
OA	0.366658	1	0.479673	0.639618
CC	0.532417	0.479673	1	0.694906
TO	0.185729	0.639618	0.694906	1

Source: Computed with e-Views 7.0 from Appendix 3

Having done this, the ordinary least squares technique was used to analyze the underlying data and the resulting regression results are as shown in Table 3, below.

Table 3:
Multiple regression result

Dependent Variable: LEL
 Method: Least Squares
 Date: 07/21/15 Time: 13:58
 Sample: 1994 – 2013
 Included observations: 19

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.846129	2.526599	1.116875	0.2790
LSM	-0.226771	0.603755	-0.392341	0.7054
LOA	2.284537	0.789610	2.918843	0.0107
LCC	1.716652	0.369905	4.627532	0.0003
LTO	-1.504430	1.297050	-1.798130	0.1016
R-squared	0.768312	Mean dependent var		7.626543
Adjusted R-squared	0.719878	S.D. dependent var		1.256536
S.E. of regression	1.124735	Akaike info criterion		3.293905
Sum squared resid	17.71039	Schwarz criterion		3.542442
Log likelihood	-26.29210	Hannan-Quinn criter.		3.335968
F-statistic	16.93258	Durbin-Watson stat		1.928217
Prob(F-statistic)	0.000044			

Source: Computed with e-Views 7.0 from Appendix 3

4.3 DISCUSSION OF FINDINGS

The study relates total expected fraud losses for the period 1994 – 2014 to the signed in explanatory variables, using the (OLS) technique. Accordingly, the model creates a platform for testing the relative contribution of each category of staff to expected losses and also to evaluate its overall explanatory power and the result is shown in Table 2.

From the estimated regression analysis results in Table 2, based on ordinary least squares, the relationship in respect of estimated losses (EL) on number of supervisors and managers (SM), officers and accountant fraud cases (OA), Clerks/cashiers (CC), and Typists/Other staff (TO), may be represented (with t-ratio levels in parenthesis) as:

$$\text{Ln EL} = 2.85 - 0.23\text{LnSM} + 2.29\text{LnOA} + 1.72\text{LnCC} - 1.50\text{LnTO} \dots\dots\dots (4)$$

(1.12) (0.39) (2.92) (4.63)

(1.80)

Only the number of supervisors and managers and Typists/Other staff involved in bank fraud cases bear the sign predicted by the model, supporting the point that while frauds and forgeries perpetrated by officers and accountants (OA), Clerks/cashiers (CC) are often not discovered thereby increasing the expected fraud losses, those executed by supervisors/managers and Typists/others are often discovered, and recovered, thereby reducing expected losses (Onanuga and Oshinloye, 2012). The results of R² and adjusted R² from the regression result are 0.77 and 0.72, meaning that the joint explanatory power of the regressors is only 77% of the variation

in the regressand, while 72% of the variation in expected fraud losses is explained by the explanatory variables. This means over 28% of fraud losses are attributable to non-insider related frauds and forgeries, which agrees with the position the Central Bank of Nigeria that more frauds are committed directly by insiders or their acquiescence than by outsiders (CBN, 2014). Notwithstanding this explanatory power of the regressors, indicated by the adjusted R², the model can still be considered a good fit for forecasting bank fraud losses in Nigeria. The F test at 5% level of significance (F_{0.05}) is 3.29 and F_{cal} under this second model is 16.93. Since F_{cal} > F_{0.05}, we reject H₀ in favour of H₁. Alternatively, since Prob (F-statistic) is 0.000044, which is smaller than 0.01, 0.05 and 0.1, we reject H₀ at 1%, 5% and 10% levels of significance. Also t_{0.05} is 1.73, while from Table 4.6 t_{sm} is 0.39 for number of fraud cases executed by supervisors and managers; since t_{SM} < t_{0.05}, we reject H₀ and conclude that supervisors and managers are not significant in explaining fraud losses in Nigerian banks. However, t_{OA}, t_{CC}, and t_{TO} are 2.92, 4.63 and 1.80, respectively and all values are greater than t_{0.05} (1.73), we reject the H₀ and accept H₁. This implies that the number of fraud cases by officers/accountants, clerks/cashiers and typist/others are statistically significant in explaining the variations in banks' losses due to frauds.

The Durbin-Watson d-statistic, unlike the F or t-tests, has no critical values that lead to the rejection or acceptance of a null hypothesis. Nonetheless, based on our test for the existence of serial correlation using the d-statistic we estimated the d-statistic in Table 4.6 as 1.93. However, the Durbin-Watson d-statistic

table gives d_u as 1.57 and d_L is 0.684; since $d_u (1.57) < d (1.93) < 4 - d_u (2.43)$, we accept the null hypothesis and state that there is no autocorrelation, positive or negative, in the error term and since the DW (=1.93) is close to 2.0, it suggests that the model is good for prediction.

4.4 Test of Hypotheses

Hypothesis: There is no significant relationship between the level of frauds in the banking sector and the cadre levels of employees.

Decision Rule: if the calculated t-statistic of the frauds committed by the various cadre levels of employees is significant at 5 per cent level using thumbs rule, reject the null hypothesis and accept the alternative hypothesis. On the basis of the decision rule and given that $t_{0.05}$ is 1.73, while from Table 4.6, t_{sm} is 0.39 for number of fraud cases executed by supervisors and managers; since $t_{sm} < t_{0.05}$, we reject this hypothesis and conclude that supervisors and managers are not significant in impacting fraud losses in Nigerian banks. However, t_{OA} , t_{CC} , and t_{TO} are 2.92, 4.63 and 1.80, respectively and all these values are greater than $t_{0.05}$ (1.73), we reject the H_0 and accept H_1 with respect to these variables. These three variables are correctly signed and significant at 5 per cent level, the null hypothesis is therefore rejected and the alternative hypothesis accepted. This implies that the number of fraud cases by officers/accountants, clerks/cashiers and typist/others are statistically significant in explaining the variations in banks' losses due to frauds.

V. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

The findings of the study are that:

- I. Seventy seven percent of frauds have insider attribution and only about 28% of fraud losses are wholly attributable to non-insider related frauds and forgeries.
- II. The number of fraud cases by officers/accountants, clerks/cashiers and typist/others are statistically significant in explaining the variations in banks' losses due to frauds.
- III. Supervisors and managers are not significant in impacting fraud losses in Nigerian banks.
- IV. An average of 433 staff are involved frauds and forgeries every year, with supervisors/managers and Officers, Accountants/Executive Assistants contributing 228 staff complications (or 53%) at 114 cases apiece.

5.2 CONCLUSION

The results suggest that frauds in the review period were mostly insider-related. With 82.35% of the staff involved in frauds out of the 153 reported in 2014 alone being technical/others staff, the time to review the casualization policy in deposit money banks seem due for review and possible jettisoning. Perceived pressure to commit fraud may be financial or non-financial, while opportunities to act unethically may arise from the very structure of the organization which provides a motivation for employees to manipulate the organization's internal control system and financial infrastructure for unwholesome personal gains. If workplace conditions are

managed by HR function to promote positive socialization, foster social learning and a sense of community in employees and management is responsive to employees' plights, the inclination to learn and indulge in anti-social/criminal behavior will be reduced and the spiraling financial losses halted and reversed. Current measures, such as the CBN 'black book' on fraudulent bank staff, the Bank Verification Numbers (BVN) encryption, the activities of SCUML, etc would, hopefully, achieve this end in the near future if sustained and strengthened. Because previous employee dishonesty in the financial industry surely constitutes a reasonable anticipation of future dishonesty by that employee wherever else he goes, the banking community needs to accept that there is reason to be concerned with the spillover or externality impacts of their fraud prevention actions or inaction on other banking entities, the sector and society. The battle against Nigerian fraud will require continued interagency collaboration, public education and greater international cooperation to accomplish greater and sustainable success. The prevention, detection and punishment of fraud offenders must be pursued extensively through measures and regulations (e.g. creating a supportive work environment, a realistic compensation scheme and a sound internal control system) that reduce the temptation to commit fraud while increasing the chances of detection.

5.3 RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

1. The CBN must work with the deposit money banks to aggressively tackle cyber crime and implement robust risk-based internal control systems and strict adherence to the codes of corporate governance to check the prevalence of insider-related frauds and forgeries. This will sign post.
2. Existing guidelines (CBN 'black book', EFCC's SCUML, etc.) on deterrence and prevention of banking sector frauds, which are currently inadequately addressing detection and mitigation activities should be strengthened and broadened by deepening the Risk Based Examination methodology and incorporating forensic skills into the current audit model
3. Recognizing the spillover or externality impacts of the individual banks' fraud prevention actions or inaction on other entities and society and noting that no meaningful achievement could be recorded without the collaborative efforts of all concerned, collaborations to facilitate understanding and reduce areas of distrust and nurture opportunity for information sharing is recommended to avert the spiraling of corporate fraud
4. The recruitment process of banks should be strengthened through a robust, IT-based, secured selection, referencing and lifestyle tracking aspects, by institutionalizing supervision of bank employees and necessary employee investigations at the hiring point in the industry.
5. Strengthen the internal control mechanism of banks, particularly, the monitoring and sustenance of effective system of dual control in banking operations as well as work environment and job content enrichment to curtail

the opportunity to commit fraud presented when employees are allowed to have wholesome access to assets and information that allow them to both commit and conceal fraud.

6. Deliberate and sustained customer education, by the CBN, NDIC and the banks on security scrutiny of bank documents and platforms, reporting and redress mechanisms should be put in place, supported with a central fraud registry where convicted bank fraudsters are indented for recall and referencing during personnel hiring processes.
7. The CBN must work with the Bankers Committee to promote professional training, retraining and certification of bank staff and consider the casualization policy in deposit money banks for review and possible jettisoning.

CONFLICT OF INTEREST

The author declares that there is no conflict of interests regarding the publication of this paper.

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Appendix 1
Insured Banks' Frauds and Forgeries

YEAR	TOTAL NUMBER OF FRAUD CASES	TOTAL AMT INVOLVED (N' M)	TOTAL EXPECTED LOSS (N' M)	NO. OF STAFF INVOLVED
1994	737	3,399	951	737
1995	625	1,011	229	625
1996	606	1,601	375	552
1997	487	3,778	228	566
1998	573	3,197	692	311
1999	195	7,404	2,730	596
2000	403	2,851	1,081	493
2001	943	11,244	906	152
2002	796	12,920	1,300	85
2003	1036	9,384	857	106
2004	1,175	11,754	2,610	383

2005	1,229	10,606	5,602	378
2006	1,193	4,832	2,769	331
2007	1,553	10,006	2,871	273
2008	2,007	53,523	17,543	313
2009	1,764	41,266	7,549	656
2010	1,532	21,291	11,679	357
2011	2,352	28,400	4,071	498
2012	3,380	18,050	4,520	531
2013	3,786	21,790	5,757	682
2014	10621	25,608	6,192	465
TOTAL	36,918	303, 920	80, 512	9,090
Highest*	10,621	53,523	17,543	737
Lowest*	195	1,011	228	85
Mean*	1758	14,472	3,834	433
Median*	1,175	11,754	2,610	383

Source: NDIC Annual Reports (1995 – 2013) & *Authors' Computation

Appendix 2

Cadre and Number of Bank Staff Involved in Frauds

Rank	SM	OA	CC	TO	TOTAL
1994	211	144	220	162	737
1995	151	142	172	160	625
1996	218	96	145	93	552
1997	203	154	124	85	566
1998	112	72	82	45	311
1999	178	144	92	182	596
2000	132	101	137	123	493
2001	55	60	30	07	152
2002	16	48	13	08	85
2003	25	41	25	15	106
2004	157	129	61	36	383
2005	169	124	54	31	378
2006	118	90	50	73	331
2007	84	89	34	66	273
2008	48	127	48	90	313
2009	94	137	200	225	656
2010	92	79	115	71	357
2011	89	126	163	120	498
2012	78	89	117	247	531
2013	97	234	128	223	682
2014	58	176	78	153**	465
TOTAL	2385	2402	2088	2215	9090
% of Total*	26.24	26.42	22.97	24.37	100
Highest*	218	234	220	247	737
Lowest*	16	41	13	07	85
Mean*	113.57	114.38	99.43	105.48	432.86
Median*	157	129	61	36	383

Source: NDIC Annual Reports (1994 – 2013) & *Author's Computation

** Of this figure, Temporary staff alone account for 126 or 82.35%

Appendix 3
Types of frauds and forgeries with frequency and actual loss sustained in 2013 and 2014

s/n	Type of fraud and forgery	2013				2014			
		Frequency	% of Total*	Actual loss (₦' bn)	% of Total*	Frequency	% of Total*	Actual loss (₦' bn)	% of Total*
1.	ATM Fraud/Card related fraud	1,739	45.93	0.585	10.16	7181	67.61	1.242	20.06
2.	Fraudulent Transfer/Withdrawal of Deposits	394	10.41	1.162	20.19	1099	10.35	0.583	9.41
3.	Suppression of Customer Deposit	324	8.56	0.482	8.37	483	4.55	0.312	5.04
4.	Internet Banking/Web-based Fraud	316	8.35	1.683	29.23	1277	12.02	3.196	51.61
5.	Fraudulent Conversion of Cheques	219	5.78	0.388	6.74	138	1.30	0.088	1.42
6.	Presentation of Stolen Cheques	196	5.18	0.120	2.09	59	0.56	0.054	0.87
7.	Unauthorized Credits	132	3.49	0.511	8.88	98	0.92	0.231	3.73
8.	Presentation of Forged Cheques	118	3.12	0.018	0.31	62	0.59	0.067	1.08
9.	Outright Theft By Staff (Cash Defalcation)	116	3.06	0.205	3.56	107	1.01	0.297	4.80
10.	Diversion of Bank Charges (Commissions & Fees)	63	1.66	0.056	0.97	42	0.40	0.036	0.58
11.	Lodgment of Stolen Warrants	55	1.45	0.034	0.59	39	0.37	0.033	0.53
12.	Foreign Currencies Theft	41	1.08	0.049	0.85	22	0.21	0.033	0.53
13.	Non-Dispensing of Money But Registered By The Electronic Journal	39	1.03	0.427	7.42	0.000	0.00	0.000	0.00
S14.	Outright Theft By Outsiders/Customers	34	0.90	0.037	0.64	14	0.13	0.021	0.34
TOTAL		3,786	100	5.757	100	10,621	100	6.193	100

Source: NDIC Annual Reports (1994 – 2013) & *Author's Computation

Strategic Planning Practices for Improved Organizational Performance: A Case of MP Shah Hospital, Nairobi

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Abstract- Strategic planning practices allow improvement of organizations performance by establishing guidelines in form of clear vision, mission statements and performance expectations including performance indicators. The study focused on the leadership and governance pillar of health system building block. The objective of the study was how communication, staff participation and capacity building influence implementation of strategic planning practices in MP Shah Hospital. A descriptive case study was employed limited to MP Shah Hospital with target population being key professional employees; target population of 349 key professionals. Both qualitative and quantitative was collected using structured questionnaires for key professional employees and key informant interview guide for the unit managers.. The study found out that 110 (91.3%) were aware of strategic planning practices in MP Shah Hospital, while 62(51.4%) agreed it was highly useful in determining performance only 75(62%) are involved in the implementation process. This was majorly affected by communication whereby majority felt communication was not timely 78(64%), support supervision was lacking since majority 84(69.6%) did not know if it exists and majority 66(54.8%) did not attend timely induction program. It was also found out that MP Shah was performing above average in clinical performance, and customer retention, however, it was noted that they needed to improve on developing effective strategies and establishing priorities in order to improve its performance. Regression analysis indicated $r = 0.736$ that changes in the organizational performance were influenced by changes in communication, staff participation and capacity building by 73.6%, while other factors not investigated in the study contributed to 26.4% of organizational performance. The study therefore concluded strategic planning practices be emphasized in terms of communication, involvement of staffs and capacity building in order to improve performance of health facilities.

Index Terms- Strategy, plan, strategic planning practices, capacity building

I. INTRODUCTION

Leadership and governance involves ensuring strategic policy frameworks exist combined with effective oversight, coalition building, regulation, attention to system-design and accountability (WHO, 2007). This research addresses the leadership and governance pillar, and seeks to examine the

challenges of implementing strategic planning practices in health facilities. At MP Shah, the management and important stakeholders spent time developing a five-year Strategic Plan. Now, months have passed and there has been progress in achieving the intended goals. According to (WHO,2007) most conspicuous problems confronting health systems were found to be many including management and leadership capacities, inherent flaws in decentralization and policy guidance, it recommended that there is need to improve health system in political stewardship, appointment of suitable managers, promote decentralization and support supervision.

The African Union Health Strategy (2007), and the Africa Health Leadership and Management Network (AHLMN), through its constitution, acknowledge this; they posit that most African countries are unlikely to achieve their national health targets and those espoused in Millennium Development Goals, without strengthening leadership, management and governance at all levels of the health system. Strategic planning in Kenya has influenced new approaches to management in the service sector are imperative as organisations from both the private and public sector face new challenges. Market dynamics have created challenges for all sorts of organizations, with the emergence of the global economy, advances in technology, increased societal demands, and the need to provide quality services with fewer available resources. Strategic planning practices involve formulation of vision and mission statement and performance of situation analysis (Pearce and Robinson, 2008). Strategic decision determines the organization's relations to its external environment, encompasses the entire organization, depends on inputs from all the functional areas in the organization and has a direct influence on the administrative and operational activities (Laban, 2003)MP Shah Hospital is one of the fastest growing hospitals with a reputation for excellent nursing care and general patient care. It was started in 1930 at a level of a nursing home with its vision and aim being providing care to the sick and alleviation of human suffering amongst communities. The facility has heightened its patient care to provide international standardized personalized level of care, including providing specialized care.

Purpose

The purpose of the study was to examine the effects of communication, staff participation and capacity building on implementation of strategic planning practices to influence performance in MP Shah Hospital, Nairobi County.

Broad objective

The main objective of the study is to determine the challenges of implementing strategic planning practices adopted by MP Shah Hospital to achieve its performance.

Specific Objectives

1. To determine the effect of communication of policies to strategic planning practices adopted by MP Shah Hospital,
2. To establish the influence of staff participation on implementation of strategic planning practices adopted by MP Shah Hospital,
3. To determine capacity building activities influence on implementation of strategic planning practices in MP Shah Hospital.

Theoretical framework

Barney theoretical model was used in this study to discuss the use of resources and capabilities in (Resource based theory). The model assumed that resources provide an organization with an excellent opportunity to develop competitive advantage. The gaps included; identifying and appraising capabilities of the organization, failing to incorporate the available resources to the plan incongruence between different stakeholders in the organisation(Agency theory) and the systematic approach to strategic formulation (Strategic Management Process Framework) to result to successful strategic management that is aligned to improving organisational performance.

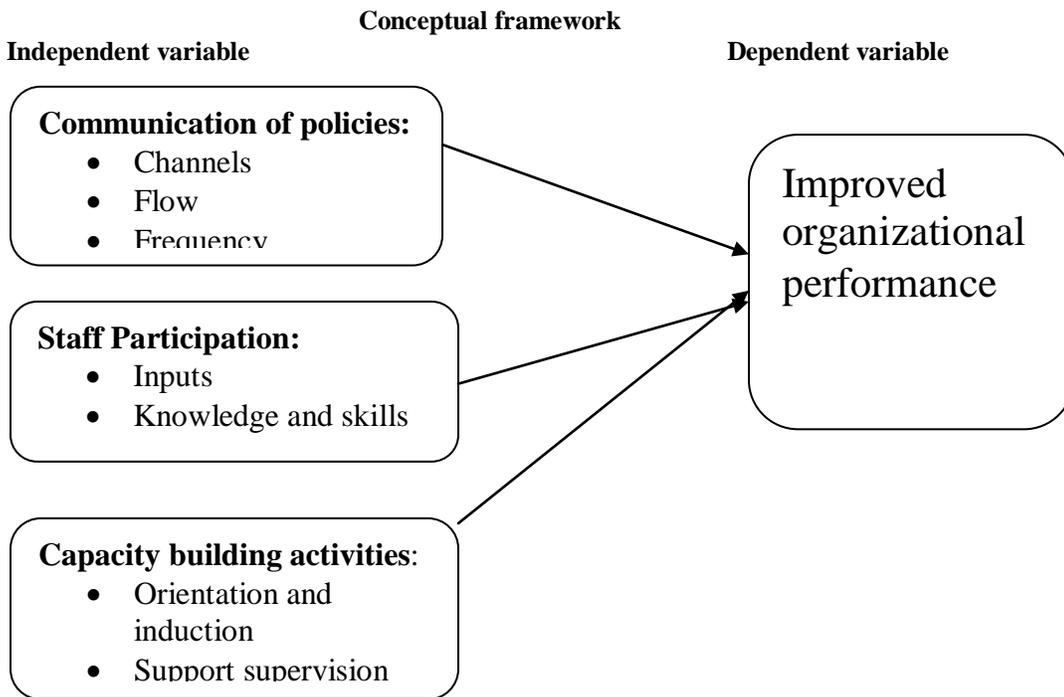


Figure 1.1: Conceptual framework

II. RESEARCH ELABORATION

The study involved a descriptive case study design, preferred because it allows for prudent description of the situation, making sure that there was minimal bias in data collection to reduce errors in interpreting the data collected. Study was carried in MP Shah hospital which lies in Westland district in Nairobi County, the district has a total of 67 facilities, whereby four of this are private institutions include MP Shah Hospital. This facility was purposively chosen because of its feasibility and being one of fastest growing private hospital in Nairobi county. The target population of this study comprised 349 key professional employees in different cadres namely nurses, medical officers, pharmacists, laboratory technologies and administration staffs working in MP Shah Hospital in Nairobi. The study used stratified random sampling to select a sample of 139 respondents from the 6 working departments then

each category was treated as a strata then simple random sampling employed to get the sample from the accessible population. Mugenda and Mugenda (2003) states that a sample of 30% is considered representative for a population less than 500, the sample size is justified by 40% since it minimized duplicity and redundancy of the data obtained. Data was collected using two instruments a structured questionnaire and a key informant interview guide.

Table 1.1: The sample size of respondent

Category of the population	Population size	Sample size(40% of the population)
Administration	60	24
Nurses	218	87
Medical officers	26	10
Pharmacists	19	8

Laboratory technician	26	10
TOTAL	349	139

Ethical Considerations

researcher obtained ethical approval from Kenya Methodist university ethical committee and clearance from MP Shah Hospital management team. Research was conducted on informed consent of the participants and information gathered was handled with a lot of confidentiality and privacy.

III. RESULTS AND DISCUSSION

Table 1.2 Characteristics of Respondents

Characteristics Respondents N (%)	Variable
Age distribution	21-30 years
67(53.4%)	
	31-40years
50(41.3%)	
	41-50 years
4(3.3%)	
Gender	Male
33(27.3%)	
	Female
88(72.7%)	
Level of Education	Certificates/Diploma
83(68.2%)	
	Graduate
38(27.3%)	

The findings 53.4% are between 21 – 30yrs old, being the majority of employee in the facility, 41.3% are within 30 – 40yrs old with only 3.3% being 41 – 50 yrs, making majority of MP Shah population young energized in terms of implementing strategic planning practices. The study found out that majority (72.7%) are female whereas (27.3%) are male gender this is attributed to the great numbers in the nursing fraternity were female gender are the majority. The study also indicated majority of the workers have attained a certificate or diploma (68.2%) and graduates (31.8%) This represents a level of knowledge that can contribute to the competitive advantage of the hospital due to knowledge and skills for patient care and participation in the strategic planning process and implementation.

Communication of Policies

Table 1.3 Communications of Policy and Directives

Characteristics Respondents N (%)	Variables
Time	Timely
43(35.5%)	
	Not timely
78(64.5%)	
Channel	Email

38(31.4%)	Memo
19(15.7%)	Circulars
7(5.8%)	Official meeting
57(47.1%)	Daily
Frequency	
14(11.7%)	Weekly
5 (4.4%)	Monthly
18(15%)	>Month
84(69.3%)	Reports
Feedbacks	
82(67.8%)	Suggestions
39(32.2%)	

The findings indicated that majority(64.5%)of the respondents agreed that communication is not timely, while (35.5%) attested that communication of policies and directives was done on timely basis. Miller and Friesen (2000) who depicted that communication made implementation of strategies easier, this shows why mp shah hospital could still be struggling to implement its strategies.

The study found out that official meeting was the most used channel of communication (47.1%) while email was following with (31.4%).The frequency of communication was indicated as majority meet in more than a month(69.3%) while those who attended monthly meetings were 15% and weekly 4.4% and daily 11.7%.

The findings show that majority (67.8%) of the respondents use reports to give feedback to the management, while (32.2%) of the respondents use suggestions to give their feedbacks. These findings concur with Karen 2009, whereby communication is a tool for public feedback and it has to be given from time to time to enhance implementation of policies. Feedbacks are seen to be an effective way of monitoring and evaluating progress of the implementation process.

Staff Participation

The study found out that majority (62.3%), attested that MP Shah Hospital is actively involved in strategic planning practices while 35.1% do not think MP Shah Hospital is actively involved. This is also depicted from a study done by (Kathama Lucy, UoN, 2012) whereby 65% of state corporation in Kenya are actively involved in strategic planning practices. Majority of the respondents (69.6%) attested that they do not know whether there is support supervision offered by the management to its staff to enhance implementation of strategic planning practices. The study shows that majority (61.6%) of the staffs never give there inputs towards decision making, whereas (36.2%) of the responded give inputs but not always, while 2.2% give their inputs always. The limitation to staff participation according to findings from the study, bureaucracy was leading (69.4%), followed by reduced staff morale by 24%, while finance as a limitation has 6.6% of the respondents. Karen 2009, reports that

effective communication increases staff morale and improves the quality of work, the findings from the study could be attributed to by communication in the organization.

Capacity Building

The findings indicated that, there was no clear information on needs assessment to guide induction and orientation programs in the hospital. Majority (60.3%) of the respondents agreed that induction and orientation was highly helpful while only 42% of the respondents attended induction program.

Perceived Organizational Performance

The study also sought to establish the performance of various aspects in MP Shah Hospital using the 5 point Likert scale, indicating to what extent respondents agree to the statements, where: 1= Far below average, 2 = A little below average, 3 =Average, 4 = A little above average,5 = Far above average. The mean and standard deviations were generated from SPSS.

Table 1.4: Perceived Organizational Performance

Majority of the respondents posited that MP Shah Hospital performed above average clinically (M=4.20) being a health facility this meant that majority of the client expectations are being met.

Correlation Analysis

This determined whether there exists any significant relationship between strategic planning practices (independent variable) and performance of health facilities (dependent

	Mean	Standard deviation
Quality of products and services	3.08	0.57
Innovation and technological change	3.19	0.79
Ability to attract employees	3.22	0.66
Ability to retain employees	3.81	0.68
Relationship among employees	3.12	0.90
Customer satisfaction	3.33	0.61
Retention of customers	3.93	0.67
Operating efficiency	3.06	0.64
Financial performance	3.45	0.67
Clinical performance	4.20	0.57

variable),measured in three dimensions namely: communication process, staff participation, and capacity building.

Table 1.5: Result on the correlation analysis

		Organizational performance index score
Communication process index score	Pearson Correlation	.528**
	Sig. (2-tailed)	.000
Staff participation index score	Pearson Correlation	.511**
	Sig. (2-tailed)	.001
Capacity building index score	Pearson Correlation	.752**
	Sig. (2-tailed)	.000
N = 121		
** Correlation is significant at the 0.01 level (2-tailed).		

This suggests that the more the implementation of strategic planning practices, the higher the level of performance. Therefore, health facilities that implement more of the strategic planning practices are more likely to achieve organizational performance, and vice versa.

Regression Analysis

To establishing the strength and direction of the relationship between the variables in the study, the researcher went further to use simple regression analysis to determine the extent to which the changes in the dependent variable (organizational performance) were influenced by the changes in the independent variable (strategic planning practices).

Table 1.6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					
					R Square Change	F Change	df1	df2	Sig. Change	F
1	.780 ^a	.736	.319	6.57252	.336	19.764	3	117	.000	

(a) **Predictors:** (Constant), Communication process index score, Staff participation index score, Capacity building index score
 The regression analysis gave a coefficient of determination (R^2) of 0.736. This implies that 73.6% of any change in the level

of organizational performance of health facilities is influenced by strategic planning practices. The other factors not investigated in this study therefore contribute to 26.4% of the organizational performance of health facilities.

ANOVA Findings

Table 1.7 ANOVA findings

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2561.351	3	853.784	19.764	.000 ^b
	Residual	5054.169	117	43.198		
	Total	7615.521	120			

a) **Dependent Variable:** Organizational performance index score.
 (b) **Predictors:** (Constant), Communication process index score, Staff participation index score, Capacity building index score
 The ANOVA table above shows that on overall $F = 19.764$ and $p < 0.05$, at 5% level of

significance. This indicates that the slope of the population regression line is not zero and, hence, that strategic planning practices are useful as predictors of organizational performance. Therefore, the model is statistically significant in predicting the influence of strategic planning practices on organizational performance of health facilities

Table 1.8: Co-efficient of regression model

Model		Un-standardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	75.881	3.309		22.934	.000
	Communication process index score	1.082	.478	.191	2.264	.025
	Staff participation index score	.250	1.391	.017	.180	.037
	Capacity building index score	1.948	.333	.505	5.856	.000

a. **Dependent Variable:** Organizational performance index score

Therefore, the equation for the regression model can be given by:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3$$

$$Y = 75.881 + 1.082X_1 + 0.250X_2 + 1.948X_3$$

Where;

- Y = is organizational performance (dependent variable)
- X_1 = is Communication process (independent variable)
- X_2 = is Staff participation (independent variable)
- X_3 = is Capacity building (independent variable)

IV. CONCLUSION

The study concluded that; policies and directives were not communicated on timely basis, to the staff. Secondly, Staffs do not give their inputs during decision making, which is a key area in strategic planning practices, this was further established in the study when majority of respondents pointed that bureaucracy was the major limitation to development of policies in the organization. Lastly, capacity-building activities such as induction programs were not done effectively, despite majority of the staff thinking that it is very useful in improving their performance and meeting the expectation of the organization

with an aim of improving general performance of MP Shah Hospital.

V. RECOMMENDATIONS

The study recommends MP Shah Hospital to adopt Strategies for effective organizational performance to include; effective communication, enhancing staff participation, enhancing strategic and critical thinking among its employees, improving on capacity building and teamwork among other factors not investigated in this study.

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Test for Fixing a Humangroup During Deportation: Case of Matsouanistes Ofdjambala

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Abstract- This text traces in broad outline the mechanisms by which a group of men under forced deportation eventually settled to the price of a thousand efforts and then how history has caught up after half a century of attachment and hope. This study was made possible through the collection of field data. This took place in several phases of additional years 1996 to 2012. We have learned a great fruit of these investigations both collective and individual. The individual and collective character of an anthropological investigation and settlement ceases to be a fiction when the testimonies are true and overlap. Most often the researcher is in front of the builders of what we should call "civilization". This is the case here because there are still some Matsouanistes alive and WITH their descendants.

Index Terms- Fixing test, human group, deportation, Matsouanistes, Djambala

I. INTRODUCTION

This study was made possible through the collection of field data. This took place in several phases of 1996 to 2012. We have learned a great fruit of these investigations both collective and individual. Indeed the individual and collective character of an anthropological investigation and settlement ceases to be a fiction when the testimonies are true and overlap. Most often the researcher is in front of the builders of what we should call "civilization". This is the case here because there are still some Matsouanistes alive and WITH their descendants.

Indeed, these witnesses gave us touch, their daily lives finger in time and space and their way of looking at problems and solutions convinced us gradually to the materialist elements in the process of their settlement in Djambala. Far from Brazzaville Djambala is 400km route that reached 14 ° East longitude of 46 and 2 ° 32 'latitude. Djambala and rural cover more than 1450km² and today, the city has over 22,000 residents. At the time of the deportation of Matsouanistes, the number was 400 individuals. In 1961 during the creation of the village, we could number more than 360 residents occupying hamlets already fixed on a 1,5km² area as 0, 30 people per hectare.

The Matsouanistes which this study is devoted to is part of the Kongo ethnic group that occupies the south of Brazzaville to Pointe-Noire. The Matsouanistes are very often from the Pool environments (Kinkala, Mayamaand Kindamba) and around Brazzaville. They owe their name to Andre Grenard Matsoua, founder of the doctrine (amicalist).

In France, the emancipator ideas prevailing in the African environment do not leave indifferent Matsoua. With his brothers

in the Middle Congo and Central Africa, he founded on July 17/1926 the said Association (amicalist) originating AEF, an association registered in the prefecture of the Seine as No. 164-649 of April 26, 1926 (1).

The year 1959 marked the beginning of the deportation of Matsouanistes Djambala, deportation that took place following the trial.

1. Historic deportation

Adept Grenard Matsoua, part of the original Pool refused to participate in various government programs between 1942 supposed date of his death Matsoua, and 1959 is the year in which YOULOU Fulbert reaches the top of the Congolese political hierarchy. *The crisis reached its culminating on 15 June while the rumor in the country was that Lari Matsouanistes still refused to vote for YOULOU. That's when the tension raises ROSE in Brazzaville and in Lari country. In front of the fanatical attitude of the incident Matsouanistes erupt everywhere taking advantage of this situation, the authorities arrested Matsouanistes leaders and many followers "they interning" from the former factory of the Mpila 28th July, the government decided to deport the North. (2)* This banishment follows a very speedy trial as already Law No. 35-59 of 30th June 1959 on its article 2 provided as follows:

Anyone who refused to pay personal income tax and its accessories will be punished with imprisonment from 2 to 6 months (3)

1-Sinda (M). *Congolese Messianism and its political implications*. Paris. p. 145

2-Idem

3 Law No. 35-59 of 30 June 1959 on the refusal to pay personal income tax and its accessories

This law was poorly applied by the politician who forced the Matsouanistes in forced exile for years.

At the material time it seems that the followers of Matsoua will be put into the arbitrariness of what has always characterized their not only civil disobedience but also military. This is what explained the behavior of the government of the post-colonial era, because since 1959, Middle Congo was already independent.

1.1. Forced migration: July 11th 1959

Supreme Court decisions have fallen, officially two leaders of the movement are condemned and forced deportation and they are: Pierre Kinzouzi and Victor Wamba. The solidarity of Matsouanistes is at its peak, convoys are organized in an electric atmosphere. Four to five large vehicles are made available to them by the republican guard escorted to the North (Djambala).??in our case

It is in these permanent stirring conditions that the first elements from Kongo leave their stronghold of Brazzaville and Pool, eventful journey punctuated with insults to the place of the Abbot Fulbert Youlou the head of Government and later took the title "the President of the Republic", elected by the National Assembly for the duration of the legislature. In Djambala welcoming Matsouanistes was less enthusiastic, a climate of mistrust prevailing between indigenous and Matsouanistes. *The reception was cold although Teke manifested sympathy for these men brutally torn from their families ...?? in the lot of the deportees I had an old friend Abel nurse.* (4)

1.2 Instability and search for balance: August 1959- 1960

This is the period during which the Matsouanistes are looking for a site of accommodation and food resources for their survival. This is also the time of adaptation and learning with very little available hosts; Matsouanistes the task was not easy, despite centuries-old ties between the two groups. Three sites were welcome; the Regional School from July to October 1959 they must decamp force, the Republican Guard is put on their heels, the group is dispersed across districts of Alima-Lefini, the jackpot is still there and is placed in the facilities of the indigenous provident society (SIP).

4- Kouyetosso (E) 2001 *Contribution to the study of Matsouanistes to Djambala: History 1959-1999 a social implantation.* p 35

The group Lekana (55 km of Djambala) after 4 months joined the Djambala following a palaver that pits a native to a group of Matsouanistes in search of firewood. Note here that the Kukuya tray (450km) is too small to receive outside its usual 18,000 inhabitants of the wave Matsouanistes are imposed. This is him this far says that this incident will cause the return of Matsouanistes Djambala. In 1960 incidents broke out between the authorities and Matsouanistes, they are ordered to leave the Native Provident Society (SIP) or they were temporarily housed. This is also the occasion of the latter clashes once again opposing the Matsouanistes to local government. The Matsouanistes triumph in caring for the old administrative authority Garage, pushing the administration to find a permanent site to permanently install their village. The district siege lasted a day and it is only in favor of dusk that the standoff was lifted. And in the morning they found a solution amicably. *The administration gave a part of the territory of Inkiéné and days later, in the Territory rose the first houses of Matsouanistes.* (5) During this period of instability and search for balance, the dominant lifestyle is one based on predation. So they are very active in the bush and forest picking, collecting everything they find in their path with a supplement hunting products and fishing that can be sold on the market. Work-money system replaces the starting job food system. This is why the first mutations were observed between indigenous and Matsouanistes Djambala towards the end of 1960

These often risky activities were practiced following a specific seasonal rhythm.

They took place in the forest and then in Savannah based on forged friendships with the natives. Fungi, insects (caterpillars, crickets, termites), asparagus and getup served as the feeding

with a loan surplus to be passed which allowed them to fill the void in savings was missing out.

Fruit land *olphiaowariensis* and *Afromomum stipulation* (malomba my nzieta and ntunduza Makanga in Kongo language) were the subject of a small business. It is in this first phase of a very pronounced predatory life only livelihood even if money was timidly appeared in Matsouanistes environment.

Kouyetosso 5- (E) 2001 *Contribution to the study of Matsouanistes to Djambala: History 1959-1999 a social implantation.* p 35

A hoarding form has also started on the horizon from the money earned.

However, we note that *this form of economy is often random and Matsouanistes last struggle to get to grips with the famine raging endemic in their camp. And it is priced at a thousand efforts they managed to impose two years after their forced exodus.* (6)

1.3 Sédentarisation: 1961-1999

This is the definitive fixation period of Matsouanistes population in perpetual wandering. It begins with the assignment of a territory to Matsouanistes. The territory of Inkiene west of the town of Djambala is also the seat of Matsouanistes who founded a permanent village there since 1961, when its sale as mentioned above. The territory covers an area of 150 hectares divided into areas of homes and crops, hamlets and farms. The geographical position of the territory meets the containment policy practiced by the administrative authorities of the time. Indeed the area is blocked between the military camp, the administration and Oyonfoula capital town of the same name earth. The 150 hectares show the small territory and the consequences as it will be the development of the portion of land so described. It was found that Matsouanistes often overflowed the space that had been ceded to them.

The village was demographically dense, Matsouanistes composed mostly of men and was divided into three districts which included a habitat, often grouped, essentially perishable materials. Fired brick and corrugated iron were used in the making of some public buildings such as the temple. Here demographics reveal how populations are connected and are inserted into this tiny space. Over time, the modern habitat appeared and cash income generated by various activities had come to improve the living conditions of Matsouanistes. The village was given provisional especially spiritual leaders. Political power was almost absent in the village. However, a representative of the group was presented to the political, general and administrative authorities in case of need. *This settlement was possible only through the activities of production and the allocation of territory that allowed the creation of a fixed village.* (7)

Lineage or clan bases being broken since 1959 the Matsouanistes could not organize themselves economically in Djambala that based on friendship and solidarity which characterize the group.

6-Okouya (G), 2000, *Djambala, men and areas of origins to today*, book II, AMAC, Brazzaville, p.110

7-Okouya (G), 1994 *Djambala and rural country from 1913 to today*, Ed. Bana aula, Brazzaville, p65

Households were born and often bringing together individuals of the same sex (400 deported in 1959, 8 were women). In reality, this village was to disappear with time faults procreative. Indeed, apart from predation and production activities, Matsouanistes hardly left their site. Also rare are the individuals who had found members of their clan.

In this micro-society in gestation production based on three economic systems: the household thus constituted, accidental clan found and nascent village and often, households were formed of men. The latter chose a chief to lead their destiny.

II. PRODUCTION ECONOMICS

The production was based economy after five years (since the founding of the village) on fruit trees and hamlets of the village; production of palm nuts, mangoes, avocados, fruits became annual and generated significant funds as and as the town grew into houses and men, especially from Brazzaville in 1963. It assisted in this time to Brownian movements of the Kongo community. In this area, the Matsouanistes now indulged in a small farming based on the cultivation of cassava and vegetables. The seasonal production cycle was emerging. From July to August the clearing of fields and the cultivation gave way to harvest vegetables, maize and groundnuts between September and November of each year. Harvest cassava occurs primarily in December and throughout the following months. To achieve this, the Matsouanistes relied on three types of groups: domestic household system based on individual work, limited cooperation and a village system that requires the effort of all Matsouanistes. These were the three fundamental levels of production Matsouanistes environment throughout the settlement period. Livestock also appeared after 1965, generally it was a small prestigious breeding and settling of accounts. With the emerging and promising production economy, Matsouanistes had not totally eradicated predation of life, on the contrary the two economies were complementary.

Besides these two *economies*:

The Matsouanistes were handymen, real human machines on construction sites, in lumbering, masonry, basketry, sculpture; they were both bakers and tailors (8). Later all these craftsmen were temporarily converted into casual traders and sometimes professionals. They also created a body of street vendors. The table below gives an idea of the occupations undertaken by Matsouanistes between 1965 and 1975 to Djambala.

8-Okouya (G) 1986 *Implementation and peoples movements in Congo*, INSEED, UMNG Brazzaville, p7

III. END OF IMPLEMENTATION AND THE GRADUAL DECLINE OF MATSOUANISTES

In 1963 a government decision was to return to their places of origin convicted of Law No. 35-59 and individuals convicted of emotional pains and people under house arrest regained their civil and political rights restored by TCM 00091 / Ministry of inside the 09/17/63. According to these provisions some Matsouanistes had begun returning to Brazzaville. But the

movement was barely perceptible. As against it sped between 1990 and 1999 because of multiple wars that tore the Congo. *With the onslaught of militias and armed forces that 20 May 1999A Djambala, the bush has reasserted itself on the village Matsouanistes that there are more.*(9) After 2000, the village began to form a real forest or anthropogenic trees dominate, mango, avocado and fruits going up to the assault of the last sections of the walls. The forest is born, but with the accelerated municipalization (2013) at this point is the presidential field; now the younger generations refer to it and beckon the basis of Matsouanistes Djambala.

IV. ANALYSE SETTLEMENT OF ELEMENTS AND PROGRESS

As predation, farming is primarily oriented towards consumption, but trade has finally taken the step. These elements of progress and differentiation were fruit trees hamlets planting and marketing the products. And by planting we mean the establishment of cultures, first origin of production and flow economy we mean the sale of goods and economic exchanges between different partners. The Matsouanistes deported as Teke indigenous, were producers of foodstuffs. While cultivating the Matsouanistes gradually freed from the tutelage Teke.

Thus they provided some of their food (cassava), which at the beginning of their settlement depended indigenous. In any event, the settlement becomes planting element from 1963-1964, part of social progress and human settlement, the company Matsouanistes now oscillates between two economies: predation and production. The surplus generated gains and savings that was missing at the start of the implementation gradually penetrates the mid Matsouanistes. This is one of the most revolutionary aspects of the settlement.

Far from settled nature of trade, money is the key to all the events and allowed the Matsouanistes to break free of chronic guardianship of their benefactors. (10)

9-Ngandzo (FD) 2014, *History of the establishment of Djambala from 1913 to the present*, ENS UMNG Master thesis, Brazzaville, p79

10-Mpiéré (J), 2003 *The changing socio-economic structures of the town of Djambala 1960A nowadays* Patent of obtaining Memory, ENAM UMNG, Brazzaville, p 25

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Conclusion

The history of Matsouanistes Djambala is encouraging in every way and very soon, after a brief period of research they have adapted to the physical and human environment influences. A slow integration program was developed; this is what explains their success by far. But ultimately, the story of Matsouanistes was only the story of a perpetual renewal with the bush that asserts its rights over the village and Matsouanistes who decamp again. The Matsouanistes from deportation had set a motto: its treatment by himself, so his contribution to Djambala was disproportionate in all areas of physical and economic life. Here as elsewhere it is said, it certainly had its tragic and

heroic pages and it is this knowledge of the environment that made him a well prepared and informed and ready to face any situation. Finally Matsouanistes history has been the story of the struggles against yourself first and then against the oppressor.

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Utilization of Service Charters in Public Hospitals in Kenya: A Case of Thika Level 5 Hospital, Kiambu County

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Abstract- Service delivery in government health facilities in Kenya still faces multiple challenges. These challenges can still be identified ten years down the line since the introduction of Service Charter. The objective of the study was to assess how the service charter utilization would influence health service delivery in Thika Level 5 Hospital (TL5H) in Kiambu County. Cross sectional study design was employed. Quantitative data was collected using questionnaires. A sample size of 156 technical employees of TL5H and patients participated in this study. Collected data was edited, coded, and entered into the computer using the Statistical Package for Social Scientists (SPSS v 23). The respondents strongly agreed that the hospital charter content is not viewed annually creating unfriendly services (mean 1.73, SD 0.97), (mean 1.74, SD 0.997) indicated the respondents strongly agreed that the service charter is not clearly understood by the majority of patients informing them of their rights when seeking services. The respondents disagreed that the hospital management is always active in monitoring performance and playing the oversight duty according to the SC (mean 2.19, SD 1.20) on whether failure to utilize the service charter may lead to deterioration of quality and equity of healthcare, the respondents agreed (mean 2.05, SD 1.54). Most of the respondents strongly agreed there is availability of support for the service charter (Mean 1.72, SD 0.93), while the respondents also indicated that the waiting time has not improved despite the availability of service charter (Mean 2.98, SD 1.09). The study also established that there was uncertainty in the amount of waiting time in TL5H (Mean 1.775, SD 0.91). The channels used for communication were not clear (Mean 1.993, SD 1.12) while the communication at TL5H does not ensure clarity on issues (Mean 1.9, SD 1.07) while the respondent agreed on communication at TL5H was not always done to get commitment from staff (Mean 1.923, SD 1.047) and there was inadequate open communication of most issues at TL5H (Mean 1.846, SD 1.075). The study recommends that 1) TL5H should improve the contents of the service charter to make it clear, to ensure that the patients fully understand the contents, 2) there should be proper monitoring of the members of staff to ensure that the service charter is fully implemented to minimize the amount of complaints by patients, 3) the service charter contents should be embedded in the organization culture to ensure that is fully and properly implemented to the satisfaction of the service users.

Index Terms- utilization, service charter, public hospitals, Kenya

I. INTRODUCTION

Health service delivery in any health system, good health services are those which deliver effective, safe, good quality personal and non-personal care to those that need it, when needed, with minimum waste of resources-be they preventive, treatment or rehabilitation. Effective provision requires trained staff working with the right medicines and equipment and adequate financing. Success also requires an organizational environment that provides the incentives to providers and users. Service delivery building block is concerned with how inputs and services are organized and managed to ensure access, quality, safety and continuity of care across health conditions, across different locations and over time (WHO, 2007).

A service charter is defined as a public document that sets out basic information on the services provided, the standards of service that users can expect from an organization, and how to make complaints or suggestions for improvement. A Patient's Charter is a written document containing a sort of "agreement" between a health structure and its patients, where the organization makes express and specific promises (standards) about the level of service quality (Baccarani and Ugolini, 2000). It is a useful communication tool for making quality known. It declares the efforts made to ensure high quality service and renders quality tangible to health staff and service users. As a patients' listening tool, the Patients Charter facilitates consistent information feedback from service users to the health organization.

The Kenyan government policy, (2006) requires that Service Charters be formulated and implemented by government agencies at all levels, statutory bodies, district authorities and local bodies. It is to be displayed in prominent places within the agencies/offices so as to make it clearly visible. In case where an agency fails to comply with the quality standards stated in its charter, the public can lodge complaint for non-compliance. Thus, the agency is made accountable, to its customers in a way that is more explicit and specific than before. For the government departments or agencies it was anticipated that the Charter would provide performance indicators, enable them to make evaluations and thus foster accountability and responsiveness in the public service (Common, 2001).

The Government of Kenya (2008-2012) acknowledges that service delivery in government health facilities in Kenya still face multiple challenges. The Charter introduced in the Ministry of Health in 2006 was intended to improve the old bureaucratic

service delivery mechanism in the hospitals by enhancing transparency, accountability and responsiveness to the clients and community health needs. The charter was intended to improve service delivery, openness and enable patients to easily understand the services offered, their costs and when and where such services can be accessed. It is to guide patients and other users on services offered, charges, timeliness and where to get redress, as well as serve as a performance measure by the hospital. However, the Service Charter has failed since services are still user unfriendly, misleading and sometimes not implemented. This has made it impossible for patients to plan well on their treatment needs, forcing others to skip important services e.g. pre-natal, ante-natal, wellness clinics etc. (Maina Waikwa, 2013).

Thika Level 5 Hospital Service Charter (SC) sets out a commitment to provide users with the service they expect and its vision statement of offering accessible, equitable and affordable service for every citizen. However, no empirical study had been done on service charter and its influence on service delivery in Kiambu County. The objectives of the study were: 1) to determine the influence of service charter's content on service delivery in TL5H and 2) to assess the use of service charters for monitoring of service delivery in TL5H.

II. RESEARCH ELABORATIONS

The research was undertaken at Thika Level 5 Hospital in Kiambu County of Kenya. The hospital serves a population of 454,166 people and is the main referral hospital in Kiambu County. It has 265 beds and the outpatient department handles an average workload of 21,000 patients' per month with a total of

460 staff (Thika Hospital HIS, 2015). A descriptive cross-section research design was employed in this study. Quantitative data was collected using questionnaires from both service providers and hospital patients. The study adopted a stratified random sampling technique to select the respondents from the different stratum of the hospital staff. The service users on the other hand were selected through the simple random sampling technique. In total 156 respondents (69 health workers and 87 service users), a response rate of 95%, were included in the final sample. Data was collected over a period of three months in January 2015 – March 2015 and it was analyzed using SPSS version 23. Authorization to carry out research was obtained from Kenya Methodist University Science, Ethics and Research Committee, The Medical Superintendent of Thika level 5 Hospital, Hospital administrators and Thika hospital research committee. Informed consent was obtained before interviewing the respondents.

III. RESULTS OR FINDINGS

Socio-demographic Information

Among the clients, 53(60.9%) of the respondents were female, and 34(29.1%) were male (See Table 1). With regard to age, findings indicate that 11(12.6%) were aged 18-24 years; 35(40.2%) were 25-34 years; 23(26.4%) were 35 and 44 years; 12(14%) were aged 45 and 54 years; and 9(10.3%) were 55 years and above. From the findings it can be deduced that those aged between 18-24 years have greater knowledge on service delivery more especially with regard to service charter at 33 (36%) than respondents aged 55 years and above.

Table 1: Services Users Demographic Characteristics (n=87)

Characteristics	Respondents N (%)
Sex	
Male	34 (39.1)
Female	53 (60.9)
Age	
18-24 years	11 (12.6)
25-34 years	34 (40.2)
35-44 years	22 (26.4)
45-54 years	11 (14)
55 and above	9 (10.3)
Level of Education	
Primary	9 (10.3)
Secondary	40 (46.0)
Diploma	25 (28.7)
Graduate	13 (14.9)
Occupation	

Unemployed	13 (14.9)
Self employed	16 (18.4)
Employed	13 (14.9)
Retired	4 (4.6)
Student	8 (9.2)
Housewife	33(37.9)

Among the service provider respondents, there were more male service providers as compared to the female participants (See Table 2). The male respondents were 41 (63.1%) whereas the females were 24 (36.9%). Majority (75%) were aged between 25 and 44 years. Majority 46(70%) of the service providers who responded to the study were university graduates. With regard to the service providers' level of experience, majority of the respondents (69.5%) had 5-10 years work experience, with 20(30.8%) having less than 5 years experience.

Experience	
Below 5 years	20(30.8)
5 - 10 years	45(69.2)

Influence of Service Charter Content

On the service charter (SC) content, the study sought to establish to what extent the respondents agreed with the statements that determined the influence of service charters content on service delivery in TL5H. A Likert scale used was 1= Strongly Agree, 2= Agree, 3= Moderately Agree, 4= Disagree and 5= Strongly Disagree (See Table 3). Among the respondents, both service providers and service users, strongly agree to statements that the hospital charter is not viewed annually creating unfriendly services (mean 1.73, SD 0.97), (mean 1.74, SD 0.997) indicated the respondents agree strongly that the service charter is not clearly understood by the majority of patients informing them of their rights when seeking services. When asked whether the SC provides guidelines on the quality of services that should be offered at the hospital (mean 1.76, SD 0.991) indicated that the respondents strongly agreed as well. The respondents agreed when asked whether the staff abided with the SC when offering services to the customers (mean 2.01, SD 1.11). When asked if the SC promotes the principle that information about products is readily accessible and available, the respondents moderately agreed which was represented by (mean 1.73, SD 1.0).

Table 2: Services providers Demographic Characteristics (n=69)

Characteristics	Responses N (%)
Age	
18 - 24 years	7(11.3)
25 - 34 years	27(41.3)
35 - 44 years	17(26.3)
45 - 54 years	8(12.5)
55 years and above	6(8.8)
Education Level	
Diploma	11(17.5)
Graduate	46(70.0)
Post graduate	8(12.5)

Table 3: Influence of SC content (n=156)

1.	2.	3.	4.	5.	6.	7.	8.
	1	1	1				
The SC ensures that clients receive friendly services	2	2	2			29.	30.
The SC is not clear and understood by all patients	3	3	3			41.	42.
The SC ensures that the clients receive feedback mechanisms	4	4	4			53.	54.

The hospital staffs abide by the SC	5	5	6	65.	66.
Charter promotes the principle that information about products is readily and widely accessible and available	6	7	7	77.	78.

The research established that in TL5H, the service charter is not reviewed annually thus creating unfriendly services. The findings also indicated that the service charter is not clearly understood by the majority of patients in TL5H. The findings further reveal that the service charter promotes the principle that information about products is readily accessible and assessable.

Use of Service Charter for Monitoring Service Delivery

Table 4 presents the responses from both the service providers and service users on the assessment on the use of service charter monitoring on health service delivery in TL5H in Kiambu County.

Table 4: Use of SC for Monitoring Service Delivery (n=156)

79.	80. 1	81.	82. 2	83.	84. 3	85.	86. 4
	92. Fr	93. %	94. Fr	95. %	96. Fr	97. %	98. Fr
Staff are committed to the SC	102.75	103.48.1	104.48	105.30.8	106.20	107.12.8	108.6
Staffs have not been subjected to active oversight on SC	114.79	115.50.6	116.45	117.28.8	118.16	119.10.3	120.8
The hospital management is always active in monitoring SC	126.15	127.9.6	128.51	129.32.7	130.25	131.16.0	132.55
Failure to utilize SC may lead to the deterioration of quality and equity of health care	138.65	139.41.7	140.43	141.27.6	142.30	143.19.2	144.10
Non – functioning supervisory and inspection mechanism have meant	150.78	151.50.0	152.47	153.30.1	154.19	155.12.2	156.10

units
offering
poor
services

Results show that the respondents strongly agreed that the hospital staff is committed to the SC (Mean 1.85, SD 1.074). The respondents which composed of both the service providers and service users disagreed that the hospital management is always active in monitoring performance and playing the oversight duty according to the SC (mean 2.19, SD 1.20). On whether failure to utilize the service charter may lead to deterioration of quality and equity of healthcare, the respondents agreed (mean 2.05, SD 1.54). Finally when asked whether non-functioning supervisory and inspection mechanism have meant units offering poor services, the respondents strongly agreed (mean 1.78, SD 0.97).

The findings indicated that the hospital staff is committed to the SC. The research also established that the members of staff in TL5H are not subjected to active oversight of the service charter. The findings of the research also show that the hospital management in TL5H is not always active in monitoring performance and playing the oversight duty according to the service charter. Findings show that none functioning supervisory and inspection mechanism have meant units offering poor services in TL5H.

The findings on the influence of service charters content on service delivery in TL5H go hand in hand with the research conducted by Brown & Moose (2001) who sought to determine how abiding by the charter improves the quality of service charters. Findings indicated that abiding by the charter rules leads to good service delivery. The study also agreed with the research conducted by Frost (2000) that proper guidelines to charters ensure quality and equity in service delivery as in the case of TL5H.

Findings from the assessment on the use of service charter monitoring on health service delivery in TL5H in Kiambu County agree with conclusions by Araujo (2005) that any failures that an organization may experience in utilizing the service charters may lead to deterioration of quality and equity of any services offered hence the need for proper utilization. According to Dias (2006), none functioning supervisory and inspection mechanism have meant units offering poor services. The findings further agree with Oliveira (2004) who concluded that supervisory and monitoring is essential for offering of good services. This was the case in TL5H.

IV. CONCLUSION

The research concludes that there is adequate information dissemination on the existence of the service charter in the hospital. This affects positively the ability of the hospital to offer services according to the guidelines provided in the service charter. The hospital however lacks strategies for the annual charter review. This affects the extent to which the charter is useful to the customers as reviews ensures incorporation of client suggestions among other simplified information.

There have been limited monitoring activities to the staff operations due to the failure of taking into consideration of the

service charter guidelines in the hospital. With this, staffs have not been fully subjected to active oversight on the service charter. In spite of this, the role of the charter as an effective tool to ensure good monitoring and governance has not received much attention in the hospital.

With reference to the study results and conclusions made from these findings, the study recommends that 1) the hospital should improve the contents of the service charter to make it clear, easy to understand and self-explanatory to ensure that the patients fully understand the contents, 2) there should be proper monitoring of the members of staff to ensure that the service charter is fully utilized to minimize complaints by the patients/clients, 3) The service charter contents should be embedded in the organization culture to ensure that is fully and properly implemented to the satisfaction of the service users.

ACKNOWLEDGMENT

We thank all the institutions and individuals who supported this study through ideas, information, and technical support. We thank all the respondents who participated in this research. We extend our appreciation to the Thika Level 5 Hospital staffs, patients and the research assistants for their provision of information and assistance during data collection.

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Growth and Characterization of CdS Thin Films by Chemical Bath Deposition

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Abstract- Thin films of cadmium sulfide (CdS) were grown by Chemical Bath Deposition (CBD) technique. Cadmium sulfide, and thiourea were used as the source materials for the preparation of the films. The films were deposited onto the good quality glass plates (75 mm X 25mm) as substrates. To carry out the growth, 1 M Cadmium sulfide solution was prepared and required amount of triethanolamine was added to form a bound stable complex. The substrates (glass plates) were stirred in the solution at the temperature 55°C with a constant rate of rotation 60 rpm using a DC motor. The pH of the reaction mixture was maintained using appropriate quantities of Sodium hydroxide and aqueous ammonia were added for the film adherence to the substrate support. Thickness of the film gets nearly saturated when the deposition time is above 90 min. Electrical resistivity of the grown CdS film was found to be of the order of $10^6 \Omega\text{-cm}$ as measured by using Four-Probe method.

Index Terms- Chemical Bath Deposition, Resistivity, UV-Visible, Thin film, energy bandgap.

I. INTRODUCTION

Cadmium Sulfide (CdS) is one of the important wide energy gap semiconductors mainly because of its applications in piezoelectric transducers, laser materials and photovoltaic cells [1]. Among the various deposition processes used to grow the thin films, solution grown technique has proved its excellence for large area thin films. These films have many advantages over the films prepared by other techniques, such as large area films and simplicity of the process [2]. Also, the film can be obtained as a pure, doped and or mixed semiconductor component. A variety of substrates of semiconductors and insulators can be deposited by this method since working temperature of the process is quite low and the preparation parameters could easily be controlled. An important application of these films is solar cells which is an important factor for the growing industrialization and need of the energy. World energy generation scenario mostly depends on conventional energy sources. The solar energy has proved its utility amongst all these sources of renewable energy. The solar cell is an important candidate for an alternative terrestrial energy source because, it can convert sunlight directly to electricity with good conversion efficiency [3]. Taking the importance of Cadmium Sulfide material into account, studies are planned to investigate the physical and electrical properties of the thin films cadmium sulfide.

II. EXPERIMENTAL

The chemical bath deposition technique was used to grow thin films of CdS with a varying molarities of the solution. The films were deposited onto a good quality glass plates as substrates (size 75 mm X 25 mm) in which cadmium Sulfide, and thiourea were used as the basic ingredients. When thiourea is added to an alkaline solution of a complex cadmium salt, the solution become turbid and solid phase of CdS is formed by the reaction [4]:



To carry out the growth, 1 M Cadmium sulfide solution was prepared. For each growth of the thin film, 10 ml of 1 M Cadmium sulfide solution was taken into a beaker. Required amount of triethanolamine was added to form a bound stable complex. The appropriate quantities of Sodium hydroxide and aqueous ammonia were added to adjust the pH of the reaction mixture and film adherence to the substrate support. The substrates (glass plates) were stirred in the solution at a constant temperature 55 °C and rate of rotation 60 rpm using a DC motor.

A. Effect of Stirring

There have been a few studies on the effects of stirring the deposition solution on the deposited film. Overall, stirring affects CBD grown films mainly by preventing deposition of loosely adhering, large aggregates. These loose deposits are readily removed by the stirring action. This is important, since they block the substrate, preventing normal adherent film growth. Such no adherent deposits can also be prevented without stirring by placing the substrate in the bath at an angle. Due this the deposit on the surface towards front side, which will usually be a mixture of adherent and the loosely adherent material, will be removed (by wiping with a reagent that dissolves the film), leaving the film on the back-side surface of the glass plate, which does not collect precipitated deposit. It is

reported that the rate of deposition is affected by stirring only at low stirring rates, and the effect is not large. There is no apparent difference between low and fast stirring rates [5]. This implies that, even slow stirring is enough to prevent sticking of large, loosely adhering particles. Apart from deposition rate, the stirring could, in some cases, strongly affect the film quality and the effect of stirring depends on the concentration of ammonia (relative to the Cd).

III. RESULTS AND DISCUSSION

A. Physical/ Surface Observations

Certain physical properties (quantum size effect, color of the film etc.) of thin film semiconductor depend on the thickness of the film. The thickness of the as grown films depends on the time of the deposition as well as the composition parameter. Therefore a series of films were grown by varying disposition time at a constant temperature 55°C with a constant rate of rotation 60 rpm and the corresponding thickness were measured. The thickness of the films was measured by using wedge shaped film. Figure.1 shows the variation of thickness of the film with the deposition time. The graph shows that the thickness is proportional to the deposition time up to ~ 60 min and the rate of increase of the thickness reduces as time increases.

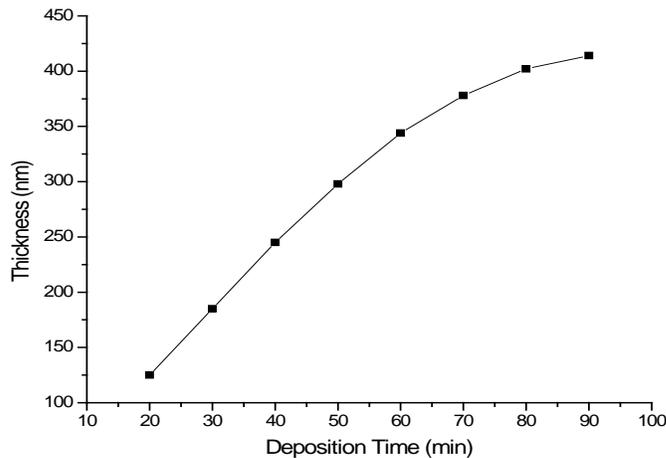


Figure 1: Time dependence of thickness of CdS thin film on deposition time

The as-grown CdS films were thin, uniform, smooth and well adherent to the glass substrate. Color of the as grown film changes with the concentration from greenish yellow to bright yellow. Observation of the film by optical microscopic (figure 2) show that average size of the grains on the as grown film is of the order of 4 -5 micrometer. It also reveals that the films are uniform in thickness and color throughout the film area.

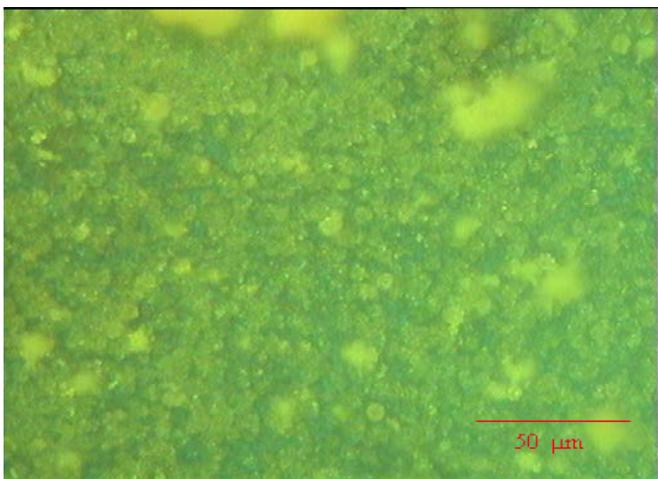


Figure 2: Surface photograph of as grown film using Optical Microscope

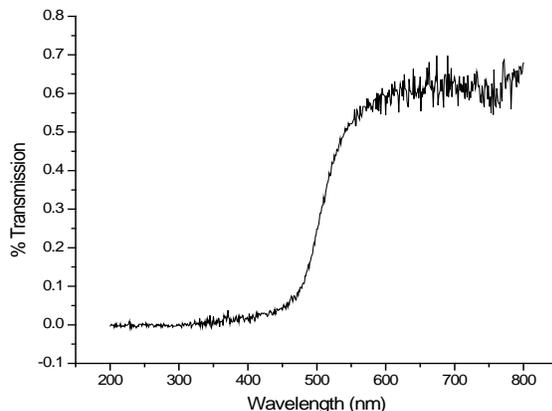


Figure 3: UV-Vis graph of CdS thin film

B. UV-Visible Spectroscopy and Nano-size of CdS Particles

Quantum size effect is one of the most important properties of CdS particles. Some thin films were annealed for 1 hr at 300 °C to form cohesive mixture of the grains on the as grown film to study the quantum size effect exhibited by the CdS particles [6]. One of the thin film was scanned on UV-Visible in transmission mode and the graph of the transmission response is shown in figure 3. The scan indicate an edge at wavelength 424 nm which corresponds to the emission energy of 2.93eV. The Brus Equation was used to obtain the radius of the quantum dot (R) by using the equation for emission energy of quantum dot semiconductor nanocrystal in terms of the band gap energy (E_g), Planck's constant (h), the mass of the excited electron (m_e^*), and the mass of the electron hole (m_h^*) given by the following equation [7].

$$\Delta E(R) = E_g(R) + \frac{h^2}{8R^2} \left(\frac{1}{m_e^*} + \frac{1}{m_h^*} \right)$$

The radius of the quantum dot affects the wavelength of the emitted light due to quantum confinement, and this describes the effect of changing radius of the quantum dot on the wavelength emitted. Radius of the nano size CdS particles calculated using above equation was observed to be ~ 3.67 nm.

C. Resistivity Measurement

Since indium is known to be good for ohmic contacts, it was used to make the contacts to the thin films. Four linear contacts with the spacing of 2.5mm were made. Current in the range of microampere was allowed to pass through the film at room temperature. The resistivity of the films was found to be in the range of (8.73 to 11.23) $\times 10^5 \Omega\text{-cm}$.

IV. CONCLUSION

Thin films of Cadmium sulfide were deposited successfully on the glass substrate by chemical bath deposition system. The grown films indicated uniform deposition of CdS particles on the substrate. Resistivity of the grown films was of the order of $10^6 \Omega\text{-cm}$ and calculated size of the CdS nano-particles is ~ 7 nm.

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Effect Thickness of Frontal Member in Frontal Crash

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Abstract- This paper deals with study of effect of varying thickness of front longitudinal member of pick-up vehicle in frontal crash. The objective is to study maximum force carrying capacity, energy Absorption and deceleration of seat member. The model chosen for study is well correlated and open source model. The physical test to FE correlation is well achieved and this model is suitable for further study about the crash behavior of frontal structure. The aim is to run this model with changes in thickness the longitudinal member of chassis structure which playing crucial role in frontal crash behavior.

Index Terms- Frontal Crash, Effect of Thickness, FEA, Crash

I. INTRODUCTION

The vehicle collision is a consequence of circumstances that produce abnormal operating conditions for the vehicle. Whether the collision occurs with another vehicle or with a stationary obstacle; it subjects the vehicle structure to forces and deformations. If the forces involved exceed the energy absorbing capability of the vehicle structure, occupants may be injured or killed. The vehicle structure should be sufficiently stiff in bending and torsion for proper ride and handling. It should minimize high frequency fore-aft vibrations that give rise to harshness. The structure should yield a deceleration pulse being deformable, yet stiff, front structure with crumple zones to absorb the crash kinetic energy resulting from frontal collisions by plastic deformation and prevents intrusion into the occupant compartment, especially in case of offset crashes and collisions with narrow objects such as trees. Short vehicle front ends, driven by styling considerations, present a challenging task to the crashworthiness engineer. In addition, the automotive safety engineer is responsible for packaging the occupants, so whatever decelerations transmitted to the occupants are manageable by the interior restraints to fall within the range of human tolerance. The ultimate goal of the safety engineer is to reduce occupant harm. Typically, designers accomplish this goal using a combination of crash avoidance and crashworthiness measures.

II. FINITE ELEMENT MODEL OF CHEVY SILVERADO

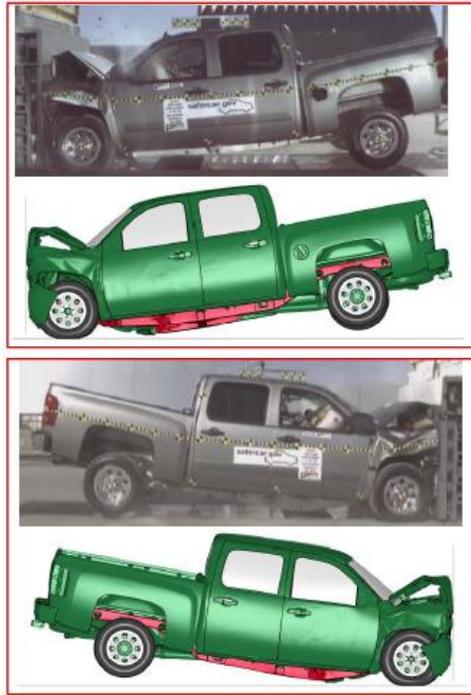
For the purpose of study an open source full vehicle model is chosen is for vehicle Silverado by Chevy Silverado. This model is released by FHWA/NHTSA National Crash Analysis Center. The model is for standard frontal impact NCAP validated model. This model is Model massed to reflect NCAP test mass (includes dummy mass and instrumentation mass. This is well correlated model with physical frontal impact test [5]

Following are few salient features of this model:

- 1) Model released by FHWA/NHTSA National Crash Analysis Centre
- 2) Silverado.2.2617kg.
- 3) Standard frontal NCAP validated model
- 4) Model massed to reflect NCAP test mass (includes dummy mass and instrumentation mass)
- 5) Detailed model, can be used for most impact scenarios
- 6) Material derived from coupon data derived coupon testing
- 7) Frontal impact validation into a rigid load cell wall.
- 8) LS DYNA is used as simulation software for the Finite Element Analysis.

This model verified against frontal NCAP test (NHTSA Test No. 5877).The crush mode of the rails and the structural members shows good correlation between test and simulation. Engine and Body mount failure were observed in the NCAP test. Suspension system is modeled in greater detail. Vehicle is set to equilibrium position under gravity loading.FE model is stable in full frontal flat rigid wall simulations (Model has been run at 25, 30 and 35 mph to ensure stability.

	FE Model	NCAP Test 5877
Weight (Kgs)	2617	2622
Engine Type	4.8 L V8	4.8 L V8
Tire size	P245/70R17	P245/70R17
Attitude (mm) As delivered	F – 1016	F – 929
	R – 1043	R – 1002
Wheelbase (mm)	3660	3664
CG (mm) Rearward of front wheel C/L	1664	1664
Body Style	4-door crew cab	4-door crew cab

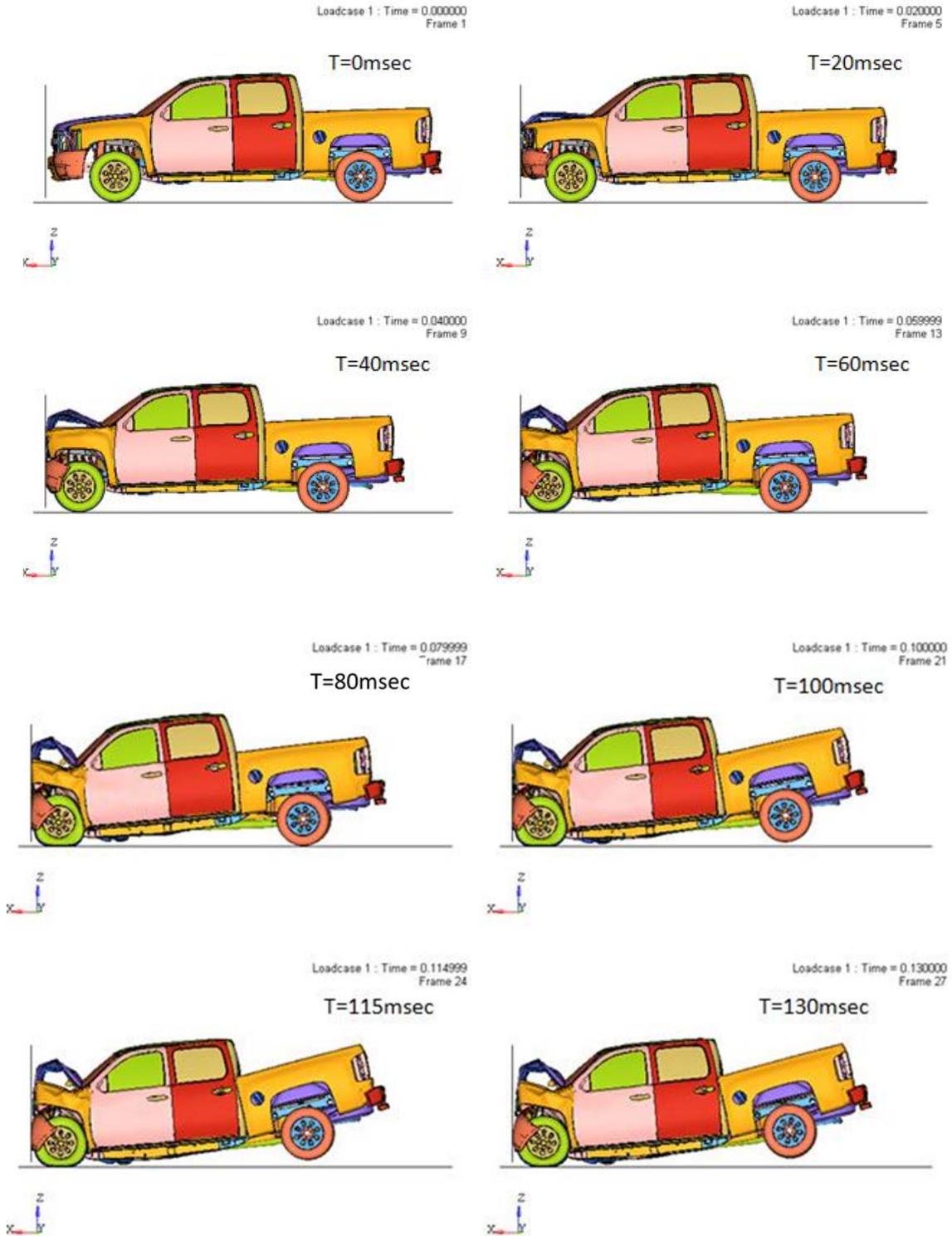


III. SCOPE OF THE STUDY

The aim of this paper is to study of effect of changes in thickness of the longitudinal member of chassis structure which playing crucial role in frontal crash behavior. The Effect is measured in terms overall energy absorbed by this member, Section force generated in the member and its effect on acceleration levels on seat mounting locations. For occupant safety lower the deceleration better to mange occupant decelerations with active restraint systems. Higher the declaration higher the risk of occupant fatal injuries due to sever forces getting generated in very small time. For this study the thickness of longitudinal member of chassis structure is kept between 2 mm to 3.5mm at an interval of 0.5 mm. So there are total 4 load cases as seen from following table.

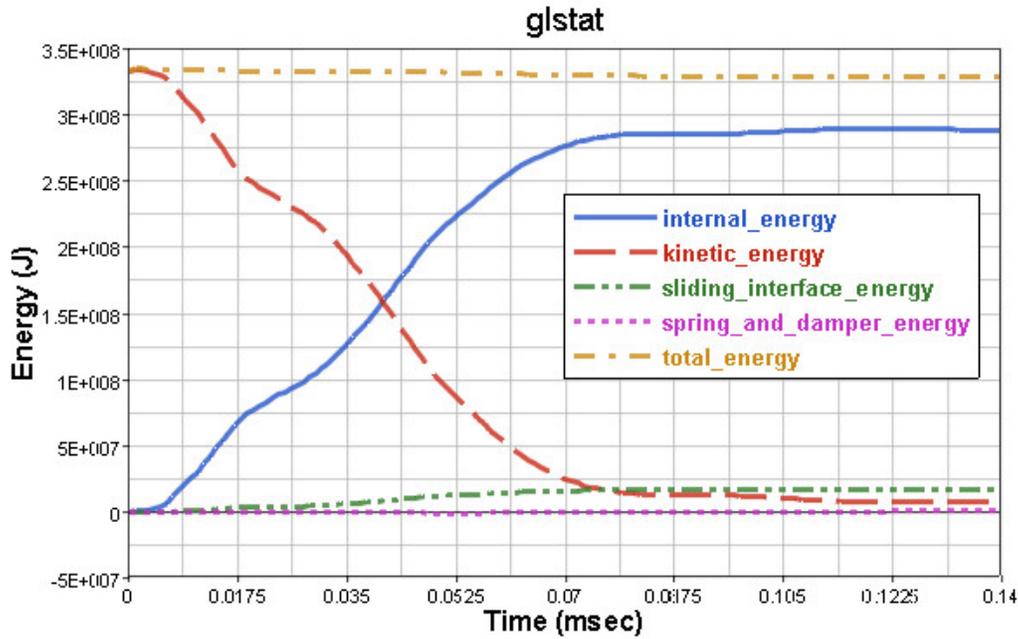
Run	Thickness (mm)	Material	Yield stress	Ultimate stress	Elongation (%)
1	2	As Existing	370	554	30
2	2.5	As Existing	370	554	30
3	3	As Existing	370	554	30
4	3.5	As Existing	370	554	30

IV. MODEL BEHAVIOR DURING FRONTAL IMPACT.

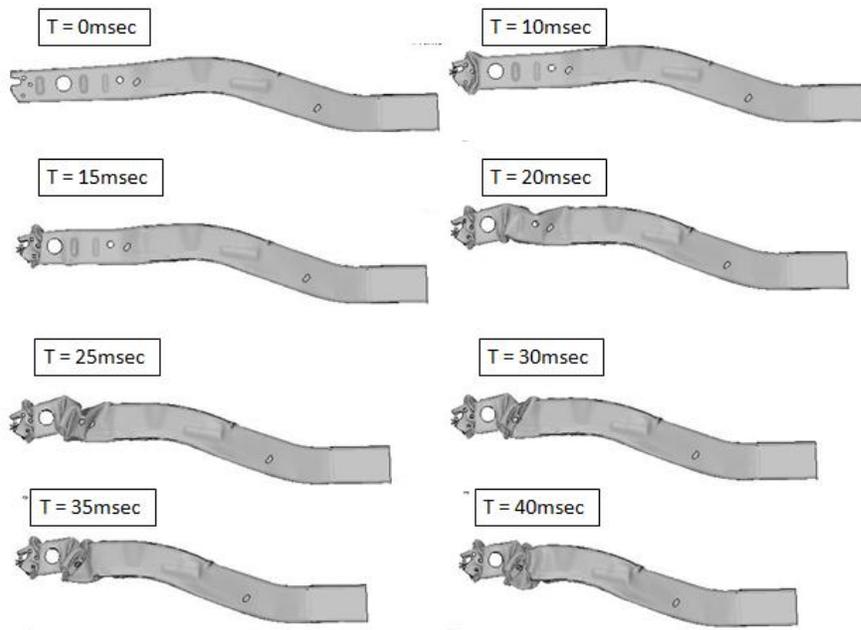


V. ENERGY BALANCE

Following diagram shows energy balance of the model. The total kinetic energy of the model is reduced over the crash duration and mostly converted into internal energy of the vehicle structure due to deformation. The sliding interface energy and spring and damper energy are lower as desired. The vehicle structure at front is designed to absorb this impact energy and longitudinal member selected for this study is playing key role in this.



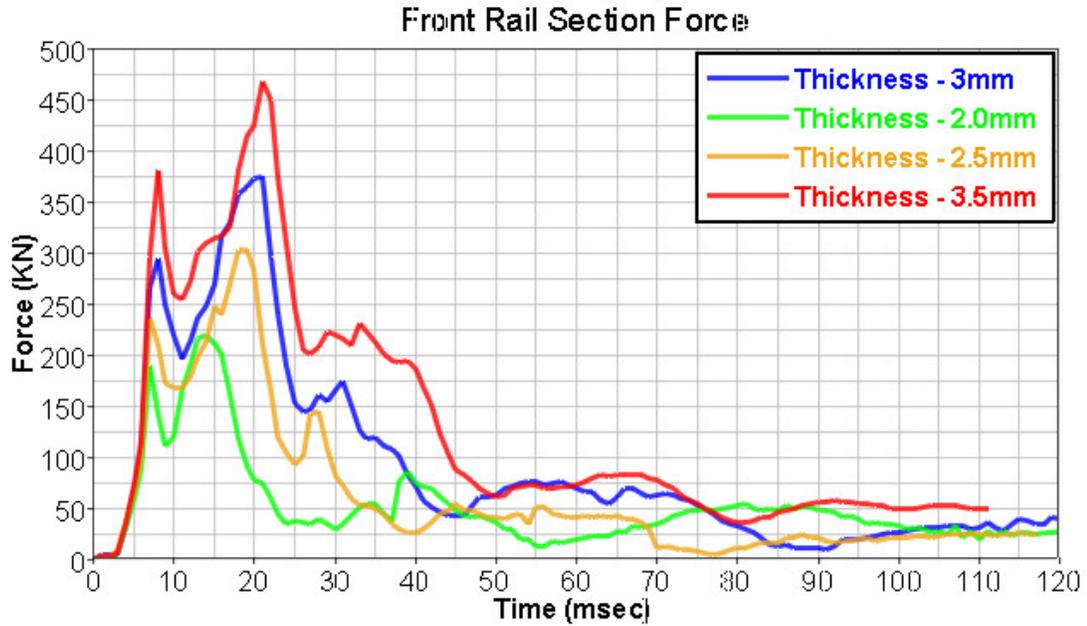
VI. DEFORMED SHAPE OF FRONT RAIL



This is the front longitudinal member for which thickness variation is done to study the effect of variable thickness. This member is gradually deformed during the crash event initiating a collapse at 25 msec .Maximum resistance is offered before the collapse is function of thickness, geometry and material.

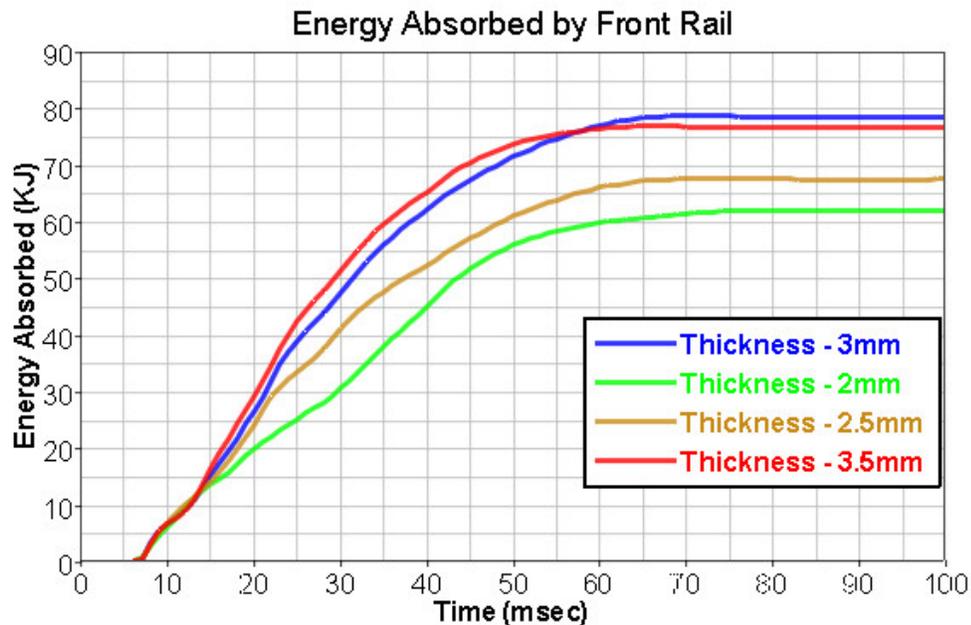
VII. SECTION FORCES COMPARISON WITH RESPECT TO VARYING THICKNESS

As seen from the comparison of results it is evident that as thickness of front rail is increased the ability to take force by front rail is increased. The original model thickness is 3mm and anything lesser than thickness give rise to lesser force taking capacity of frontal longitudinal rail.



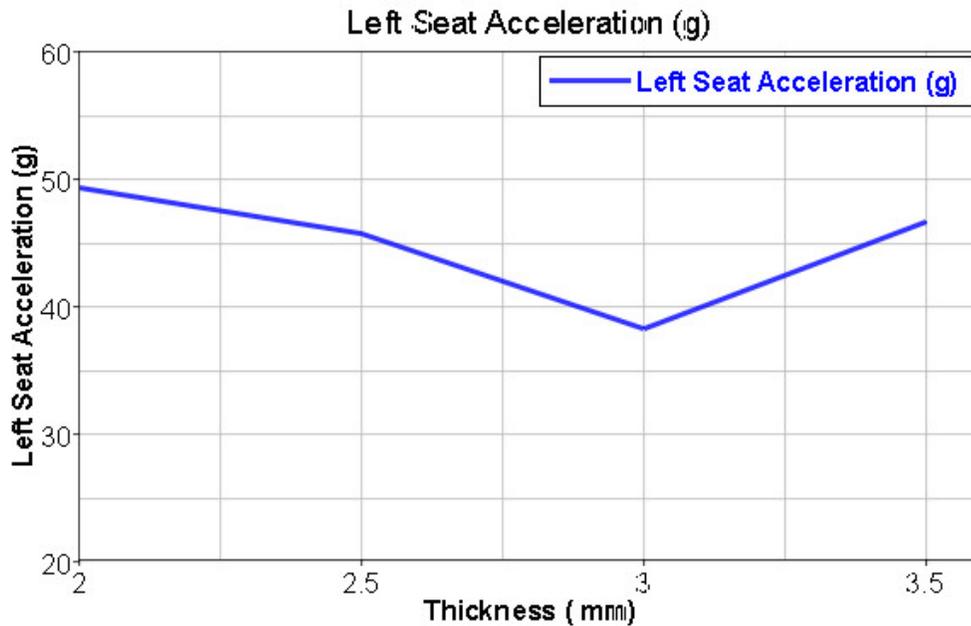
VIII. ENERGY ABSORPTION COMPARISON WITH RESPECT TO VARYING YIELD OF MATERIAL

This is plot of Energy Absorption by front rail for different thicknesses. As thickness of front rail is increased there is increase in energy absorption capacity. Also it is indicating increasing thickness after certain limit the energy absorption capacity is not increasing. So there is limit to Energy absorption capacity of the rail with increase in thickness and further increase may give stiff response from the rail.



IX. ACCELERATION COMPARISON WITH RESPECT TO VARYING THICKNESS

The acceleration for left seat is monitored in this case and it is showing interesting trend. The acceleration is high at the lowest thickness of 2mm and gradually decreases with increase in thickness up to 3mm and again sharply rises with thickness of 3.5mm. At lower thicknesses the front rail's giving up with less force and residual forces are transferred further towards passenger compartment, resulting higher deceleration of left seat. So at thickness of 3mm it appears to be optimum design with relatively lower acceleration of the left seat as well as fairly good force and energy absorption capability. Also the gain in energy absorption from 3 mm to 3.5 mm is relatively less or negligible along with adverse effect of increase in deceleration of the seat.



X. CONCLUSION AND FURTHER STUDY

At lower thicknesses the front rail's giving up with less force and residual forces are transferred further towards passenger compartment, resulting higher deceleration of left seat. So at thickness of 3mm it appears to be optimum design with relatively lower acceleration of the left seat as well as fairly good force and energy absorption capability. Also the gain in energy absorption from 3 mm to 3.5 mm is relatively less or negligible along with adverse effect of increase in deceleration of the seat.

Further study can be taken with different material properties for frontal longitudinal members with the same thickness to verify effect of material yield, plasticity on force carrying capacity, energy absorption and acceleration levels at seat mounting locations.

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Solar Powered Reciprocating Pump

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Purpose of this Manual:- This article is a note or manual for mechanical engineer where work as rotating engineer or where concern to apply reciprocating pump into the system. Article contain how to select pump, performance analysis, power estimation, NPSH estimation and also to create or complete calculation sheet, datasheet and specification sheet as a part of detail engineering and purchasing activity.[1]

Abstract- In present days, people need more and more power for driving instruments. A solar based reciprocating pump is a pump, running on electricity on electricity generated by solar cell, available from collected sunlight as opposed to greed electricity or diesel run water pump.

Nowadays many types of pump are available such as, positive displacement pump, impulse pump, velocity pump, gravity pump, steam pump, valve less pump. A reciprocating pump is class of positive displacement pump, is used for variety of purpose such as, car washing, irrigation, color spraying, extraction of oil from bottom of the earth, large fountain, garden water pump, etc. If 50% of the diesel pump were replaced with solar PV pump set, diesel consumption could be reduced to the turn of about 225 billion liter/year.

A solar reciprocating pumping systems is believed to be applicable to many remote and domestic irrigations applications without access to electricity relaying diesel power and having insufficient wind for pumping and to be cost competitive, locally manufacturable alternative to photovoltaic. This system consists of solar collector, battery, motor, crankshaft, reciprocating pump, valve, and tank. [2]

Keeping this entire thing in mind we are proposing to design solar powered reciprocating pump.

Index Terms- Reciprocating Pump, Solar PV panel, Battery, Crankshaft, Rotating panel, ON/OFF Valve.

I. INTRODUCTION

Aim:

It start from scratch with a definite mission, generates activities involving a variety of movement and human resources all direct towards fulfillment.

A project is a short time limited, goal directed, major undertaking, required the commitment of various skills and resources. It also describe goal together in a temporary organization to specific purpose. In project work, they have to make any machine or structure which is based on mechanical principal.

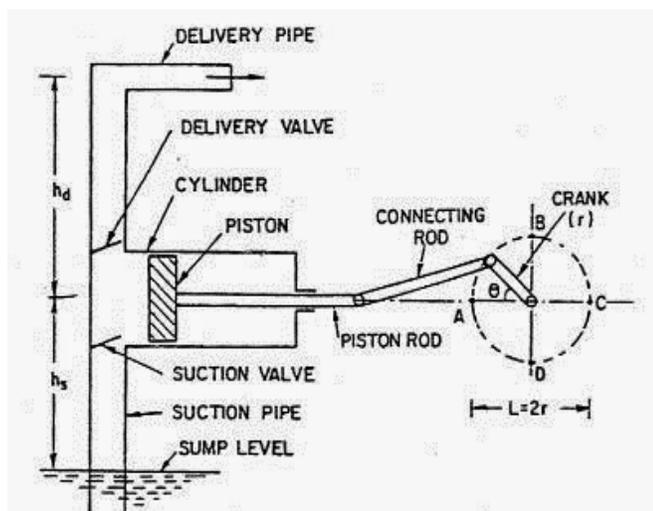
Type and construction features of reciprocating pump :

1. Position
 - Vertical
 - Horizontal
2. Purpose
 - Metering Pump
 - Power Pump
3. Piston or Plunger acting : Single acting, Double acting
4. Number of Plunger in One Casing : Single, Duplex, Triplex, Multiplex
5. Liquid End Type : Direct exposed, Diaphragm
6. Plunger direction : Forward, Backward. [1]

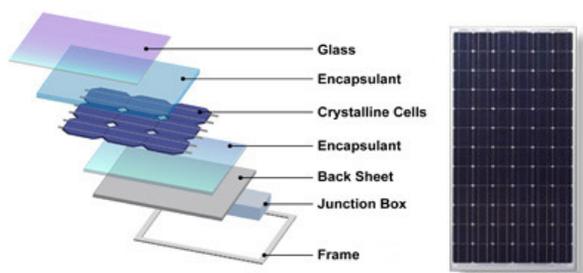
II. MAIN COMPONENTS OF SYSTEM

The Source: Water sources can be deep drilled wells, streams, springs, ponds, rivers, etc. The main variables, in addition to initial cost, that factor into system design are the recharge rate of the source and the volume of the source reservoir. Ideally, the source should recharge faster than pump can take water out of it. [3]

The pump: This is the heart and soul of the solar water pumping system. Pumps fall along a spectrum of high-flow/low-head to low-flow/high-head. In other words, for a given power input, the pump produces a unique combination of flow and pressure. When selecting a pump you are basically selecting that combination of performance characteristics. Solar pumps are rated according to the voltage of electricity that should be supplied. A 12 volt pump is a small one, 24 volt is more the norm, while 48 volts and upwards will require more power and might pump more water. These include filters, float valves, switches, etc.[3]



Photovoltaic (PV) panels: The photovoltaic panels make up most (up to 80%) of the systems cost. The size of the PV-system is directly dependent on the size of the pump, the amount of water that is required (m^3/d) and the solar irradiance available. A panel is rated in watts of power it can produce. The SPV water pumping system should be operated with PV array capacity in the range of 200 Watts peak to 5000 Watts peak, measured under Standard Test Conditions (STC). Sufficient number of modules in series and parallel could be used to obtain the required PV array power output. The power output of individual pvModules used in the PV array, under STC, should be a minimum of 74 Watts peak, with adequate provision for measurement tolerances. Use of PV modules with higher power output is preferred. Indigenously produced PV module(s) containing mono/multicrystalline silicon solar cells⁴. [3]



The water distribution system:- In many countries of the world, trenches are dug to gravity feed water through an intricate network of irrigated plots or holding tanks. Here farmers tend to use black polyethylene piping. Whatever the system is to get water, there important thing to consider is the smaller the diameter piping and the longer the piping run, the harder a pump has to work and the more pressure the pump must create. [3]

Motor pump-set: Following types of motor pump sets could be used in the SPV water pumping systems

- 1 Surface mounted DC motor pump-set
- 2 Submersible DC motor pump set
- 3 Submersible AC motor pump set
- 4 Floating DC motor pump set.

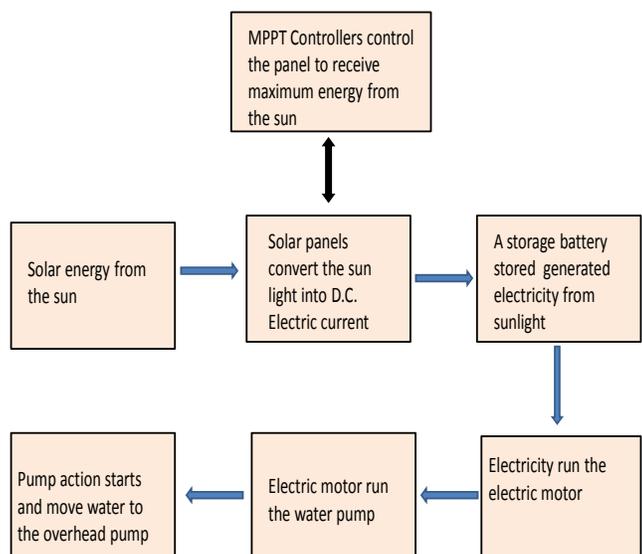
Mounting structures and tracking system: To enhance the performance of SPV water pumping systems, it is desirable to use a tracking system. Manual, passive and auto tracking are permitted. The PV modules will be mounted on metallic structures of adequate strength and appropriate design, which can withstand load of modules and high wind velocities up to 150 km per hour. The support structure used in the pumping system will be hot dip Galvanized iron (G.I). The G.I. structures for mounting the Solar panels could be so designed, that these can be manually/ auto adjusted for optimal tilt throughout the year.6. Controller: The purpose of the controller is twofold. Firstly, it matches the output power that the pump receives with the input power available from the solar panels. Secondly, a controller usually provides a low voltage protection, whereby the system is switched off, if the voltage is too low or too high for the operating voltage range of the pump. This increases the lifetime of the pump thus reducing the need for maintenance. [4]

Inverter:- It changes the direct current from the solar panels into alternating current for the pump. The supported power range of inverters extends from 0.15 to 55 kW and can be used for larger irrigation systems. However, the panel and inverters must be sized accordingly to accommodate the inrush characteristic of an AC motor. [5]

SR. NO.	COMPONENTS	MATERIAL
1	Solar panel	Silicon
2	Battery	-
3	Crank shaft	Mild Steel
4	Motor	-
5	Valve	Stainless Steel
6	Tank	Mild Steel
7	RECIPROCATING PUMP	Plastic
8	Pipe	Stainless Steel
9	Stand	Mild Steel

Working:-

Working principle:



Solar pumps utilize the photovoltaic effect to produce free electricity used for water pumping. Photons of light hit a collection of solar cell, exciting electrons into a higher state of energy, making them act as charge carriers an electric current. This is how Photovoltaic (PV) cells produce electricity. DC electricity is produced in a set of silicon solar cells gathered in modules and put together into arrays. Connected to a

reciprocating pump. Inlet pipe of reciprocating pumps are mounted or in the source and its outlet to the water delivery point. Storage can be done by the use of elevated water tanks or storage ponds where water is stored until it is demanded and delivered to end-users or through the use of batteries that store electricity and save it until there is demand for water. The first is apparently more feasible and less maintenance-demanding as compared to battery storage systems. [6]

Some solar pumping applications use tracking systems to maximize power production and increase daily gain, through single axis or dual axis tracking solar collectors. This is applied in case of high volume demand but requires large water storage volumes.

Most commercial HPLC pumps are based on a reciprocating piston design, as shown here. A motor-driven cam pulls the piston back and forth in the pump head. A flexible seal around the periphery of the piston prevents leakage of mobile phase out the back of the pump. Check valves mounted in the head open and close in response to small changes in pressure to maintain a one-way flow of solvent.

The pump cylinder with its check valves is often accessible from the outside to allow easier servicing of the check valves and replacement of the pump seals. This part of the pump is called the pump head. During the delivery stroke, flow increases from zero up to a maximum, then decreases back to zero. During the intake stroke, flow is zero. The pressure inside the pump changes in the same way as flow going from zero to a maximum value, and then staying at zero during the intake stroke.[7]

Methodology:-

Lathe Machine:-

Grinding machine:-

Height from centre length	165mm
Length	1829mm
Swing over saddle	203mm
No. of spindle possible	8
Range of spindle speed	240-750 rpm
Range of cross feed	0.008-0.0223mm
Net weight of machine	690 kg

Drilling machine:-

Height from centre length	165mm
Length	1829mm
Swing over saddle	203mm
No. of spindle possible	8
Range of spindle speed	240-750 rpm
Range of cross feed	0.008-0.0223mm
Net weight of machine	690 kg

Cutter machine:-

Height from centre length	165mm
Length	1829mm

Swing over saddle	203mm
No. of spindle possible	8
Range of spindle speed	240-750 rpm
Range of cross feed	0.008-0.0223mm
Net weight of machine	690 kg

Welding machine:-

Types of welding machine	Electric
Power required	3 Phase
Height	760 mm
Length	900 mm

Important Parameters:-

[9]

• Displacement (gpm) is the calculated capacity of the pump with no slip losses. For single-acting plunger or piston pumps, it is defined as the following:

Where: D = displacement, (gpm US)

A = cross-sectional area of plunger or piston, (in²)

M = number of plungers or pistons

n = speed of pump, (rpm)

s = stroke of pump, (in.) (half the linear distance the plunger or piston moves linearly in one revolution)

f) Slip(s)

• Slip is the capacity loss as a fraction or percentage of the suction capacity. It consists of stuffing box loss BL plus valve loss VL. However, stuffing box loss is usually considered negligible.

g) Valve Loss (VL)

• Valve loss is the flow of liquid going back through the valve while it is closing and/or seated. This is a 2% to 10% loss depending on the valve design or condition.

h) Speed (n)

• Design speed of a power pump is usually between 300 to 800 rpm depending on the capacity, size, and horsepower.

To maintain good packing life, speed is limited to a plunger velocity of 140 to 150 ft/minute. Pump speed is also limited by valve life and allowable suction conditions.

i) Pulsations

• The pulsating characteristics of the output of a power pump are extremely important in pump application. The magnitude of the discharge pulsation is mostly affected by the number of plungers or pistons on the crankshaft.

j) Net Positive Suction Head Required (NPSHR)

• The NPSHR is the head of clean clear liquid required at the suction centerline to ensure proper pump suction operating conditions. For any given plunger size, rotating speed, pumping capacity, and pressure, there is a specific value of NPSHR. A change in one or more of these variables changes the NPSHR.

• It is a good practice to have the NPSHA (available) 3 to 5 psi greater than the NPSHR. This will prevent release of vapour

and entrained gases into the suction system, which will cause cavitations damage in the internal passages.

k) Net Positive Suction Head Available (NPSHA)

• The NPSHA is the static head plus the atmospheric head minus lift loss, frictional loss, vapour pressure, velocity head, and acceleration loss in feet available at the suction centre-line

Installation, Operation, and Troubleshooting of Pumps

• The subsequent data will provide useful to personnel involved in the application or maintenance of pumps. The information is categorized into the following headings:

I. Alignment of Shafts

II. Water Hammer

I. ALIGNMENT OF SHAFTS

Misalignment of the pump and driver shaft can be angular (shaft axes concentric but not parallel), parallel (shaft axes parallel but not concentric), or a combination of both

a. COUPLINGS

• Couplings provide a mechanically flexible connection for two shaft ends that are in line.

• Couplings also provide limited shaft end float (for mechanical movement or thermal expansion) and within specified limits, angular and parallel misalignment of shafts.

Couplings are not intended to compensate for major angular or parallel misalignment.

• The allowable misalignment will vary with the type of coupling, and reference should be made to the manufacturer's specifications enclosed with the coupling. Any improvement in alignment over the coupling-manufacturer's minimum specification will increase pump, coupling, and prime mover life by reducing bearing loads and wear.

• Flexible couplings in common use today are chain, gear, steel grid, and flex member.

b. Angular Misalignment

• To check angular misalignment

- insert a feeler gauge between the coupling halves to check the gap;

- check the gap between coupling halves at the same location on the coupling as for the original gap check.

- To correct angular misalignment, adjust the amount of shims under the driver and/or adjust driver location in the horizontal plane.

c. Parallel Misalignment

- To check parallel misalignment, the dial indicator method is used
 - with the dial indicator attached to the pump or driver shaft, rotate both shafts simultaneously, and record dial indicator readings through one complete revolution;
 - correct the parallel misalignment by adjusting shims under the driver.
- On certain large units, limited end float couplings are used.

III. WATER HAMMER

Water hammer is an increase in pressure due to rapid changes in the velocity of a liquid flowing through a pipeline. This dynamic pressure change is the result of the transformation of the kinetic energy of the moving mass of liquid into pressure energy. When the velocity is changed by closing a valve or by some other means, the magnitude of the pressure produced is frequently much greater than the static pressure on the line, and may cause rupture or damage to the pump, piping, or fittings. This applies both to horizontal and vertical pump installations.

The velocity of the pressure wave depends upon the ratio of the wall thickness to the inside pipe diameter, on the modulus of elasticity of the pipe material, and on the modulus of Elasticity of the liquid.

The head due to water hammer in excess of normal static head is a function of the destroyed velocity, the time of closure, and the velocity of pressure wave along the pipe.

Benefits of solar water reciprocating pump:

- Solar water pumps are used for irrigation of crops, water livestock and provide portable drinking water.
- Solar water pump uses peak solar array output which frequently coincides with high-water demand during long, dry summer days.
- Solar water pumps can also be designed for portability to be moved based on water demand or change of season requires.
- Their operating cost is less compared to diesel pumps.
- Recent fuel price increases and generally intensive maintenance schedules however can make diesel pumps expensive.[8]

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Enhancement of Data Security on Transmission Network Using Fuzzy Logic

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Abstract- Security of data is an important factor in data transmission through network. This paper proposed a new method using fuzzy set theory to enhance the security. The data in the form of text to be transmitted is encrypted by using the AES Rijndael algorithm. The encryption algorithm is the mathematical procedure for performing encryption of data. A key is used to cipher a message and to decipher it back to the original message. Then the scrambled encrypted text is converted into numeric form by applying the fuzzy set theory. The fuzzy logic provides the text in the zero to one value. These numerical values before decryption are again converted into scrambled text. if the key provided by the user is the same key that is used for the encryption then original data will be retrieved. The paper, integrates the encryption of text and conversion of the unscrambled text from numerical to original by using fuzzy logic.

Index Terms- Fuzzy logic, Fuzzy set theory, Encryption, AES Rijndael Algorithm.

I. INTRODUCTION

Fuzzy logic is a problem solving control system methodology that lends itself to implementation in systems ranging from simple, small, embedded microcontrollers to large, networked, multi-channel pc (or) workstation-based data acquisition and control systems. It can be implemented in hardware, software (or) a combination of both. Fuzzy logic provides a simple way to arrive at a definite conclusion based upon vague, ambiguous, imprecise, and noisy (or) missing input information. Fuzzy sets and fuzzy logic are powerful mathematical tools for modeling and controlling uncertain systems in industry, humanity and nature they are facilitators for approximate reasoning in decision making in the absence of complete and precise information [1]. The basic concept underlying fuzzy logic is that of a linguistic variable.

A variable whose values are words (or) sentences in natural (or) artificial languages are called linguistic variables. Fuzzy sets are a generalization of classical sets and infinite valued logic is a generalization of classical logic. There is also correspondence between these two areas.

Network Security is becoming more and more crucial as the volume of data being exchanged on the internet access [2]. Based on the above, the security involves four important aspects: Confidentiality, message authentication, integrity and non – repudiation. Popular application of multimedia technology, and increasingly transmission ability of network gradually leads us to acquire, information directly and clearly through various

methods. In cryptography, public-key cryptosystems are convenient in that they do not require the sender and receiver to share a common secret in order to communicate securely [3]. However, they often rely on complicated mathematical computations and are thus generally much more inefficient than comparable symmetric-key cryptosystems. Cryptography is the process of transforming plain text into unintelligible form called the cipher text. The technology of the encryption is called cryptology[4]. In this paper the text encryption is based on the symmetric key algorithm where both the encryption and the decryption keys are the same. Symmetric cryptography refers to encryption methods in which both the sender and receiver share the same key.

II. REVIEW

Related work done on fuzzification and its result shows that security problem involving computer based systems are getting more frequent for security attention. The number and variety of attacks by person and malicious software from outside organization, particularly and consequences of inside attacks also remain a major concern.

Cryptography is the practice and study of hiding information. Modern cryptography intersects the disciplines of mathematics, computer science and electrical engineering. Applications of cryptography include ATM cards, computer passwords and electrical commerce

Public key cryptography is a fundamental and widely used technology around the world. It is the approach which is employed by many cryptographic algorithms and cryptosystems. Public-key algorithms are most often based on the computational complexity of hard problems often from number theory[5] Most of the users do not have the required resources for the communication. Current algorithms which are available for the encryption either takes high processing time and not secure enough to help the limited bandwidth

The encryption algorithm is an integral work of data encryption and decryption process. They should preserve high security to the data transmitted. Basically, encryption algorithms are divided into three major categories transposition, substitution and transposition-substitution technique [6].

III. BACKGROUND

Security is the main problem in the modern data communication. There are a lot of cyber-crimes have arises with the development of technology. Cryptography consists of cryptology and crypto analysis. Encryption comes under

cryptology. In this paper the text encryption is based on the symmetric key algorithm where both the encryption and the decryption keys are the same

AES Rijndael Algorithm

The encryption algorithm is an integral work of image encryption and decryption process. They should preserve high security to the image transmitted. Rijndael algorithm is one of the AES (Advanced Encryption Standard) algorithms, used for text encryption technique. It is a block cipher algorithm, in which the block means the information to be encrypted is divided into blocks of equal length, It is an iterated block cipher, with a variable block length and variable key length.

AES Rijndael Algorithm Operations:

- Describe the set of rounds keys from the cipher key.
- Initialize the state array with the block data (plaintext).
- Add the initial round key to the starting state array.
- Perform nine rounds of state manipulation.
- Perform the tenth final round of state manipulation.
- Copy the final state array and as the encrypted data (cipher text)

Fuzzy set theory

Fuzzy set theory is an extension of classical set theory where elements have varying degrees of membership. A logic based on the two truth values True and false is sometimes inadequate when describing human reasoning [7]. Fuzzy logic uses the whole interval between 0 (false) and 1 (True) to describe human reasoning. A fuzzy set is any set that allows its members to have different degree of membership function in the interval [0,1]. The degree of membership (or) truth is not same as probability [5]. Fuzzy truth is not likelihood of some event (or) conditions. The fuzzy truth represents membership in vaguely defined sets.

IV. METHODOLOGY

Symmetric key cryptography refers to encryption methods in which both the sender and receiver share the same key (and, less commonly, in which their keys are different, but related in an easily computable way) [8]. The modern study of symmetric ciphers relates mainly to the study of block ciphers and stream ciphers and to their applications. A block cipher take as input a block of plaintext and a key, and output a block of cipher text of the same size. Since messages are almost always longer than a single block, some method of knitting together successive blocks is required. Several have been developed, some better security in one aspect or another than others. They are the mode of operations which must be carefully considered when using a block cipher in a crypto system. Rijndael algorithm is one of the AES (Advanced Encryption Standard) algorithm used for data encryption technique. It is a block cipher algorithm in which the block means the information to be encrypted is divided into blocks of equal length. It is an integrated block cipher, with a variable block length and variables key lengths [9].

Internally, the AES algorithms operations are performed on a two dimensional array of bytes called the state. The state

consists of four rows of bytes, where Nb is the block length divided by 32. The function of AES Rijndael is as follow

i. SubBytes Transformation: The sub Bytes () Transformation is a non

-linear byte substitution that operates independently on each byte of the state using a substitution table.

ii. Shift Rows Transformation: In the shift rows () Transformation, the bytes in the last three rows of the state are cyclically shifted over different number of bytes. The first row will not get shifted.

iii. Mix Column Transformation: In mix column () Transformation. The columns of the state are considered as polynomial and then multiplied by modulus with fixed polynomial individually.

iv. Add Round Key Transformations: In the Add Round Key () Transformation, a round key is added to a state by a simple bitwise XOR operation. Each round key consists of Nb words from the key schedule those Nb words are each added into the columns of the state.

Encryption and Fuzzification

The secret evaluation on communication between various networks is concerned with the working effect of secret regulatory authorities and with the economic interests of the evaluated objects. The quality of the secrecy evaluation not only affects the message that is transmitted between the nodes. In the traditional process of encryption evaluation mainly studies the security system of evaluated enterprises by the findings. Finally, they evaluate enterprises on the basis of the total points. There are a lot of uncertainty and fuzziness in the course of this evaluation. Eg, the difficulty in quantifying the indexes. Therefore, the fuzzy set theory and method were introduced in the secrecy evaluation. It is the organic combination of quantitative and qualitative evaluation, so the secrecy censorship evaluation becomes more scientific and realistic.

Encryption of data using Matrix Transformation

A new method to transmit the data over the network is proposed. The communication involves the encryption of data before passing it to the receiver. For the data encryption the key is generated using the AES standard algorithm, which is symmetric. Then, store the encrypt file in the memory for comparing for later process. The matrix transformation is the next step in this process. For the matrix conversion the ASCII value of the encrypted text is considered. The conversion ends in the binary coded value which is in ones and zeros. After this step, get the encrypted data put into matrix formation, get the fuzzy membership matrix.

For the decryption of the text again the matrix transpose formation is created. The following steps are taken place in the decryption process to retrieve the encrypted data from the remote system, Convert the matrix with encrypted text into matrix transpose formation. The fuzzy evaluation score is now received. After the retrieval of the data the decryption process is taken place by use the symmetric key algorithm. This file is compared with the original data for processing. At the end of the process the original data can be retrieved and the data can be transferred between the users without any modification.

V. RESULTS

The proposed system ends in the encryption and the fuzzification of the user defined text. The test result shows that the encrypted data have to be loaded, while the symmetric key for the text to be encrypted is given and saved. From the test result, it is discovered that the conversion as matrix took place after the encryption of the text. This matrix transformation provide the security and the authentication so that the intruders cannot able to know the transformation code of the text.

VI. CONCLUSION

In this paper, a symmetric cryptosystem is introduced, enhancing a new method to encrypt the user defined text that eliminates the random and man-made factors of secrecy evaluation to the maximum. It plays an important role in enrichment and development of multi-object evaluation technique, which raises the secrecy level. Each block of the data is encrypted using symmetric key rounds which then will also get the matrix conversion. This work is done using Rijndael cryptography symmetric algorithm for encryption/decryption. Hence the matrix form of data consists of only the binary values of the original data. This will eliminate the modification of the data by the intruders.

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Assessment on factors controlling nutrient dynamics in a small tropical river using multivariate analysis

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Abstract- Water samples (N= 96) were collected from Meenachil river for 16 locations (S1-S16) in pre monsoon (PRM), monsoon (MON) and post monsoon (POM) seasons during 2013 and 2014. The nutrients like NO_3 , PO_4 (<1 mg/L) and SiO_2 (<4 mg/L) are generally low in the river, and increases from upstream to downstream. The cations of abundance include Na> Ca> K> Mg> Fe for PRM, Ca> Na> Mg> K> Fe for MON and Na> Ca> Mg> K> Fe for POM. Anion abundance include Cl> HCO_3 > SO_4 > SiO_2 > NO_3 > NO_2 > PO_4 during PRM, HCO_3 > Cl> SO_4 > SiO_2 > NO_3 > PO_4 > NO_2 during MON and Cl> HCO_3 > SO_4 > NO_3 > SiO_2 > NO_2 > PO_4 during POM. The factor analysis result illustrate F1 loading (TEMP, TH, SAL, Mg, Ca, SO_4 , Na, K, Cl and HCO_3) of 69.85 % during PRM clearly indicating the role of tropical weathering process in the river system. From the F1 loading during MON, it is interpreted that positive loading of NO_2 , PO_4 , Na and K indicate role of agricultural runoff in determining the water quality of river system. During POM, F1 loading for TH, SAL, PO_4 , Mg, Ca, SO_4 , Na, K and Cl accounting 67.89 % variance depicts influence of agricultural as well as anthropogenic activity on the river system. Cluster analysis reveals that stations in the highland and a part of midland (S1-S10) is comparatively less polluted. During PRM, river mouth station S16 alone forms a separate cluster indicating dominance of saline water ingress in that station. While in POM the effect of liming of agricultural land in this watershed also has much influence in controlling the river water chemistry in the lowland stations especially S14, S15 and S16.

Index Terms- River nutrients, Tropical river, Pollution identification, Multivariate analysis

I. INTRODUCTION

Rivers constitute to the main water resources in inland areas for drinking, irrigation and industrial purposes; thus, it is a prerequisite for effective and efficient water management to have reliable information of water quality [1]. Livelihoods such as agriculture, fishing and animal husbandry are affected by poor water quality. Biodiversity, especially of freshwater ecosystems is under threat due to water pollution [2]. The water quality of a natural stream is determined by the concentration of different chemical variables of the water body. The change in the concentration of these different variables is the result of a

number of random processes, including rainfall, runoff, anthropogenic activities, geology etc. Water quality can be affected when watersheds are modified by alterations in land use pattern, sediment balance, or fertilizer use from industrialization, urbanization, or conversion of forests and grasslands to agriculture and silviculture [3]. Natural factors like geology, climate, hydrology and vegetation are usually first order controls of the amount and composition of dissolved and particulate substances transported by rivers. Now-a-days, human-induced environmental changes often go far beyond natural variations and therefore may lead to drastic change in the river input to estuaries and affect coastal ecosystems [4]. Increased nutrient input into the riverine system emphasizes the imbalances and alterations in terrestrial sources. Thus the quantity and quality of nutrient input to the rivers needs to be monitored to cope with the existing and future climatic and environmental changes [5].

The water quality assessment, however, does not focus on the instantaneous concentration as it is seldom that the instantaneous concentration has an impact on the water user. Rather the overall difference in the magnitude of the concentration and range of concentration over a period of time must be used as a measurement of the water quality status [6]. Due to spatial and temporal variations in water chemistry a stringent and scientific mode of continuous water quality monitoring pattern is necessary for surface waters especially for rivers. Thus, monitoring programs including frequent water samplings from specific sites and determination of its quality is of vital value.

Study area

The Meenachil river (Order= 7th; Length= 78 km; Area= 1272 km²), one of the important rivers in Central Kerala (Fig.1), is formed by several streams originating from the Western Ghats at Araikunnumudi (elevation=1097m above msl) and flows in the E-W direction and finally debouch into the Vembanad lake (a Ramsar site). The entire river basin area geographically lies between N latitude 9^o25' to 9^o55' and E longitude 76^o30' to 77^o00'. Major part (41 km; 53%) of this river runs through midland terrain, 21 km (27%) through the highland and the rest (16 km; 20%) is seen to flow through the low land terrain. The river has 47 sub-watersheds and 114 micro-watersheds [7,8]. It has 38 tributaries including major and minor ones.

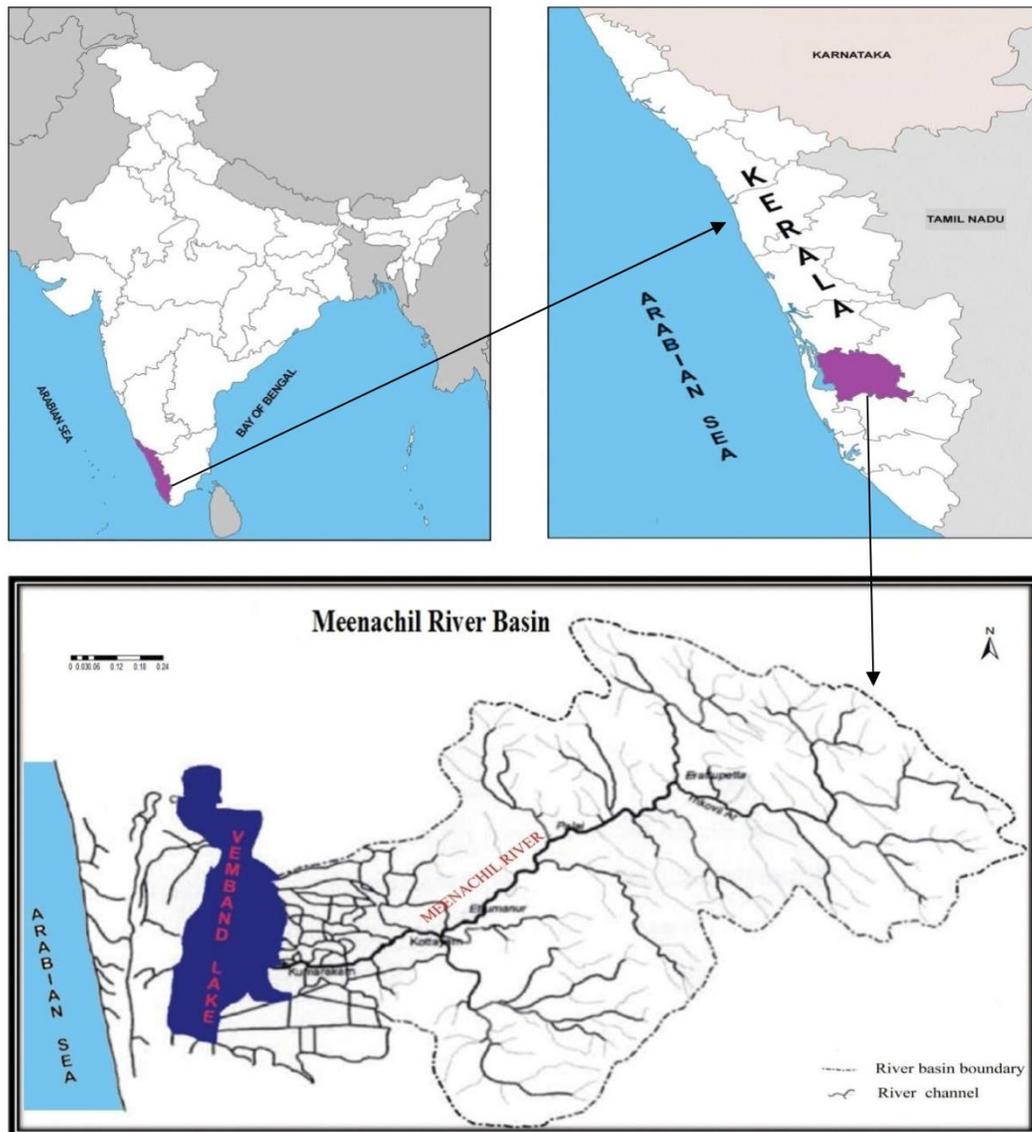


Figure 1. Location map of study area

The major tributaries are Kadapuzha, Kalathukadavu, Kurisumalai, Trikkoil, Punjar, Meenadom [9]. The river exhibits a dendritic drainage pattern and splits into a number of distributaries in the lowlands and finally merges with the Vembanad Lake at Kavanattinkara [10].

The basin primarily comprises of Precambrian metamorphic rock system. The major soil type prevalent in the area is well drained lateritic soils, while main rock types of the area belong to Charnockite/charnakite gneiss, Biotite gneiss (migmatite), cordierite gneiss, magnetite quartzite and pyroxene granulite. Quaternary formations of fluvial deposit, fluvio marine and paleo marine deposits were found in lower reaches of river [11].

The Meenachil river basin falls within the realm of tropical humid climate and high variations in relief from the west coast to the hilly region of the Western Ghats in the east and proximity to the sea influence the climatic parameters. During 2010 – 2014

period the mean annual temperature of the area is 32.5°C , experiencing average annual rainfall of 3030 mm, while mean humidity is 88.6 percent. The basin experiences both south-west and north-east monsoons. The south-west monsoon sets during June and lasts till August. The north-east monsoon, which is uncertain strikes in October and continues till the end of November.

SAMPLING SCHEME AND METHODOLOGY

River water samples (total no.= 96) were collected in Meenachil river from upstream to downstream for 16 locations (S1-S16) The water samples were collected for pre monsoon (PRM), monsoon (MON) and post monsoon (POM) seasons during 2013 and 2014. The portrait of sampling locations was given in table 1 and figure 2.

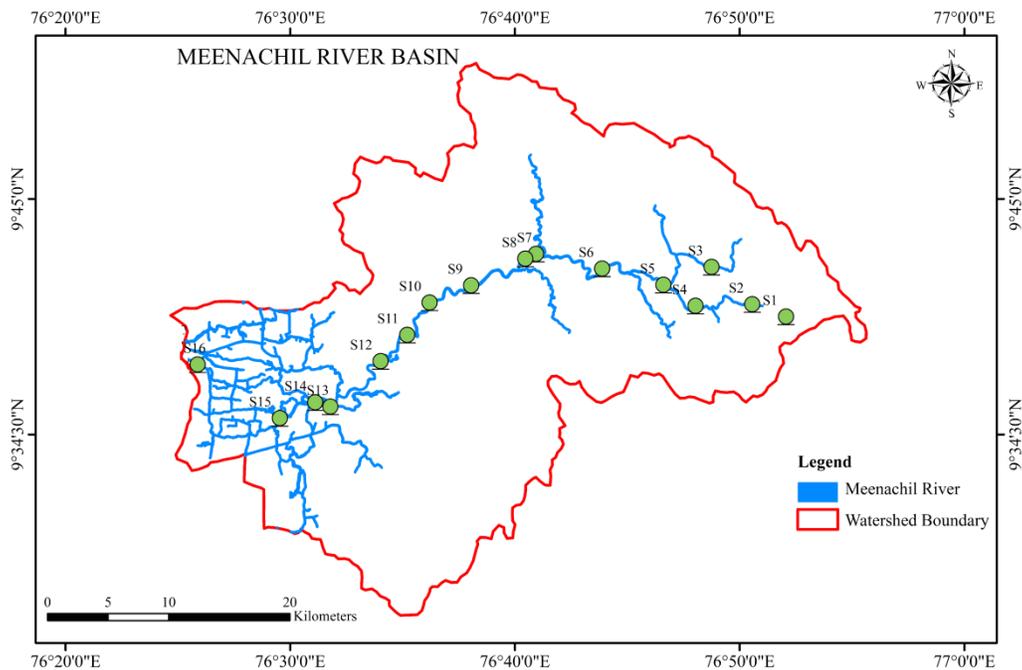


Figure 2. Portrait of Sampling locations

The samples were collected in clean polyethylene bottles kept under dark or below ambient temperature and were analysed using standard procedures [12,13]. The parameters identified include Temperature, pH (Systronics pH meter, 361), TDS, Conductivity (Systronics Conductivity-TDS meter, 308), Total Hardness (TH), Total Solids (TS), Salinity, HCO₃, Fe, PO₄, Si, DO, BOD, NO₂, NO₃, Mg, Ca, SO₄ and Cl. DO was estimated by Winkler’s Iodometric method using MnSO₄ and alkai KI and

titrating against thiosulphate using starch as indicator, while BOD is measured after incubating it for 5 days at 20⁰C. All spectrophotometric analysis were done using Systronics UV-VIS, 118, spectrophotometer while Na and K were determined using Flame Photometer (Elico CL 361) after conducting standard calibration. Chloride concentrations were estimated by employing argentometric titration using standard silver nitrate solution having potassium chromate as indicator.

Table 1. Description of sampling stations

Station No.	Stations	Lat. (N)	Long. (E)	Location remarks
S1	Adivaram	9 ⁰ 39'44.8"	76 ⁰ 52'3.8"	Forest and plantation
S2	Perumkulam	9 ⁰ 40'17.9"	76 ⁰ 50'33.7"	Forest and plantation
S3	Tikkoi	9 ⁰ 41'57.8"	76 ⁰ 48'45.1"	Plantation and Mixed vegetation
S4	Punjar	9 ⁰ 40'13.8"	76 ⁰ 48'2.1"	Plantation and Mixed vegetation
S5	Erattupetta	9 ⁰ 41'9.8"	76 ⁰ 46'36.4"	Plantation and Mixed vegetation
S6	Baranamghanam	9 ⁰ 41'53.2"	76 ⁰ 43'52.9"	Plantation and Mixed vegetation
S7	Pala	9 ⁰ 42'32.5"	76 ⁰ 40'56.3"	Plantation and Mixed vegetation
S8	Kadapattoor	9 ⁰ 42'19.7"	76 ⁰ 40'27.6"	Plantation and Mixed vegetation
S9	Cherpungal	9 ⁰ 41'8.6"	76 ⁰ 38'3.2"	Plantation and Mixed vegetation
S10	Kidangoor	9 ⁰ 40'22.4"	76 ⁰ 36'12.3"	Plantation and Mixed vegetation
S11	Pattarmadom	9 ⁰ 38'56.1"	76 ⁰ 35'12.5"	Plantation and Mixed vegetation
S12	Perror	9 ⁰ 37'45.8"	76 ⁰ 34'1.5"	Plantation and Mixed vegetation
S13	Kottayam Railway Bridge	9 ⁰ 35'44.2"	76 ⁰ 31'47.3"	Plantation, Mixed vegetation and minor industrial area
S14	Chungam	9 ⁰ 35'55.5"	76 ⁰ 31'6.6"	Paddy and Mixed vegetation
S15	Illickal	9 ⁰ 35'13.5"	76 ⁰ 29'32.2"	Paddy and Mixed vegetation
S16	Kavanattinkara	9 ⁰ 37'36.9"	76 ⁰ 25'52.9"	Paddy, river lake interface area

II. RESULTS AND DISCUSSION

a. Spatio-temporal nutrient variability

The water quality analysis of river water conducted for PRM, MON and POM of 2013 and 2014. For the convenience of study, the season wise averaged data for 2013 and 2014 are presented in Figure 3-4 . What follows is a brief summary of the season wise averaged results.

Temperature, TEMP

During PRM, the TEMP ranged from 19.1 to 20.0°C having an averaged value of 19.42°C. But in MON the average TEMP dropped to 19.18°C and then increased to 19.7°C during POM. The mean TEMP values of river water during PRM, MON and POM are 19.42, 19.18 and 19.35 respectively. It was well noted that the narrow range of temperature difference found in the river system might be due to the high runoff phenomenon seen in many tropical rivers.

pH

During PRM, pH values ranged from 6.67 to 7.13, while in MON values ranged from 7.12 to 7.99. However, during POM it ranged between 6.75 and 7.37. The mean pH values of river water during PRM, MON and POM are 6.89, 7.56 and 7.05 respectively. pH is important for acid-base neutralisation, water softening, precipitation, coagulation, disinfections and corrosion control. It tends to increase during day largely due to the photosynthetic activity (consumption of carbon dioxide) and decreases during night due to respiratory activity.

Total Dissolved Solids, TDS

During PRM, TDS values ranged from 32.66 to 682.11 mg/L, while in MON values ranged from 40.45 to 52.83 mg/L. However, during POM it ranged between 44.35 and 326.90 mg/L. The mean TDS values of river water during PRM, MON and POM are 168.18, 47.52 and 91.14 respectively. It has an overall effect on the living creatures like humans, aquatic and terrestrial organisms. Hence, the influence of temperature in weathering process could aid in uplifting TDS values.

Conductivity, COND

During PRM, COND values ranged from 51.02 to 1065.80 $\mu\text{S/cm}$, while in MON values ranged from 63.20 to 82.55 $\mu\text{S/cm}$. However, during POM it ranged between 69.30 and 510.78 $\mu\text{S/cm}$. The mean COND values of river water during PRM, MON and POM are 262.7, 74.2 and 142.4 respectively.

Total Hardness, TH

During PRM, TH ranged from 9.04 to 206.79 mg CaCO_3 , with a mean value of 53.45. The maximum concentrations were observed at S16 (Kavanattinkara). However, during MON, TH has mean value of 18.36, with maximum concentration of 23.49 at S16 station. During POM, TH ranged from 19.49 to 78.61 mg CaCO_3 , having a mean value of 32.3. The maximum value were noted at S16. From these results it was evident that seasonal factors has got much influence in controlling the TH in the river.

Total Solids, TS

During PRM, TS ranged from 0.05 to 0.41 mg/L having a mean value of 0.13. The maximum concentration was observed at S16 (Kavanattinkara). However, during MON, TS has mean value of 0.16, with maximum concentration of 0.41 mg/L at S16 station (Kavanattinkara). During POM, TS ranged from 0.03 to 0.31 mg/L, having a mean value of 0.1. The maximum value was noted at S16. It was observed that TS show highest values in downstream stations, with maximum concentrations were observed during MON, followed by PRM and POM. Results show that monsoon effect could be a factor which aids in elevating TS concentrations in the river.

Salinity, SAL

During PRM, SAL ranged from 0.02 to 0.58 ppt with a mean value of 0.15. The maximum concentration was observed at S16 (Kavanattinkara). However, during MON, SAL has mean value of 0.02, with maximum concentration of 0.03 ppt at S15 (Chungam) and S16 (Kavanattinkara) stations. During POM, SAL ranged from 0.01 to 0.27 ppt (mean= 0.06). The maximum value was noted at S16. It was observed that SAL show highest values in downstream stations, while maximum concentrations were observed during PRM, followed by POM and MON. Results shows that monsoon factor has got vital influence in modifying the SAL concentrations in the river.

Dissolved Oxygen, DO

During PRM, the DO ranged from 6.35 to 7.7 mg/L with a mean value of 7.01. The maximum concentration was observed at S1 (Adivaram). However, during MON, the DO has mean value of 7.19, with maximum concentration of 7.7 mg/L at S1 (Adivaram) and S2 (Perumkulam) stations. During POM, the DO ranged from 6.5 to 7.4 mg/L, having a mean value of 6.98. The maximum value was noted at S1. It was observed that DO show highest values in upstream stations, while maximum concentrations were observed during MON, followed by PRM and POM. Results show that monsoon effect could be a factor which aids in elevating DO concentrations in the river.

Biological Oxygen Demand, BOD

During PRM, the BOD ranged from 0.45 to 1.45 mg/L with a mean value of 0.90. The maximum concentration was observed at S13 (Kottayam Railway bridge) and S16 (Kavanattinkara) stations. However, during MON, BOD has a mean value of 0.58, with maximum concentration of 0.95 mg/L at S16 (Kavanattinkara) station. During POM, the BOD ranged from 0.5 to 1.55 mg/L, having a mean value of 0.85. The maximum value was noted at S13 (Kottayam Railway bridge). It was observed that BOD show highest values in downstream stations, while maximum concentrations were observed during PRM, followed by POM and MON. Results show that monsoon dilution effect could be a factor which helped in lowering BOD concentrations in the river.

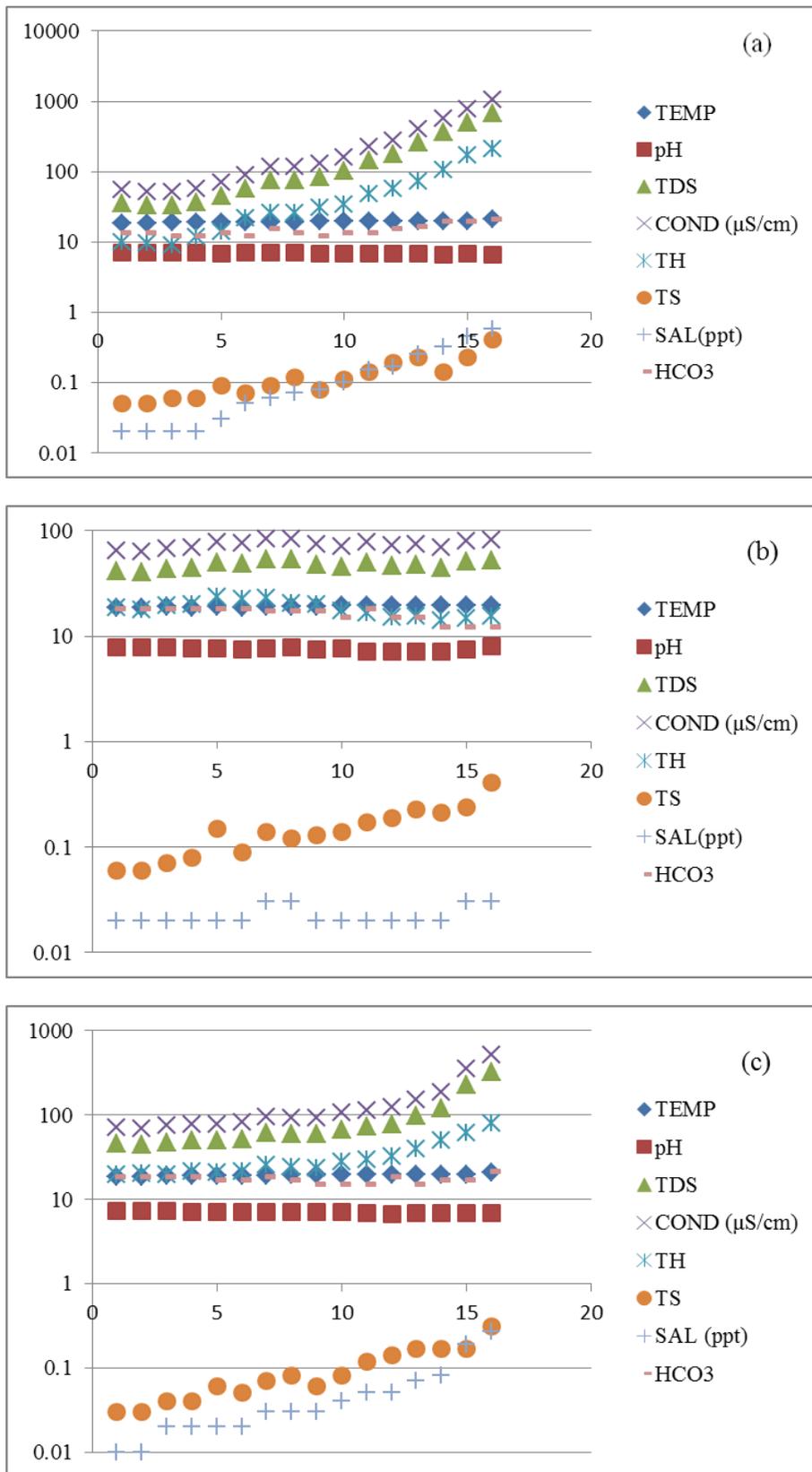


Figure 3. Mean values of River water parameters during (a) PRM (b) MON and (c) POM

Bicarbonate, HCO_3^-

During PRM, HCO_3^- ranged from 12.20 to 21.35 mg/L with a mean value of 14.97. The maximum concentration was observed at S16 (Kavanattinkkara). However, during MON, HCO_3^- has a mean value of 16.44, with maximum concentration of 18.3 mg/L in upstream stations (S1-S6). During POM, HCO_3^- ranged from 15.25 to 21.35 mg/L, with a mean value of 17.25. The maximum value was noted at S16. It was observed that HCO_3^- show an erratic trend from upstream to downstream, while maximum concentrations were observed during MON, followed by POM and PRM. Results show that monsoon effect could be a factor which aids in elevating HCO_3^- concentrations in the river.

Phosphate, PO_4

During PRM, PO_4 ranged from 0.01 to 0.12 mg/L and having a mean value of 0.04. The maximum concentration was observed at S16 (Kavanattinkkara), the river mouth station. It was noted that PO_4 show an erratic trend from upstream to downstream with more fluctuations were evident in downstream stations. This could be due to the extensive agricultural practices prevailing in the downstream reaches of river basin. However, during MON, PO_4 has a mean value of 0.06, with maximum concentration of 0.18 mg/L at S16 station. It was observed that MON showed maximum concentrations of PO_4 in most stations. Runoff from agricultural lands and rubber plantation area could be the prominent source for this phenomenon. POM also show a similar pattern as that of PRM with a mean PO_4 value of 0.04 and a maximum concentration of 0.15 mg/L at S16.

Silicate, SiO_2

During PRM, SiO_2 ranged from 0.95 to 3.99 mg/L with a mean value of 1.84. The maximum concentrations were observed at S12 (Peroor). However, during MON, SiO_2 has mean value of 1.94, with maximum concentration of 3.75 mg/L at S12 station. During POM, SiO_2 ranged from 0.07 to 0.54 mg/L, having a mean value of 0.17. The maximum value were noted at S12. It was noted that maximum availability of SiO_2 was observed in midstream stations during PRM and MON. From these results it was evident that seasonal factors has got much influence in controlling the silica concentrations in the river.

Nitrite, NO_2

During PRM, NO_2 ranged from 0.02 to 0.08 mg/L with a mean value of 0.05. The maximum concentration was observed at S16 (Kavanattinkkara). However, during MON, NO_2 has a mean value of 0.04, with maximum concentration of 0.09 mg/L at S16 station. During POM, NO_2 ranged from 0.03 to 0.06 mg/L, with a mean value of 0.05. The maximum value was noted at S5, S7, S11, S13 and S16. It was observed that NO_2 show an erratic trend from upstream to downstream and maximum concentrations were noted during PRM and POM. Results show that monsoon factor has got much influence in regulating the NO_2 concentrations in the river.

Nitrate, NO_3

During PRM, NO_3 ranged from 0.03 to 0.93 mg/L having a mean value of 0.21. The maximum concentration was at S16 (Kavanattinkkara). However, during MON, NO_3 has mean value

of 0.09, with maximum concentration of 0.29 mg/L at S16 station. During POM, NO_3 ranged from 0.08 to 0.73 mg/L, having a mean value of 0.40. The maximum value was noted at S14 (Chungam). It was observed that NO_3 show an erratic trend, while downstream stations show maximum concentrations during PRM and POM. Results show that monsoon factor has got much influence in regulating the NO_3 concentrations in the river. The change in landuse and land cover particularly the increase in Rubber plantation in the highland and midland did not increase the NO_3 in water. However, in the lowland region, the mixed crops, paddy and coconut can contribute NO_3 into the river .

Iron, Fe

During PRM, the content of Fe ranged from 0.04 to 0.22 mg/L with a mean value of 0.07. The maximum concentration was observed at S5 (Erattupetta). However, during MON, Fe has a mean value of 0.03, with maximum concentration of 0.06 mg/L at S5 station. During POM, Fe ranged from 0.02 to 0.08 mg/L (mean = 0.04). The maximum value was noted at S5. It was observed that Fe show highest values in a particular station especially at S5 Erattupetta which is supposed to be of geogenic source. Results show that Fe is not supposed to be a contamination factor in the Meenachil river .

Magnesium, Mg

During PRM, Mg ranged from 0.38 to 34.80 mg/L having a mean value of 6.6. The maximum concentration was observed at S16 (Kavanattinkkara). However, during MON, Mg has a mean value of 1.09, with maximum concentration of 1.80 mg/L at S16 station. During POM, Mg ranged from 0.79 to 11.92 mg/L, having a mean value of 3.18. The maximum value was noted at S16. It was observed that Mg show highest values in downstream stations, while maximum concentrations were observed during PRM, followed by POM and MON. Results shows that monsoon factor has got vital influence in modifying the Mg concentrations in the river.

Calcium, Ca

During PRM, Ca ranged from 3.00 to 25.43 mg/L having a mean value of 10.52. The maximum concentration was observed at S16 (Kavanattinkkara). However, during MON, Ca has a mean value of 5.56, with maximum concentration of 7.35 mg/L at S5 (Erattupetta). During POM, Ca ranged from 6.31 to 11.83 mg/L, with a mean value of 7.68. The maximum value was noted at S16. It was observed that Ca show an erratic trend, while maximum concentrations were noted during PRM and POM. Results highlight that Ca show maximum availability during PRM, followed by POM and MON.

Sulphate, SO_4

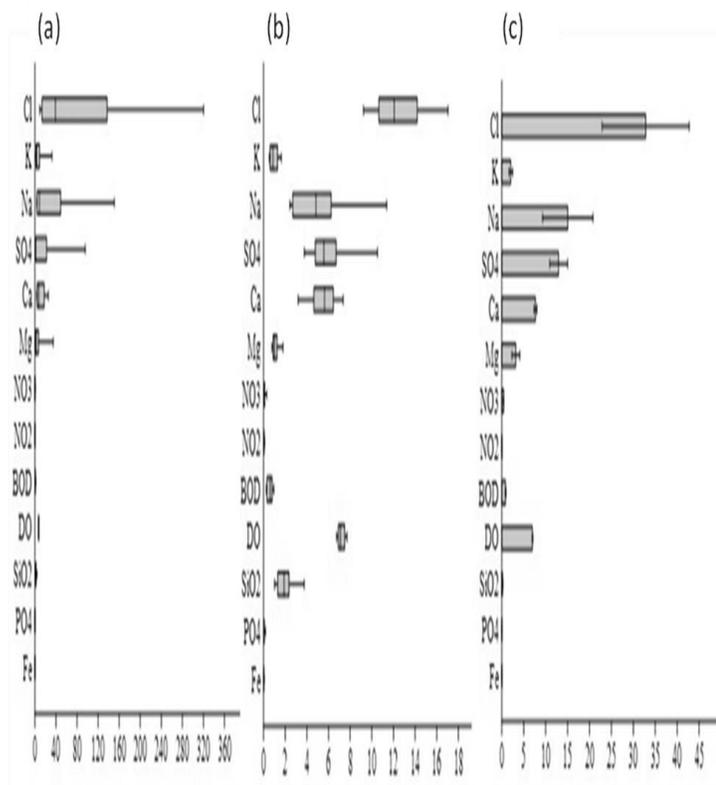
During PRM, SO_4 ranged from 0.81 to 95.53 mg/L with a mean value of 14.87. The maximum concentration was at S16 (Kavanattinkkara). However, during MON, SO_4 has mean value of 6.10, with maximum concentration of 10.52 mg/L S16. During POM, SO_4 ranged from 7.33 to 36.21 mg/L, having a mean value of 12.96. The maximum value were noted at S16. It was noted that maximum availability of SO_4 was observed in downstream stations during PRM and POM. From these results it

was evident that seasonal factors have got much influence in controlling the SO₄ concentrations in the river.

Sodium, Na

During PRM, the Na ranged from 3.21 to 150.70 mg/L with a mean value of 29.01. The maximum concentration was observed at S16 (Kavanattinkkara). However, during MON, Na has mean value of 5.24, with maximum concentration of 11.38 mg/L at S16. During POM, it ranged from 3.25 to 87.78 mg/L (mean= 15.04). The maximum value was noted at S16. It was noted that maximum availability of Na was observed in downstream stations during PRM and POM. From these results it was evident that dominance of lake water has got much influence in controlling the Na concentrations in the river water in downstream stations especially at S14, S15 and 16.

Figure 4. Mean values of River water nutrients during (a) PRM (b) MON and (c) POM



Potassium, K

During PRM, the content of K ranged from 1.40 to 32.26 mg/L having a mean value of 7.39. The maximum concentration was at S16 (i.e., Kavanattinkkara). However, during MON, the K has mean value of 0.97, with maximum concentration of 1.63 mg/L at S16. During POM, it ranged from 0.80 to 6.44 mg/L, having a mean value of 2.04. Again, the maximum value was noted at S16. It was noted that maximum availability of K was observed in downstream stations during PRM and POM. From these results it was evident that similar to Na, the dominance of lake water has got much influence in controlling the K concentrations in the river water especially in downstream stations.

Chloride, Cl

During PRM, Cl ranged from 9.23 to 320.21 mg/L having a mean value of 82.98. The maximum concentration was registered at S16 (i.e., Kavanattinkkara). However, during MON, Cl has a mean value of 12.68, with maximum concentration of 17.04 mg/L at S7 (Pala). During POM, Cl ranged from 7.10 to 151.23 mg/L, having a mean value of 32.82. The maximum value were noted at S16. It was noted that maximum availability of Cl was observed in downstream stations during PRM and POM. From these results, it was evident that dominance of lake water has got much influence in controlling the Cl concentrations in the river water in downstream station during PRM.

b. Correlation Analysis

During PRM (Table 2), it was noted that temperature (TEMP) plays an important role in defining the water quality structure of Meenachil river mainly owing to its good correlation with various hydrochemical parameters. Significant positive correlation was observed between TEMP and other parameters like TDS (0.86), conductivity-COND (0.86), total hardness-TH (0.85), TS (0.87), salinity-SAL (0.89), HCO₃ (0.81), Ca (0.95), Na (0.82), Cl (0.89). Meanwhile, negative correlation of TEMP with pH and DO is also of vital importance. TDS, COND, TH and TS show good positive correlations with various cations and anions like Mg, Ca, Na, K, SO₄ and Cl. However, parameters like Fe and DO do not show significant positive correlation with other ionic groups. Significant correlation among Mg, Ca, Na, K, SO₄ and Cl were noticed during this PRM season.

A completely varied water quality scenario with respect to PRM was noticed from correlation matrix of MON (Table 3). No significant positive correlation was observed here owing to the monsoon impact mainly due to dilution effect occurring in the riverine system. However, some fundamental correlations were noted between TDS and SAL (0.75), Mg (0.62), and Cl (0.93). Existence of positive correlation between Na with TS (0.89), PO₄ (0.90), SO₄ (0.91) and K (0.89) were also noted.

During POM, correlation matrix (Table 4) depicts the existence of positive correlation between TDS and TH (0.97), TS (0.90), SAL (0.99), PO₄ (0.97), Mg (0.95), SO₄ (0.98), Na (0.99), K (0.96) and Cl (0.99). Similarly significant correlation of TS with PO₄ (0.90), NO₃ (0.81), Mg (0.93), SO₄ (0.94), K (0.89) and Cl (0.90) were also noted. Significant positive correlation among Mg, Ca, Na, K, SO₄ and Cl which were prevalent in PRM was also observed in POM season.

Table 2. Correlation matrix of water quality parameters during Pre Monsoon

	TEMP	pH	TDS	COND	TH	TS	SAL	HCO ₃	Fe	PO ₄	Si	DO	BOD	NO ₂	NO ₃	Mg	Ca	SO ₄	Na	K	Cl
TEMP	1																				
pH	-919**	1																			
TDS	.856**	-.821**	1																		
COND	.856**	-.821**	.996**	1																	
TH	.853**	-.818**	.995**	.995**	1																
TS	.869**	-.793**	.925**	.925**	.908**	1															
SAL	.886**	-.846**	.997**	.997**	.995**	.925**	1														
HCO ₃	.808**	-.801**	.938**	.938**	.927**	.826**	.935**	1													
Fe	.022	-.114	-.126	-.126	-.149	.006	-.110	-.097	1												
PO ₄	.659**	-.675**	.758**	.758**	.714**	.867**	.741**	.660**	.238	1											
Si	.666**	-.613**	.297	.297	.291	.489	.345	.331	.224	.358	1										
DO	-.608**	.751**	-.484	-.484	-.478	-.506**	-.516**	-.462	-.654**	-.569**	-.541**	1									
BOD	.758**	-.721**	.665**	.665**	.638**	.767**	.685**	.603**	.379	.705**	.532**	-.621**	1								
NO ₂	.503*	-.399	.521*	.521*	.475	.607**	.517*	.501*	.270	.533*	.181	-.334	.535*	1							
NO ₃	.623**	-.542**	.663**	.663**	.631**	.799**	.660**	.539*	.268	.748**	.358	-.465	.842**	.715**	1						
Mg	.782**	-.746**	.982**	.982**	.990**	.884**	.973**	.905**	-.181	.702**	.185	-.407	.577**	.449	.609*	1					
Ca	.950**	-.918**	.949**	.949**	.947**	.892**	.968**	.908**	-.065	.687**	.508**	-.602*	.727**	.497**	.633**	.892**	1				
SO ₄	.759**	-.728**	.984**	.984**	.976**	.898**	.968**	.913**	-.155	.767**	.154	-.399	.598**	.511*	.644**	.986**	.878**	1			
Na	.822**	-.782**	.993**	.993**	.979**	.933**	.982**	.924**	-.122	.801**	.256	-.449	.661**	.559**	.696**	.973**	.917**	.991**	1		
K	.793**	-.775**	.988**	.988**	.990**	.874**	.980**	.926**	-.165	.714**	.175	-.434	.587**	.468	.597**	.994**	.907**	.990**	.980**	1	
Cl	.887**	-.850**	.997**	.997**	.995**	.924**	1.000**	.937**	-.114	.738**	.349	-.516**	.683**	.513**	.657**	.973**	.969**	.966**	.981**	.979**	1

Table 3. Correlation matrix of water quality parameters during Monsoon

	TEMP	pH	TDS	COND	TH	TS	SAL	HCO ₃	Fe	PO ₄	Si	DO	BOD	NO ₂	NO ₃	Mg	Ca	SO ₄	Na	K	Cl
TEMP	1																				
pH	-.667**	1																			
TDS	.445	.003	1																		
COND	.445	.003	.996**	1																	
TH	-.627**	.479	.210	.210	1																
TS	.684**	-.173	.533*	.533*	-.569*	1															
SAL	.216	.330	.748**	.747**	-.001	.480	1														
HCO ₃	-.652**	.298	-.234	-.234	.750**	-.819**	-.395	1													
Fe	.196	-.215	.144	.144	.050	.224	-.118	-.135	1												
PO ₄	.483	.112	.482	.482	-.496	.895**	.612*	-.797**	-.068	1											
Si	.701**	-.519*	.519*	.519*	-.225	.418	.215	-.233	.387	.156	1										
DO	-.968**	.695**	-.532*	-.532*	.546*	-.663**	-.271	.654**	-.209	-.480	-.736**	1									
BOD	.929**	-.486	.560*	.560*	-.554*	.807**	.319	-.639**	.165	.650**	.571*	-.888**	1								
NO ₂	.462	-.109	.227	.227	-.515*	.780**	.152	-.524*	.154	.669**	.151	-.378	.690**	1							
NO ₃	.217	.201	.435	.435	-.196	.759**	.462	-.455	.193	.712**	.258	-.191	.408	.676**	1						
Mg	.061	.353	.616*	.616*	-.002	.630*	.766**	-.526*	.048	.767**	-.029	-.143	.246	.304	.638**	1					
Ca	-.605*	.316	-.032	-.032	.930**	-.761**	-.283	.890**	.028	-.742**	-.199	.560*	-.606*	-.591*	-.417	-.369	1				
SO ₄	.476	-.079	.534*	.534*	-.397	.844**	.558*	-.845**	.177	.872**	.190	-.544*	.570*	.473	.840**	-.677**	.912**	1			
Na	.691**	-.235	.470	.471	-.663**	.898**	.566*	-.939**	.049	.902**	.282	-.708**	.756**	.593*	.527*	.669**	-.862**	-.862**	.912**	1	
K	.851**	-.410	.503*	.503*	-.689**	.875**	.482	-.820**	.077	.770**	.504*	-.815**	.890**	.691**	.563*	.417	-.794**	-.697**	.886**	.886**	1
Cl	-.539*	-.043	.932**	.932**	-.066	.528*	.796**	-.317	.071	.462	.512*	-.586*	.617*	.269	.393	.498**	-.123	.450	-.504*	-.604*	-.604*

Table 4. Correlation matrix of water quality parameters during Post Monsoon

	TEMP	pH	TDS	COND	TH	TS	SAL	HCO ₃	Fe	PO ₄	Si	DO	BOD	NO ₂	NO ₃	Mg	Ca	SO ₄	Na	K	Cl	
TEMP	1																					
pH		1																				
TDS			1																			
COND				1																		
TH					1																	
TS						1																
SAL							1															
HCO ₃								1														
Fe									1													
PO ₄										1												
Si											1											
DO												1										
BOD													1									
NO ₂														1								
NO ₃															1							
Mg																1						
Ca																	1					
SO ₄																		1				
Na																			1			
K																				1		
Cl																					1	

c. Factor Analysis (FA)

The FA result of combined data set for PRM reveals the principal component factors determining the quality of water in the river. The result (Table 5) illustrate three principal components viz., factor 1 (F1) explaining a % variance of 69.85, factor 2 (F2) (12.99) and factor 3 (F3) (6.73) respectively. From the loading chart it was quiet evident that F1 comprise of different parameters mainly TEMP, TH, SAL, Mg, Ca, SO₄, Na, K, Cl and HCO₃, signifying weathering and saline water ingress, while F2 include mainly due to TEMP and Si indicating strong influence of weathering process, and F3 highlights anthropogenic pollution mainly due to strong positive loading of Fe, PO₄, BOD, NO₂ and NO₃ along with negative loading for pH and DO.

The FA analysis for MON reveals the principal component factors determining the quality of water in the river. The result (Table 6) illustrate four principal components, viz., F1 explaining a % variance of 53.20, F2 (15.07), F3 (11.04) and F4 (7.37) respectively. From the F1 loading it is interpreted that negative loading for pH, TH, HCO₃, DO, Ca and positive loading of NO₂, PO₄, Na and K indicate role of agricultural runoff in determining the water quality of river system. The F2 explained 15.07% of variance indicate minor role of weathering process with positive loading of Si, BOD and Cl. The F3 factor explains the combined effect of SAL, Mg, and Cl, while F4 explain the effect of Fe and NO₃ in modifying the riverine environment.

During POM (Table 7), F1 loading for TH, SAL, PO₄, Mg, Ca, SO₄, Na, K and Cl explaining 67.89% variance depicts influence of agricultural as well as anthropogenic activity on the river system. F2 which explained 12.30% of variance mainly attribute to TEMP, Si, and BOD indicating role of weathering process in modifying the water quality. F3 explaining 7.78 % of variance is mainly from Fe and NO₂ and negative loading of PO₄ along with DO indicating role of instream biological process in riverine processes.

Table 5. Principal Component factors using PCA during Pre Monsoon

	Rotated Component Matrix ^a		
	Component		
	1	2	3
TEMP	0.734	0.592	0.192
pH	-0.682	-0.66	-0.175
TH	0.951	0.214	0.191
SAL	0.934	0.265	0.229
Fe	-0.42	0.413	0.7
PO ₄	0.597	0.258	0.57
Si	0.12	0.885	0.049
DO	-0.216	-0.736	-0.452
BOD	0.448	0.494	0.601
NO ₂	0.378	-0.01	0.744
NO ₃	0.481	0.178	0.747
Mg	0.961	0.102	0.188

Ca	0.859	0.453	0.181
SO ₄	0.953	0.055	0.267
Na	0.939	0.142	0.3
K	0.963	0.115	0.198
Cl	0.935	0.27	0.223
HCO ₃	0.891	0.249	0.173
Total	12.57	2.34	1.21
% of Variance	69.85	12.99	6.73

Table 6. Principal Component factors using PCA during Monsoon

Rotated Component Matrix ^a				
	Component			
	1	2	3	4
TEMP	0.529	0.767	0.003	0.017
pH	-0.372	-0.55	0.554	-0.106
TH	-0.914	-0.181	0.223	-0.022
SAL	0.108	0.24	0.888	-0.045
HCO ₃	-0.86	-0.258	-0.288	-0.141
Fe	-0.094	0.352	-0.057	0.767
PO ₄	0.689	0.36	0.539	0.083
Si	0.009	0.835	0.071	0.301
DO	-0.427	-0.885	-0.004	-0.079
BOD	0.455	0.818	0.159	0.181
NO ₂	0.563	0.192	0.02	0.548
NO ₃	0.301	-0.005	0.307	0.778
Mg	0.22	-0.091	0.894	0.241
Ca	-0.939	-0.124	-0.185	-0.084
SO ₄	0.551	0.305	0.588	0.283
Na	0.72	0.555	0.37	0.145
K	0.641	0.645	0.205	0.22
Cl	-0.034	0.752	0.608	0.062
Total	9.576	2.712	1.987	1.326
% of Variance	53.202	15.069	11.037	7.366

Table 7. Principal Component factors using PCA during Post Monsoon

Rotated Component Matrix ^a			
	Component		
	1	2	3
TEMP	0.299	0.856	0.151
pH	-0.514	-0.8	-0.196

TH	0.935	0.275	0.156
SAL	0.913	0.38	0.091
HCO ₃	0.305	-0.628	0.375
Fe	-0.101	0.074	0.891
PO ₄	0.889	0.312	-0.061
Si	0.354	0.77	0.17
DO	-0.672	-0.578	-0.305
BOD	0.459	0.778	0.305
NO ₂	0.403	0.425	0.694
NO ₃	0.495	0.529	0.478
Mg	0.875	0.414	0.133
Ca	0.869	0.07	0.186
SO ₄	0.948	0.179	0.184
Na	0.975	0.179	0.067
K	0.941	0.235	0.132
Cl	0.927	0.35	0.076
Total	12.219	2.214	1.401
% of Variance	67.885	12.301	7.783

d. Cluster Analysis (CA)

Cluster analysis conducted for PRM (Fig.5) reveals the influence of topography and climatic influence which affect the water quality of river system. It was noted that during PRM stations 1-10 forms a cluster while 11- 15 forms another separate cluster strictly depicting a separation for stations between pollution sources . Similarly river mouth station 16 forms separate cluster indicating dominance of saline water ingress in that station. From the factor analysis it was inferred that influence of Mg, SO₄ and Cl plays a vital role in making a vast separate cluster pattern in low land stations.

While during MON cluster formation (Fig.6) strictly showed diverse patterns mainly owing to SW monsoon effect. Here small sub clusters were evident mainly due to point and non point source of pollution. Cluster formation at upland stations 1-6 indicate less pollution as compared with other clustered stations. Dominance of monsoon water in river mouth station was also highlighted here owing to the cluster formation (station 15 and 16).

Here in POM (Fig.7) also similar cluster formation as that of MON period was noticed and the availability of NE monsoon was also evident from the result. In the downstream stations (15 and 16) apart from this the closure of Thanneermukkom bund also has enormous impact in controlling the saline water intrusion. Similarly the effect of liming of agricultural land in this season also has much influence in controlling the river water chemistry in the lowland stations.

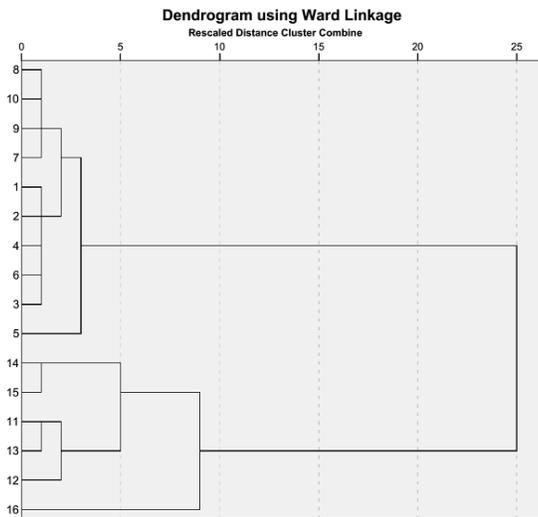


Figure 5. Dendrogram of HCA for different stations during PRM

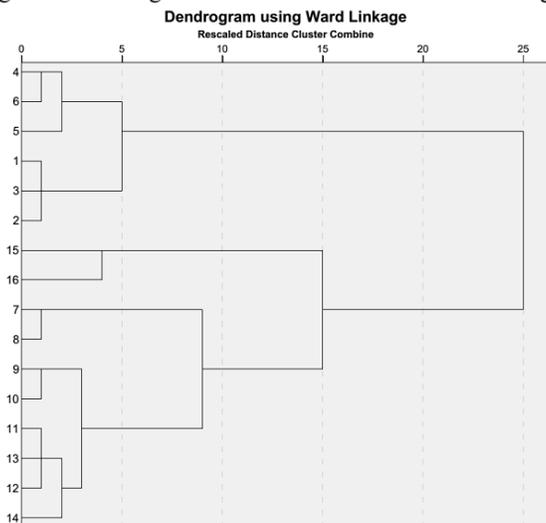


Figure 6. Dendrogram of HCA for different stations during MON

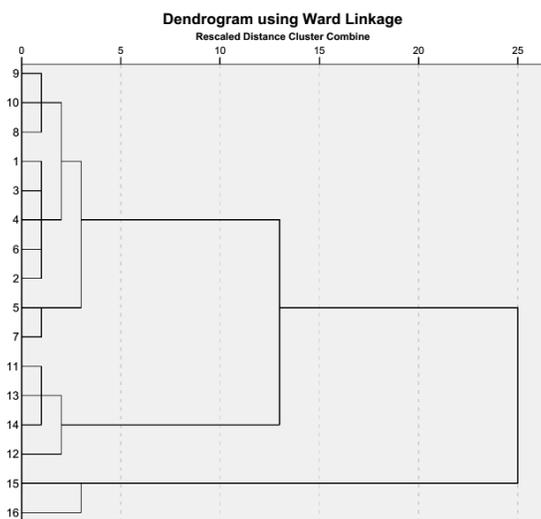


Figure 7. Dendrogram of HCA for different stations during POM

III. SUMMARY

From the study, it has been found that irrespective of seasons most of the parameters in most of the stations (except downstream S15, S16) are within permissible range for drinking purpose. River water parameters like BOD, DO, NO₂, NO₃, HCO₃, PO₄, SiO₂, and Ca, show an erratic trend with maximum contents towards the downstream side. The nutrients like NO₃, PO₄ (<1 mg/L) and SiO₂ (<4 mg/L) are generally low in the river, and increases from upstream to downstream due to the input from the agricultural field and from other sources.

The cations in the decreasing order of abundance include Na> Ca> K> Mg> Fe for PRM, Ca> Na> Mg> K> Fe for MON and Na> Ca> Mg> K> Fe for POM. Similarly, the anions in the decreasing order of abundance include Cl>HCO₃>SO₄>SiO₂>NO₃>NO₂>PO₄ during PRM, HCO₃> Cl> SO₄> SiO₂> NO₃> PO₄> NO₂ during MON and Cl> HCO₃> SO₄> NO₃> SiO₂> NO₂> PO₄ during POM.

The factor analysis result during PRM clearly indicating the role of temperature in weathering process and hence the water quality in the river system. F1 loading during MON indicate role of agricultural runoff in determining the water quality of river system. During POM, F1 loading depicts influence of agricultural as well as anthropogenic activity on the river system. Similarly, in cluster analysis, three separate clusters were getting for each of the three seasons. Generally, the stations in the highland and a part of midland (e.g., S1-S10) form one cluster, the stations from midland to lowland (e.g., S11-S14) another cluster and the stations in the downstream side (S15 & 16) form a third cluster in different seasons. However, during PRM, river mouth station S16 alone forms a separate cluster indicating dominance of saline water ingress in that station. While in POM the effect of liming of agricultural land in this watershed also has much influence in controlling the river water chemistry in the lowland stations especially S14, S15 and S16.

IV. CONCLUSION

A comprehensive river basin management strategy should be implemented in Meenachil river, especially toward downstream locations where rampant low land agricultural system prevails. Liming of agricultural lands and application of fertilisers should be in accordance with best agricultural management practices. Scientific execution regarding closure and opening of Thanneermukkom barrier has got pronounced effect in controlling salt water ingress in lower reaches of river basin.

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A Single Image Haze Removal Algorithm Using Color Attenuation Prior

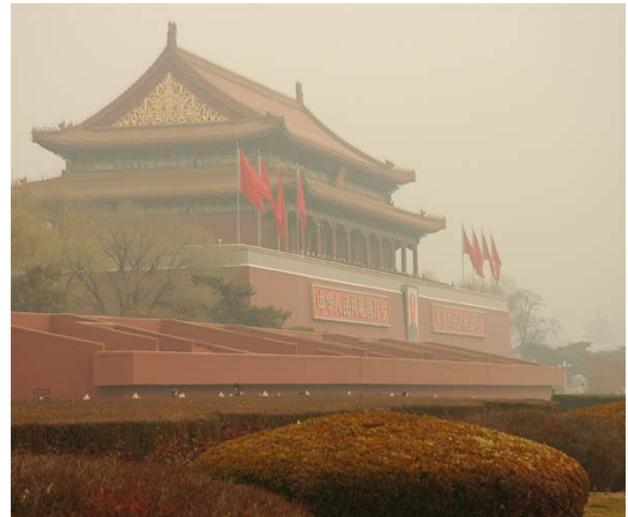
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Abstract- Single image haze removal has been a challenging problem due to its ill-posed nature. In this paper, we propose a simple but powerful color attenuation prior for haze removal from a single input hazy image. By creating a linear model for modeling the scene depth of the hazy image under this novel prior and learning the parameters of the model with a supervised learning method, the depth information can be well recovered. With the depth map of the hazy image, we can easily estimate the transmission and restore the scene radiance via the atmospheric scattering model, and thus effectively remove the haze from a single image. Experimental results show that the proposed approach outperforms state-of-the-art haze removal algorithms in terms of both efficiency and the dehazing effect.

Index Terms- Dehazing, defog, image restoration, depth restoration.



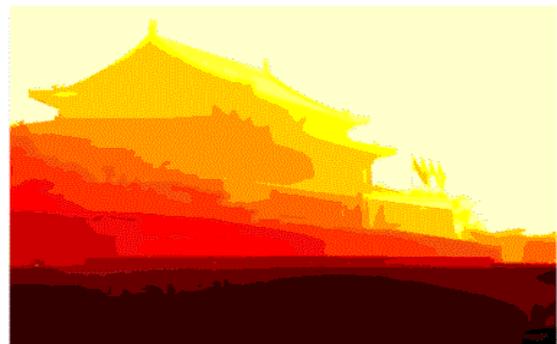
a)

I. INTRODUCTION

Outdoor images taken in bad weather (e.g., foggy or hazy) usually lose contrast and fidelity, resulting from the fact that light is absorbed and scattered by the turbid medium such as particles and water droplets in the atmosphere during the process of propagation. Moreover, most automatic systems, which strongly depend on the definition of the input images, fail to work normally caused by the degraded images. Therefore, improving the technique of image haze removal will benefit many image understanding and computer vision applications such as aerial imagery [1], image classification [2]– [5], image/video retrieval [6]– [8], remote sensing [9]–[11] and video analysis and recognition [12]–[14].

Since concentration of the haze is different from place to place and it is hard to detect in a hazy image, image dehazing is thus a challenging task. Early researchers use the traditional techniques of image processing to remove the haze from a single image (for instance, histogram-based dehazing methods [15]– [17]). However, the dehazing effect is limited, because a single hazy image can hardly provide much information. Later, researchers try to improve the dehazing performance with multiple images. In [18]– [20], polarization-based methods are used for dehazing with multiple images which are taken with different degrees of polarization.

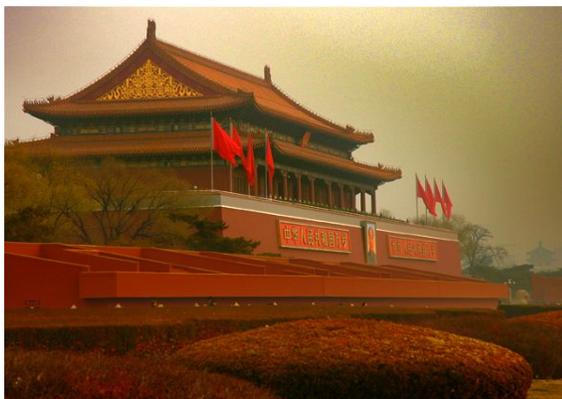
Recently, significant progress has been made in single image dehazing based on the physical model. Under the assumption that the local contrast of the haze-free image is much higher than that in the hazy image.



b)



c)



d)

Fig.1 An overview of the proposed dehazing method. a) Input hazy image. b) Restored depth map. c) Restored transmission map. d) Dehazed image.

In this paper, we propose a novel color attenuation prior for single image dehazing. This simple and powerful prior can help to create a linear model for the scene depth of the hazy image. By learning the parameters of the linear model with a supervised learning method, the bridge between the hazy image and its corresponding depth map is built effectively. With the recovered depth information, we can easily remove the haze from a single hazy image. An overview of the proposed dehazing method is shown in Figure 1. The efficiency of this dehazing method is dramatically high and the dehazing effectiveness is also superior to that of prevailing dehazing algorithms.

II. COLOR ATTENUATION PRIOR

To detect or remove the haze from a single image is a challenging task in computer vision, because little information about the scene structure is available. In spite of this, the human brain can quickly identify the hazy area from the natural scenery without any additional information. This inspired us to conduct a large number of experiments on various hazy images to find the statistics and seek a new prior for single image dehazing. Interestingly, we find that the brightness and the saturation of pixels in a hazy image vary sharply along with the change of the haze concentration.

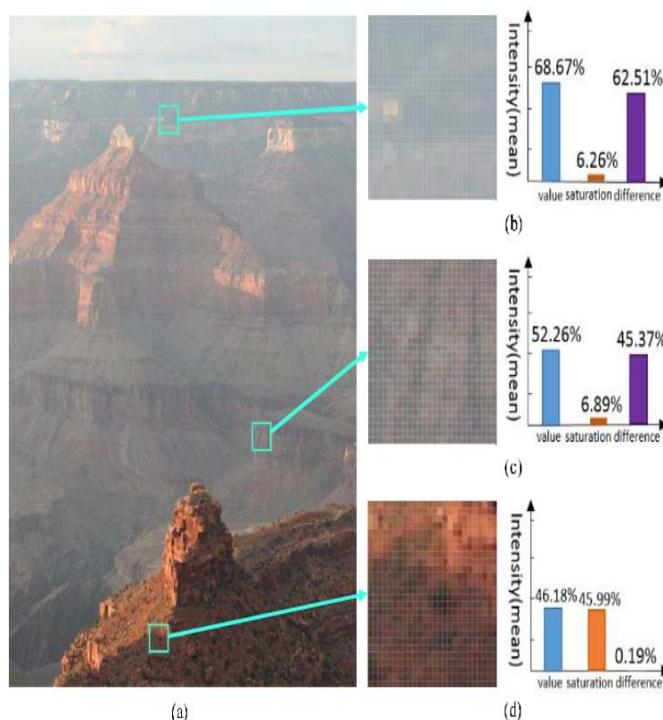


Fig. 2. The concentration of the haze is positively correlated with the difference between the brightness and the saturation. (a) A hazy image. (b) The close-up patch of a dense-haze region and its histogram. (c) The close-up patch of a moderately hazy region and its histogram. (d) The close-up patch of a haze-free region and its histogram.

Figure 2 gives an example with a natural scene to show how the brightness and the saturation of pixels vary within a hazy image. As illustrated in Figure 2(d), in a haze-free region, the saturation of the scene is pretty high, the brightness is moderate and the difference between the brightness and the saturation is close to zero. But it is observed from Figure 2(c) that the saturation of the patch decreases sharply while the color of the scene fades under the influence of the haze, and the brightness increases at the same time producing the high value of the difference. Furthermore, Figure 2(b) shows that in a dense-haze region, it is more difficult for us to recognize the inherent color of the scene, and the difference is even higher than that in Figure 2(c). It seems that the three properties (the brightness, the saturation and the difference) are prone to vary regularly in a single hazy image.

III. HAZE REMOVAL ON IMAGE

The block diagram for haze removal of image. Here the input of image is in the form of haze. Then the dehazing applied two different methods. First approach is pre compression; it means the dehazing technique applied after compression. Dehazing techniques are color attenuation prior Then the result applied to compression standards for image in JPEG. The post compression is first input image applied to dehazing techniques before compression. The ringing and blocking artifacts can be reduced by choosing a lower level of compression. They may be eliminated by saving an image using a lossless file format. So,

the pre compression is gives better performance and fewer artifacts than the post compression.

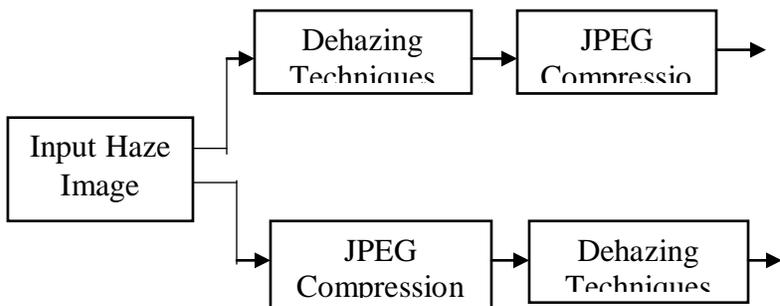


Fig. 3 Block diagram for Haze removal.

IV. SCENE DEPTH RESTORATION

In the Figure 4 illustrates the imaging process. In the haze-free condition, the scene element reflects the energy that is from the illumination source (e.g., direct sunlight, diffuse skylight and light reflected by the ground), and little energy is lost when it reaches the imaging system. The imaging system collects the incoming energy reflected from the scene element and focuses it onto the image plane. Without the influence of the haze, outdoor images are usually with vivid color (see Figure 4(a)). In hazy weather, in contrast, the situation becomes more complex (see Figure 3(b)). There are two mechanisms (the direct attenuation and the airlight) in imaging under hazy weather. On one hand, the direct attenuation caused by the reduction in reflected energy leads to low intensity of the brightness. It reveals the fact that the intensity of the pixels within the image will decrease in a multiplicative manner.

So it turns out that the brightness tends to decrease under the influence of the direct attenuation. On the other hand, the white or gray airlight, which is formed by the scattering of the environmental illumination, enhances the brightness and reduces the saturation. It can be deduced from this term that the effect of the white or gray airlight on the observed values is additive. Thus, caused by the airlight, the brightness is increased while the saturation is decreased.

Since the airlight plays a more important role in most cases, hazy regions in the image are characterized by high brightness and low saturation. This allows us to utilize the difference between the brightness and the saturation to estimate the concentration of the haze.

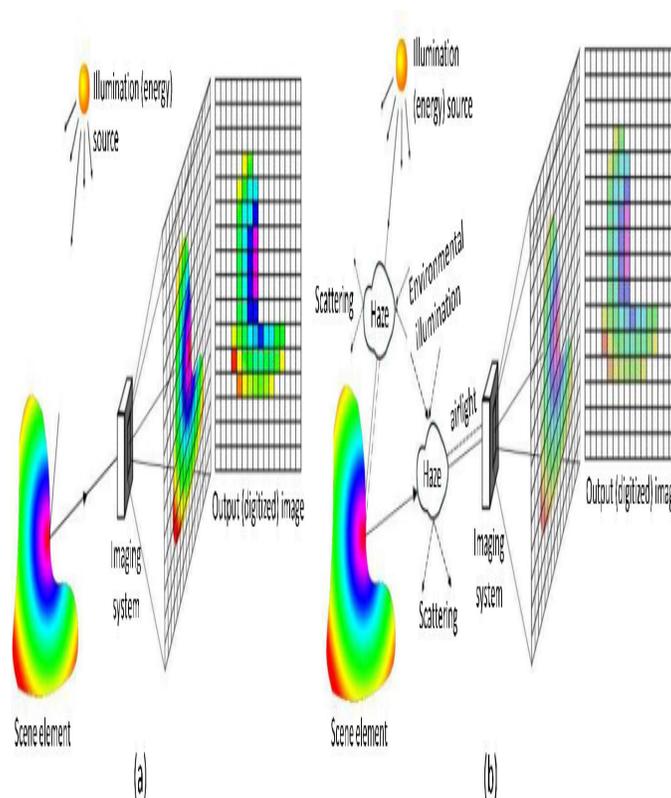


Fig. 4 The process of imaging under different weather conditions. (a) The process of imaging in sunny weather. (b) The process of imaging in hazy weather.

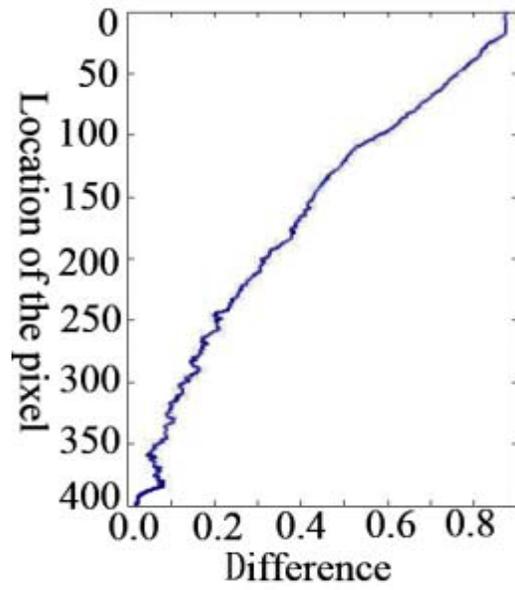
In Figure 5, The difference increases along with the concentration of the haze in a hazy image, Since the concentration of the haze increases along with the change of the scene depth in general, we can make an assumption that the depth of the scene is positively correlated with the concentration of the haze.



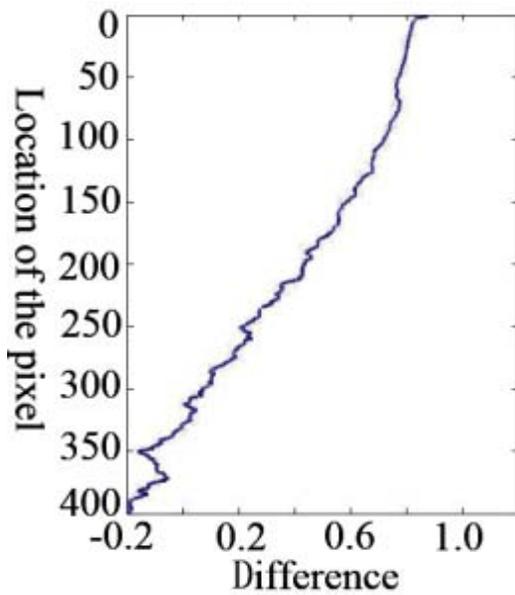
a)



b)



d)



c)

Fig. 5 Difference between brightness and saturation increases along with the concentration of the haze. (a) and (b) A hazy image. (c) and (d) Difference between brightness and saturation.

I. Experimental results

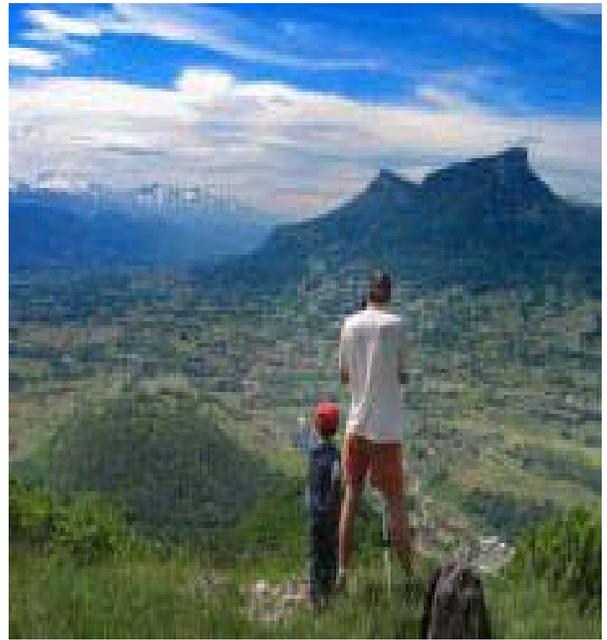
In figure 6, there are different types of Haze images. The input haze images are first applied the dehazing techniques after applying the JPEG compression now we get pre compressed dehaze image and the input haze images are applied the JPEG compression after that applying the dehazing techniques now we get post compressed dehazeimage(output image).



a)



b)



d)



c)



e)



f)

Fig. 6 Difference between the (a), (c) and (e) A hazy image (Input image). (b), (d) and (f) A dehaze image (Output image)

V. CONCLUSION

In this paper, we have proposed a novel linear color attenuation prior, based on the difference between the brightness and the saturation of the pixels within the hazy image. By creating a linear model for the scene depth of the hazy image with this simple but powerful prior and learning the parameters of the model using a supervised learning method, the depth information can be well recovered. By means of the depth map obtained by the proposed method, the scene radiance of the hazy image can be recovered easily. Experimental results show that the proposed approach achieves dramatically high efficiency and outstanding dehazing effects as well.

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Core Syllabus for OJI Promise (POCO)

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Orientation The first day I was introduced to this hospital, I was taken around the hospital compound and the inside of the hospital by the Director of the hospital (Prof. E.O Oji). In the process of the hospital round, I was made to understand and confirm that there were major departments in the hospital by the director. These departments are as followed

- ❖ THE OPD DEPARTMENT (OUT PATIENTS DEPARTMENT)
- ❖ THE IPD DEPARTMENT(IN PATIENTS DEPARTMENT)
- ❖ THE HOSPITAL COMPOUND

1. OPD DEPARTMENT: The OPD Department also fully known as *out patients department* is located in the right wing of the hospital, the OPD been the very major and busy department, inside it has other departments, which is as followed

- ❖ The Reception
- ❖ The OPD Lounge
- ❖ The Nursing station
- ❖ The Consulting Room
- ❖ The Pharmacy
- ❖ The OPD Toilet
- ❖ The Dilating Room
- ❖ The V.A (Visual Acuity) Unit
- ❖ The IT (Information Technology) Room
- ❖ The Theatre Suite (Comprising the Scrub Room, Changing Unit and the Theatre).

2. THE IPD DEPARTMENT: This department fully known as *in patients department* is located in the left wing of the hospital and inside it comprises other departments inside it. These are as followed:

- ❖ Female's ward
- ❖ Female's Toilet ,used also for Height and Weight Test
- ❖ Female's changing porch and Wardrobe
- ❖ Private ward
- ❖ Male's ward
- ❖ Nursing station
- ❖ Male's Toilet
- ❖ Linen Room
- ❖ Scrub room/file room
- ❖ IPD Lounge
- ❖ IPD Post OP Examination unit/library department

3. THE HOSPITAL COMPUND: The hospital compound has strategic flowering units that make the hospital look fine and neat. There are also some units that can be cited in the compound like the nursing quarters which are located at both ends of the hospital, the security rooms also located at the back

of the hospital and in front at the hospital's gate. There is also the dog's house located in front of the gate.

In front of the hospital is been located the **Incinerator** for disposal of dry/burnable materials.

The electricity and water supply to the hospital is been passed through underground from the Directors house nearby to the hospital, these places been dug through the road and through the hospitals compound for passage of electric wires and water pipes are been marked out and protected against breakage. Every staff in the hospital should know or knows about this.

CONCLUSION:

All the departments mentioned above has it's purpose of been there and has one or two staff that sees after each department and functionality. Also most of the departments are well furnished for effectiveness.

In all the departments were created for the proper functioning of the hospital, therefore none of departments should be neglected or abandoned

EMERGENCY CARE

In an eye hospital such as Ngene St. Luke's International Eye Hospital, there are some eye cases that need immediate or urgent attention to arrest the situation before it gets worse.

In this case we see such situations as emergency care, which in further explanatory at it is seen as an "unexpected and dangerous eye situations that must be dealt with immediately.

There are some references that further explain some of these emergencies care. These are as followed:

I. CASE 1

MISS KANU AKUDO (SEEN- 24/05/10)

Miss Kanu came into the hospital with her left eye very reddish, tearing and with droopy lids, resulting to almost closing of the eye.

Miss Kanu and the guardian on a chat with the sister, I learnt she had the left eye been pierced with the broom. This could be regarded as **Traumatic**. Also her visual acuity showed that she was unable to see with that eye due to the **Trauma**.

DOCTOR'S REPORT:

- On seeing the doctor she complained of serious pain in the eye, tearing of the eye, and noticing discharges in that eye. She also made mention of having headache and body fever due to the trauma.

DOCTOR'S DIAGNOSIS:

- After a very detailed examination by the doctor, he made out his findings as:

- Traumatic Cataracts
- Superlative keratitis
- Uveitis
- Keratitis
- Ciliary injection

With these findings, it is very clear that the said broom has gone beyond the conea and gone through the lens to the ciliary, causing traumatic cataracts and ciliary injection. Also in front of the cornea and conjunctiva, it has resulted to keratitis and uveitis, this has made the eye reddish with discharges.

- TREATMENT- R

After the diagnosis there were some recommended medication by the doctor, which is listed as followed:

- ❖ **Gut Chloremphenicol:** This was to be taking as eye drops every two hourly. It was to prevent the eye against infection.
- ❖ **Tetracycline Ointment:** This was to taken or applied to the eye twice (b.d) daily. This was to keep the eye moist against dryness, also to prevent infection and quicken the healing.
- ❖ **Codein Phosphate:** This was to be taken 4hrly, to reduce or kill any pain resulting from the trauma.

- DOCTOR'S ADVICE:

She was advised to adhere to all the treatment given to her and not allow another hit on that eye in order to quicken the healing and recovery. The doctor made her to understand that if she did all that, in less than one month she will recover from most pains and discharges, before any other step can be taken in order to recover the eye to its farmer state.

II. CASE 2

MRS NNEJI ANGELA -50YRS (SEEN-28/11/12)

Mrs. NNEJI ANGELA visited the hospital on the 28th Nov. 2012. When she came in to book for consultation in the booking unit of the hospital, I found out that **MRS. NNEJI** had reddish eyes and some discharges coming out from the eyes.

During her booking and primary examination (**Biometrics**), I also noticed that she had blurred vision especially in the left eye, this was been manifested by the use of our visual acuity chat.

Although the blurred vision wasn't much, but because of her age and a small history of her eyes, it was clearly known to me that it was an emergency case.

DOCTOR'S REPORT:

During her consultation with the Doctor, she explained her eye problems which she made mention of, **Itching, Reddness, Dischahrges and Blured Visions.**

N.B: She was also hypertensive and was on medication for it, but it wasn't been controlled very well when her vital signs was checked.

DOCTORS DIAGNOSIS

On proper examination by the Doctor, using a well equipped gadgets like the, **SLIT LAMP AND APPLANATION TONOMETER** (used in checking eye pressure)..

The following were observed:

- ❖ NO LP. Left
- ❖ c/d (cup disc) 0.5
- ❖ C.S Glaucoma
- ❖ Rt. Drainage oh
- ❖ Lt. Drainage observed.
- ❖ Early Cataracts L > R
- ❖ Quiet ACs.

With the conclusion of these findings, it was noted that the major eye problem she had was **C.S Glaucoma** which was measured at **Lt. 50 and Rt. 30 (normal should be between 10-20)**. This was what coursed her redness, blurred vision and maybe the discharges.

Other eye complaints were not as severe as the **C.S Glaucoma**, although they were properly attended to by the Doctor.

- TREATMENT- R

The Doctor recommended some medication to her after the proper examination and diagnosis, this was as followed:

- ❖ **Gut Pilocarpine 4%:** This was to be administered 4hourly each day. This was to constrict the pupils and help to reduce the high ocular pressures.
- ❖ **Gut Timolol 0.5:** This was to be applied Twice daily (b.d). It is also to help in reduction of high ocular pressure.
- ❖ **Diamox (Acetazolamide tabs) 250mg:** This one is in form of tablet. It was to be administered **Once daily (o.d)**. This was to make the patient to pass away more water (**urine**) in which will help in the reduction of ocular hypertension.

- DOCTOR'S ADVICE

She was advised to get all the drugs prescribed to her and also adhere strictly in the application of the drugs. She was also made to know that all the drugs was very important and none can be left below.

N.B: Glaucoma refers to a group of eye disorders that usually have few or no initial symptoms and eventually cause harm to the optic nerve that carries the information from the eye to the brain.

In most cases, Glaucoma is associated with higher than-normal pressure inside the eye (ocular hypertension).` if untreated or uncontrolled, glaucoma first cause peripheral vision loss act eventually can lead to blindness.

III. CASE 3

MR EZETOHA MARCEL 45 YRS (SEEN- 29/11/2012)

Mr. Ezetoha visited the hospital on the 29th Nov. 2012 with his Right eye very reddish, swollen eye lids, tearing, discharges and droopy eye lids.

During his booking and primary examinations (Biometrics) by the Nurses for consultation with the Doctor, I found out that

Mr. Ezetoha was unable to see with the Right eye, he was only able to notice the (LP) light perception.

When on a little chat with Mr. Ezetoha, he told me he had a hit at the right eye, which may have caused all these symptoms.

DOCTOR'S REPORT

When Mr. Ezetoha was finally handed over to Doctor for proper consultation and diagnosis. Mr. Ezetoha explained his eyes worries which included, pains in the right eye, unable to see with the right eye, Headache etc. all these were caused by the hit he got on the right eye on the 16th Nov, 2012 as he explained to the Doctor and according to him, it was his first trauma on the eye.

DOCTOR'S DIAGNOSIS

On paper and comprehensive examination by the Doctor on Mr. Ezetoha's eyes, the following were observed;

- ❖ Rt. Traumatic conjunctivitis.
- ❖ Rt. Striate keratitis
- ❖ Rt. Traumatic cataracts
- ❖ Rt. Vitreous haze
- ❖ Haze Retinal View Rt.
- ❖ IOP (intra-ocular-pressure) Reading 18.

After getting all these diagnosis and findings, it was finally concluded that Mr. Ezetoha had a Rt. eye trauma which has lead to its poor vision, and also the trauma resulted to an early Rt. eye cataracts.

The Lt. eye wasn't affected and was in good condition also the IOP was normal at (13)

TREATMENT

The Doctor recommended some medications for Mr. Ezetoha, in which he was meant to adhere strictly to quicken the healing of the Rt. eye. These includes;

- ❖ GUT MAXIDEX (Tid) Rt:- To be administered thrice daily, this was to make the eye to change from it's current state of redness to its natural colour and also quicken the healing.
- ❖ Gut Tropicamide% (b.d):- It was to be applied thrice daily. This was to help in the dilatation of the pupil which will keep the pupil in a static form in order to quicken the healing of the eye.
- ❖ OC. Fulcithalamic (b.d):- It was to be applied thrice daily. This medication was to help to fight any infection which may have attached with the trauma or will come afterwards.
- ❖ Tabs Codeine Phosphate (4hrly):- This was to be taken/ every 4hourly with pain, starting from the hospital. This was to help ease any pain or headache which the trauma must have caused.

DOCTOR'S ADVICE:-

The Doctor told him to adhere strictly to all his medication and treatment, as this will help in the quick recovery of the eye in a short period of time.

CONCLUSION ON THE EMERGENCY CARE:

With the few cases mentioned above, it was well noted that all the cases needed an urgent care and attention, the more urgency and attention we give each case the better and safer way to recover the eye if possible.

Here in ST. LUKE'S INT. EYE HOSPITAL all these emergency cases are been given a first hand attention; in this situation, it is not to interfere or jump the queue of patients that have been waiting or have come before the emergency case, it is done in a gentle way in order not to erupt or course any chaos in the hospital by the patients.

When we see any emergency case, the first thing we do is to welcome the patient gently, have a quick calm chat with the patient and finally have a quick assessment of the affected eye. All these are done by the nurse in charge at the moment, before the Doctor can be alerted afterwards for proper assessment and diagnosis.

All these care will help make the patient involved to be more relaxed, kill any anxieties and be rest assured that he/she will be managed and attended to well.

N.B: The after care of the emergency case is very highly important, because at this point the patient plays a big role. Most times the patient doesn't do their own part well to enhance their eye healing, and this could be in the case of; Medication neglect, unable to renew their medication, not adhering strictly with the instructions etc.

In order to avert the problem of aftercare inadequacies, a very serious and proper emphasis is been made to the patient on the mode of application of his/her medication and after care.

OUT PATIENT PROCEDURES:

In ST LUKE'S INT EYE HOSPITAL, there are procedures or order in which we do follow in admitting patients for consultation and these procedures helps in proper assessment of each patient before he/she can be able to see the Doctor for proper consultation, non of the procedure can be by-passed, because all the procedures work jointly to give a proper assessment of the patient.

N.B:- All these procedures can be referred to as Hospital "BIOMETRIES:-

These procedures are as followed.

- ❖ OUT PATIENT REGISTER
- ❖ ISSUEANCE OF HOSPITAL ADMISSION CARD & OPENING OF FOLDER
- ❖ BLOOD PRESSURE/PULSE CHECK
- ❖ VISUAL ACUITY CHECK.

-OUT PATIENT REGISTER:-

Here in NGENE ST. LUKE'S INT. EYE HOSPITAL an out patient register is been provided for the patients that are coming in for consultation and this register is kept at the out patient lounge or Hall.

In this process each patient that comes in to the hospital, goes first to the hospital register and puts down his/her name and then wait till it reaches his/her turn before been attended to.

ISSUEANCE OF HOSPITAL ADMISSION CARD/OPENING OF PATINTS FOLDER:-

Before any patient can be recognized or admitted in NGENE ST. LUKE'S INT. EYE HOSPITAL he/she must have

purchased what we refer to as HOSPITAL ADMISSION CARD, without this card, the patient cannot be admitted for consultation by the Doctor.

In this process, when a patient is called by the nurses in the clerking or admission room, following the sequence of the Out Patient Register, the first thing a patient is asked for by the Nurse-in charge is for his/her Hospital card. If the patient doesn't have any card. He/she has to purchase the card or if he/she has one already, the folder has to be fished out of the folder boxes.

In the issuing of Hospital card a specific amount is paid for the card, by the patient and some information is also needed from the patient in order to get a proper information about the patient and also fill in the card blank spaces.

After the card has been issued to the patient, a folder is also opened for him/her in which a detailed and comprehensive information is noted down in the folder. Also the patients information is put inside the computer for safe recovery.

N:B HOSPITAL CARDS ARE BEEN RENEWED EVERY 1 YEAR PERIOD

BLOOD PRESSURE/ PULSE CHECK

During the process of clerking and getting information from the patient in order to fill in the folder, a vital sign is conducted, and this is known as. Blood Pressure and pulse Check

In this process a machine called SPHIGNOMANOMETER. is used in checking the patients blood pressure /pulse, this is to determine the height /range of the patient blood pressure /pulse and this will go a long way in helping the consultant during consultation.

After the check, result is noted in the patients folder and moved over to the next level of assesment.

VISUAL ACCUTY CHECK

This process follows suite after opening of folder and recording of vital signs.

In this process, the patient is examined on his/her ability to see or the extent he/she will be able to see at the point of visit in the hospital, this is done with a specific chart and a distance been recognized world wide as a way of checking the vision of a person. The chart used in doing this is referred to as "Snellings Visual Acuity chart" and the standard way of checking a persons visions using the Snellings Chart. Is by making the person to stay at 20ft (6M) and read what he/she sees in the chart. The person can be scored as e.g 6/6 (this means that the patient can see at 6 meters what a normal person can see at 6meters), 6/60

(Means that the patient can see at 6meters what a normal person can see at 60meters) etc.

Most times there are other ways in which we use in checking patients vision.

- I. Hand movement (HM) or counting fingers (c f)
- II. Light perception(L P)
- III. Illiterate chart(E.chart)
- IV. Children's chart

- ❖ HAND MOVEMENT (HM) → this is done when the patient is unable to read the snelling's chart or the E-chart, because of the poor state of the vision. We can adapt this

procedure in order to ascertain the current nature of the vision.

- ❖ LIGHT PERCEPTION (LP) → this is done when the patient is unable to read the charts and see the hand movement or counting fingers this is when light perception can be adapted.
- ❖ ILLITRATE CHART (E-CHART)- This is used, if the patient is unable to read anything because of illiteracy, we can use the e chart to determine the extent of the vision.
- ❖ CHILDREN'S CHART → This is used mainly for children of tender age that are not able to read or write. In this chart the child is meant to notify different drawing or figure in a chart or even point at them.

N.B → There are also signs or methods attached to it, like; S- mean that he/she can read the snelling's chart without any glasses, C- means that the person read the snelling's chart with glasses.

This process is probably the last thing a patient goes through before he/she can be forwarded to the doctor for proper consultation.

IN-PATIENT CARE:

In patient can be referred to as those patient admitted in the hospital (theatre suite) after surgery or patient admitted to be monitored over a long period of time.

In NGENE ST LUKE'S INT EYE HOSPITAL, there are ways or procedures in which these admitted patients are being taken care of for the period of their admission

These in-patient care procedures are as followed:

- ❖ Monitor of patients vital signs
- ❖ How to instruct the patients on how to use hospital facilities.
- ❖ How to undertake a simple and complex investigation on the drugs/medication patients are on before surgery.

1) MONITOR OF PATIENTS VITAL SIGNS

In this procedure, the Nurse on duty, takes care or monitors the in-patients vital signs, and to achieve that, there are some equipments made to help in monitoring a patients vital signs, they include; sphygmomanometer, thermometer, etc.

- **Sphygmomanometer:** This is used in checking or monitoring the patient's blood pressure and pulse range. It can be done at different hour interval depending on the patient's blood pressure range while in admission in the hospital. Sphygmomanometer we use here in NGENE ST. LUKE'S INT. EYE HOSPITALS recently is the automatic sphygmomanometer it reads the patients blood pressure range and pulse at the same time. Although in the past we have made use of the manual sphygmomanometer in checking the patients vital signs, but we found out the most recently made sphygmomanometer, which is the automatic gives more accurate reading than the manual.
- **Thermometer:** This is used in checking the patient's temperature at different hour interval, to know how the patient's temperature runs while in admission in the hospital. This can be done by putting the thermometer at the patients

armpit which is the most suitable place to take the temperature reading, it is left for some time after which, it is removed and the reading taken.

There are other equipments that can be used in checking/monitoring patient's vital signs, but the two listed above are the ones we make use of in NGENE ST. LUKE'S INT EYE HOSPITAL and it is the important ones.

2) HOW TO INSTRUCT THE PATIENTS ON HOW TO USE HOSPITAL FACILITIES

In NGENE ST. LUKE'S INT EYE HOSPITAL there are important areas of facilities in the admission ward that we consider while patients are admitted in ward. Few are:

- ❖ How to use the electricity
 - ❖ How to use the bathroom/toilet
 - ❖ How to use the beds and the cupboards
- How to use the electricity:
Before a patient is admitted in the ward, the patient is been taking for a ward round, in this process, the patient is shown the electrical appliances in his / her room/ward before any admission, like the light switches or the sockets; they are shown how to on/off the light switches without any dirt on the wall and also how to use the sockets if they want to plug anything that won't be of any danger to hospital power source or the hospital. The patient is advised too, to switch off any lighting switches or sockets when there is power outage (NEPA in Nigeria).
 - How to use the bathroom/toilet:
During a ward round with the patients, the patient is shown the bathroom/toilet, how to flush the toilet after each usage to avoid any bad odor in the hospital, he/she is also shown the wash hand basin and the tap. More importantly there are little steps inside the hospital the patient is advised to avoid in order not to trip and fall while heading into the bathroom/toilet.
 - How to use the beds and cupboards:
The patient is shown his/her bed and cupboard during ward round, he/she is advised to use the bed and cupboard adequately in order to avoid any damage and also not to store easily spoilt food in the cupboards.

N:B During the ward round with the patients before admission in the ward. There is an exception for those that will have a surgery; this means that the patient must have a helper which will see him/her through while in admission. In this case the helper joins in the ward round too, in order to guide the patient after surgery.

- ❖ How to undertake a simple and complex investigation on the drugs/medication patients are on before surgery

This case, before any surgery or before a patient is booked for surgery, the patient passes through a series of tests which can also be referred as **BIOMETRY**. During this procedure the doctor must have confirmed most medications the patient is on and advised him/her on how to go about the medication before surgery.

Most times the patients tend to hide or fail to mention all the medications in which they adhere to before coming to be booked for surgery. Here is when the nurse in-charge takes over,

during advice and other biometry tests by the nurse, the patient is made to understand the dangers of any counter drug reaction, if there is any medication he/she fails to mention. In this stage it instills some fear in the patient and he/she tends to assess or remember if there is any he/she is forgetting to mention.

In few cases, when the patient fails to remember, due to age or may act in a worrying way, the nurse may ask the guardian or any of his/her helper, if that fails, they can be booked for another date for consultation with the nurse or doctor as the case may be.

N:B In NGENE ST. LUKE'S INT. EYE HOSPITAL we don't rush into surgery if we are not clear with the patients medical history, this enables us to achieve the maximum of what we intend to achieve.

-PRE-OPERATIVE CARE OF PATIENTS:-

There are procedures taken before any surgery is done on any patient, in NGENE ST. LUKE'S INT EYE HOSPITAL in which helps to relax the mind of the patients before the surgery. As in any case anxiety does not help during Eye surgery at NGENE ST. LUKE'S INT. EYE HOSPITAL. These procedures can be listed as followed.

- ❖ Welcoming of patients on the day of surgery
- ❖ A little chart with the patient
- ❖ Checking of vital signs of the patient before the surgery

1) Welcoming of patients on the day of surgery.

In this case most times the patients that come in for surgery are full of anxiety, with their mind full of fear of the unknown. In this situation the nurse in charge takes the first step in welcoming the patient in the OPD, making them feel at home, most times with some smile at the face and may be crack a little joke in which gives the patient a little relieve of any anxiety.

The nurse also helps the patient with his or her bags and leads the patient to the ward, shows him/her the ward to stay and have a little ward round again to clarify the patient appropriately on how to stay in the ward. Finally the patient is lead back to the OPD for other pre-operative care.

2) A little chart with the patient:

During this process, the patient must have had a little relieve and relaxation. The nurse in charge seats down with the patient and have a little chart with him/her. The nurse makes the patient believe that surgery will be easy and fast, tells the patient the good and bad things about surgery in a humanly manner.

The nurse also explains the procedure to be taken before the surgery is like: the dilation and the purpose for it, Anesthetic drops and purpose for it etc. the nurse also assures the patient of our devoted attitude in attaining the best standard.

3) Checking of vital signs of the patient before the surgery

The patient vital signs are taken after the chat and before dilation to ascertain the blood pressure/pulse range. This helps us to make a firm decision on how the surgery proceeds. The doctor is alerted on the Bp check if there is any abnormal reading and he takes a final decision on how to proceed and also advice on how dilation drops to use on the patient.

This stage of pre-operative care does not only apply to the nurse on duty or nurse in charge, but applies to every staff in the hospital, because it goes a long way to make the patient feel at home and relaxed before the surgery.

-OPERATIVE CARE:-

In this procedure of operative care, there are things to know on the surgery day. Some of these operative care can be listed as followed:

- ❖ Knowing the number of patients to be operated and their details
- ❖ How to attend to patients before or during surgery
- ❖ How to interpret a patients vital signs (e.g Bp/pulse)
- ❖ How to attend to patients after surgery.

1) Knowing the number of patients to be operated and their details:

In this case it is important that the nurse is able to know or memorize the names, ID numbers, age, details of pre-operative care etc. of the patients that came for surgery. This is important because the nurse acts as an eye for the doctor before the surgery. So any misinformation about a patient pre-operative detail may be disastrous, it is supposed that the nurse goes specifically on each patient pre-operative detail with adequate attention and confirmation from the doctor if necessary to avoid any misinformation that can be of danger.

2) How to attend to patients before or during surgery

In this procedure we can refer to the PRE-OPERATIVE CARE OF PATIENTS IN PAGE ABOVE. It is explains the details on how a patient is made to relieve anxiety and relax before surgery, also other details is specified too.

3) How to interpret a patients vital signs

It is very important to know when a patients vital signs (Bp/pulse) is high, low or normal, before surgery, this goes a long way in making a firm decision on how the surgery is to proceed. In determining the vital sign, there are ranges in which we can use to ascertain the level of the vital sign, there are ranges in which we can use to ascertain the level of the vital sign (Bp/pulse) and also it is recognized in the whole world. They are
For women =130-140/60-70mmHg
For men = 135-145/70-80mmHg

4) How to attend to patients after surgery:

After surgery the patient is been lead out of the theater gently with a clear guide to avoid any trip and fall on the pathway. The nurse will gently seat the patient down and remove all the theater clothing worn on the patient before the surgery. The patient is made to relax again, before the doctor comes for post-operative details and advice to the patient.

Operative care is done with uttermost attention and detailed advice. There shouldn't be any misinformation during this procedure as any mistake will be fatal and dangerous. So in that case there shouldn't be any error in this procedure at all.

-CARE OF CHILDREN AND YOUNG PEOPLE -

In NGENE ST. LUKE'S INT. EYE HOSPITAL we give uttermost priority to children and young ones. During each clinic,

we ascertain the variety of patients that came for consultation first before proceeding for consultation.

Although there is a sequential pattern of seeing the patients and discharging them, we first and foremost in a quiet and orderly manner single out the little ones out from the crowd to attend to them first.

The reason for this is that most children cannot withstand, been in the crowd, staying at a place for long time or withstand hunger, by moving them fast for consultation, they can be discharged quickly to avoid other unnecessary children problems.

For little babies, during consultation they are also gently pampered to help the doctor examine them appropriately like: during the eye examination they are wrapped appropriately with a blanket with the parent securing the arms and the legs to avoid any kick or poking by the child, although they may be crying, but the important thing will be done as fast the doctor can. After the examination the child can be issued sweet or biscuit to stop him/her crying.

Also during dilation the child does not stay with the crowd in the dilating room, he/she will be carried around the hospital premises by the parent while the nurse dilates at interval, it makes the child feel secured.

This procedure makes the children feel at home and also gives the parent or guardian assurance of what we are doing to his/her ward.

-CARE OF ADULTS AND ELDERLY PEOPLE:-

In this procedure, just like the care of children every elderly patients are given same attention as the children.

We give same attention we give the children to the very elderly ones.

Some of the elderly patients may come in wheel chair, they will be gently and in a quiet way singled out for early consultation to avoid any additional care.

There are some adults that have problems with their general health; it is good the nurse in the lounge pays close attention to the patient, to see if there is any to move quickly for consultation and discharge. Also some elderly ones may not be able to stay with the crowd; they are also given priority too.

This is a humanly procedures that gives this types of patients assurance of our professionalism at the NGENE ST. LUKE'S INT. EYE HOSPITAL.

-CARE OF PATIENTS WITH REDUCED VISION:-

There are patients with impaired or very reduced vision, in this case, the nurse pays close attention to these ones, especially them been in a new environment, they will want to help themselves feeling they can manage. We don't allow it, instead they are gradually lead by the nurse with adequate guide on the footing to different parts if the hospital during their consultation.

Also during visual acuity they are allowed the privacy to avoid them feeling inferior or embarrassed. The nurse makes sure they are appropriately lead well until they are discharged.

-USE OF ELECTRICALS

In NGENE ST. LUKE'S INT. EYE HOSPITAL, there are different sections at light appliances, switches and sockets.

The handling of electrical is a very much of importance, because most of our work and everyday day to day activities depends on them.

At this section the nurse on duty or the nurse in charge makes sure that all the appliances, switches and sockets are switched off after the days work to avoid any electrical problem or misuse.

All the appliances at NGENE ST. LUKE'S INT. EYE HOSPITAL are handled with uttermost care, some of these appliances are as followed.

- ❖ Slit lamps – (for eye examinations)
- ❖ Auto refractor – (for glass prescription)
- ❖ F D T (Frequently Doubling Technology) - (for eye field check)
- ❖ Desk top/ lap top computers (for hospital clerking)

All these appliances, switches, sockets should be a past of all the staff and personnels to take care of by the nurse in charge or nurse on duty.

Any damage of any appliance is reported to the appropriate authority to repair or replace for the hospital efficiency.

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Bacteriological Analysis of Salad Vegetable in Eke Awka Market, Anambra State, Nigeria

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I. INTRODUCTION

Vegetable salad is a very common food accompaniment in Nigeria. The vegetables that usually make up this recipe include tomatoes, cucumber, carrots, cabbage and lettuce. They are sold in almost every market, and can be seen hawked around by traders. Fruits and vegetable have been identified as significant sources of pathogens and chemical contaminants (Uzeh *et al.*, 2009). As a result, environmental and food microbiologists have continued to identify and suggest control measures for hazards at all stages in the supply chain (Johngen, 2005). Khan *et al.* (1992) reported that bacterial contamination results from various unsanitary cultivation and marketing practices. In another study, Tambekar *et al.* (2006) reported that bacterial contamination of salad vegetable was linked to the fact that they are usually consumed without any heat treatment. These vegetables can become contaminated with pathogenic microorganisms during harvesting, through human handling, harvesting equipments, transport containers, wild and domestic animals pathogens from the human and animal reservoir as well as other environmental pathogens can be found at the time of consumption. Although spoilage bacteria, yeast and mould dominate the micro flora on row fruits and vegetable, the occasional presence of pathogenic bacteria, parasites and viruses capable of causing human infection has also been documented (Hassan *et al.*, 2006).

Coli forms are facultative anaerobic Gram negative rods belonging to the family *Enterobacteriaceae*. They are known contaminants of food and water, causing various intestinal and extra-intestinal infections such as urinary, central nervous system and respiratory tract infections (John, 2007).

The presence of *E. coli* in some green leafy vegetables few studies have examined the presence of entophytes or surface associated bacteria from the perspective of human consumption, by sampling minimally processed vegetables such as ready-to-eat salad produce. Similarly, few studies have focused on the entire entophyte community, rather than just potential pathogens, even though native entophyte bacterial populations could potentially serve as competitors to such organisms.

However, in Nigeria, local utilization of carrots, cabbage, onions, and cucumbers is limited to direct unprocessed eating either wholly or a growing awareness on the need to evaluate microorganism associated with spoilage of these vegetables.

The aim of this research work is to isolate the organisms associated with Salad vegetable spoilage in Eke Awka market, Awka, Anambra state, Nigeria.

II. LITERATURE REVIEW

Shelf life of fresh-cut fruits and vegetable

Fresh-cut fruits and vegetable are any combination thereof that has been physically altered from its original form, but remains in a fresh state (IFPA, 2001). Fresh cut fruits and vegetable offer consumers ready to eat produce that is one of several convenient, nutritious and fresh-like tasting, and are a rapidly growing category of value-added produce products that are minimally or lightly processed. Processing of fresh-cut products involves sorting, cleaning, washing, heating, peeling, coring and slicing, depending on products. The processing can be as simple as fresh-cut grape tomatoes for which raw tomato fruit is only sorted and washed with sanitized water or as complicated as cut cantaloupe, for which cantaloupe is sorted, cleaned with brush and spray water, heat treated with hot water or steam, peeled, deseeded, chunked, and rinsed with sanitized water before packaging in rigid containers. The fresh-cut fruits include melon chunks and slices, cored and sliced pineapple, apple wedges treated with ant browning preservatives; peeled citrus fruits and segments; de-capped strawberry; de-stemmed and washed grapes; sliced kiwifruit and fruit salads. Examples of fresh-cut vegetable are shredded lettuce; shredded and diced cabbage washed and trimmed spinach, peeled "baby" carrots, cauliflower and broccoli florets, sliced and diced tomatoes, peeled and sliced potatoes, snapped green beans, trimmed green onions, cleaned and diced onions, and mixed salads. Compared with whole fresh produce, fresh-cut produce is ready-to-us (ready to eat), contain 100% usable product, and always requires processing, refrigeration (including chilling-sensitive). Fruit and vegetables that can be injured after a period of exposure to chilling temperatures. Fresh-cut produce or products are in a raw state or fruit-like nutritious, and contain live tissues without freezing, canning (heat sterilization), dehydrating, fermentation, acidification, or treatments with additives or processed, minimally processed refrigerated, lightly processed, and prepared in literature and application communications. Fresh cut fruit and vegetable sales are approximately & 12 billion per year in the North American food services and retail market and account for nearly 15% of all produce sales (IFPA, 2001). Fresh-cut produce offer growers an opportunity to increase sales by adding value to raw agricultural commodities. The largest portion of US fresh-cut vegetable sales at retail is fresh-salads.

Impact of microbiological spoilage

Microbiological spoilage or microbiological shelf life has become a major reason for sensory quality shelf life failure for most package fresh-cut fruits and vegetables, followed by surface

discoloration (e.g., pinking of cut lettuce, browning of cut potato, graying or browning with processed pineapple and gray discoloration with cabbage), water soaked appearance or translucency (e.g., cut water melon, papaya, honey dew and tomatoes), moisture loss (e.g., “baby” carrot and celery sticks), off-aroma (e.g., diced cabbage), flavor changes (e.g., cut kiwi fruits). Microbial spoilage including off-flavor (e.g., fermented aroma with cut lettuce, sour taste with cantaloupe and bell pepper) formation, slimy surface (e.g., “baby” carrots), wetness and soft rot and visual microbial growth/colonies has been used as a main or exclusive objective criterion to determine shelf life of fresh-cut products (Sapers *et al.*, 2001). Brackett (1994) concluded that microbial decay can be a major source of spoilage of fresh-cut produce. O’Connor Shaw *et al.*, (1996) reported that microbial spoilage is a limiting factor for shelf life of fruit pieces stored under controlled temperature or atmospheric conditions. Shelf life, including microbial spoilage, results in 30-50% shrinkage of fresh-cut fruit (Warren, 2005) microbial spoilage has used by quality failure for more than 50% of fresh-cut vegetable produce commodities and almost have been treated with preservative (such as anti browning reagent) or packaged properly using MAP technologies. Under equilibrium modified atmosphere (MA) conditions, mixed fresh-cut bell pepper (including green, yellow, and red bell pepper) was unacceptable by day 6 of storage at 7°C due to acidic flavor, water loss and texture change (Jacxsens *et al.*, 2003). Processed lollo Rosso lettuce had a shelf life of shorter than 7 days at 5°C due to high microbial counts and off-odor formation under MAP.

Sources of Microbial Contamination

Microbial contamination sources of fresh-cut fruits and vegetables include raw materials and contact with processing equipment. The microorganisms that exist on the surfaces of raw, whole produce appear to be the major source of microbial contamination and consequent spoilage of fresh-cut fruit and vegetables Sapers’ *et al.*, (2001) reported that, compared with the good surface sanitization practices, no decontamination treatment or an ineffective antimicrobial treatment on whole cantaloupe resulted in premature microbiological spoilage of fresh-cut cantaloupe studies have also revealed over a year period of sampling that there is a close relationship between the total mesophilic aerobic counts on lettuce raw material and those on finished shredded lettuce product—several outbreaks of *Salmonellasis* that were associated with cut cantaloupe and water melon have resulted from *Salmonella* present in the United States on the rind contaminated in the field or packing house (Harris *et al.*, 2003). Inoculation of *Listeria monocytogenes* and *Salmonella* on the surface of entire cantaloupe resulted in the contamination to fresh-cut pieces during cutting (Ukuk and Fett, 2002). These results indicate that bacterial on the surface of whole produce are that same as those on fresh-cut produce and can contaminate finished product through processing. Fresh-cut products can also be contaminated by spoilage microorganisms through contact by people or equipment during processing possibly by air during processing and packaging steps, especially in facilities that have been used for produce processing over an extended period of time. Cantwell and Suslow (2002) found significantly higher bacterial counts during processing on automated cutters and package fillers of a lettuce processing line,

indicating that clean product can become relations where vegetables and fruit debris can accumulate, such as cutters and package-filling equipment. Shredding slicing steps in fresh-cut processing resulted in increased microbial population by 1-3 logs on cut cabbage, lettuce and onions (Garg *et al.*, 1990) and at least a 1-log increase for lettuce and chicory salads (Jockel and Otto, 1990).

Microbiological spoilage mechanisms in fresh-cut fruit and vegetable

Growth of microorganisms subsequently forming visible colonies is a common cause of spoilage of fresh-cut fruit and vegetables. There is in general a linear relationship between the microbial cell numbers and spoilage of cut produce during refrigerated storage (Zhuang *et al.*, 2003). This relationship stronger for fresh-cut melons and fruits compared with fresh-cut vegetables have been established for quality of fresh-cut produce—for example, in France and Germany, Microbiological specifications for mesophilic aerobic bacterial populations or aerobic plate counts (APC) of salad vegetables at production (fresh) are 5×10^6 cfu/g, for separating good quality from marginally acceptable quality, and at use by date are 5×10^7 cfu/g (Lund, 1993). However, the exceptions to this overall positive linear relationship have been reported in many studies (Zhuang *et al.*, 2003). Sappers *et al.* (2001) did not observe a consistent difference in total APC between unspoiled and spoiled cut cantaloupe during refrigerated storage. However, in the same report, a lower APC was consistently associated with unspoiled products. These phenomena suggest the following.

1. Most, if not all, of the analyses that are currently conducted to determine microorganism populations of cut produce during storage are not specific enough to be associated with the shelf life or spoilage.
2. Low microbial counts are necessary to avoid or reduce spoilage of cut produce; however, high total microbial populations do not always correlate with spoilage.
3. It is not practical to use a microbiological specification based only on nonspecific microbial test results to reject fresh-cut products on a commercial level. APC and yeast, or lactic acid bacterial counts cannot be solely used to judge or predict shelf life or spoilage of lots of production although there is an overall linear relationship between microbial loads and a quality of fresh-cut produce.

Formation of organic acids such as lactic acid and acetic acid associated with decreased pH values and generation of volatile compounds such as ethanol from fermentation of sugar by yeasts are additional mechanisms that result in aroma and flavor defects of fresh-cut products stored or packaged under MAP. Bacterial soft rot, which is characterized by water-soaking and formation of a slimy surface on plant tissues, has been identified as the leading cause of storage disorders in many types of whole produce and is frequently observed in fresh-cut fruits (Ukuk and Fett, 2002) and vegetables during storage. Bacterial soft rot results from degradation of plant cell walls by pectolytic enzymes produced by a variety of microorganisms, including *E. carotovora*, *P. marginalis*, *Batrytis*, *Clostridium*, *Alternaria*, *Geotrichum*, and *Fusarium* (Bulgarelli and Brackett, 1991). Many microbes use pectolytic enzymes to overcome plant

defense mechanisms and access plant nutrients. The pectin methyl esterase (PME), and polygalacturonase (PG), pectin lyase (PNL) and pectate lyase (PL), can degrade pectin's in the middle lamella of the cell, thereby resulting in liquefaction of the plant tissue leading to conditions such as soft rots other enzymes such as hemi-cellulose, cellulose, and proteases are also involved in the spoilage process but are usually secondary to pectinases, molecular genetic research has revealed that multiple isozymic forms of the pectolytic enzymes exist. These are inducible and are not equally involved in the degradation of plant tissues. Their importance in soft-rot formation is dependent on bacterial genus. In summary, microbial spoilage of fresh-cut produce can be caused by microorganisms or microbial growth processes. There is a strong relationship between microbial populations and shelf life if the cause of quality failure is visible growth of micro flora on the surface. However, there is a relationship between microbial cell numbers and shelf life if the cause of quality failure requires specific metabolic activity, particularly under conditions of temperature abuse.

Prevention and control of microbial spoilage

Many thermal and non thermal technologies have been developed to control microorganisms on fresh-cut produce. These have been summarized by Farber *et al.*, (2003). Types of thermal processing used to treat fresh-cut produce include hot water, hot steam, and hot sanitizing solution. Thermal processing is a relatively new technology to the fresh-cut produce industry. Laboratory studies with inoculated whole melons revealed that the thermo safe process can effectively reduce microbial cell numbers on the surface of produce by 5 log units. The process time (from seconds to minutes) and temperature (from 60 to 100°C) are dependent upon the commodities being treated. There are a number of difficulties associated with the application of thermal processes to fresh-cut fruit and vegetables for example; thermal processed cannot be used for fresh-cut commodities such as deterioration of quality characteristics. Also, can other processed products be called fresh-cut after a thermal process treatment is applied? Another limitation is that thermal processes are generally an inefficient use of energy and create a challenge for cold chain management which is needed by fresh-cut processes for product distribution. Further research and development is needed to validate thermal processes that can achieve a 5-log microbial reduction without affecting the quality of processed produce. Non thermal technologies can be classified as either physical or chemical. Physical technologies include high pressure, irradiation, pulsed electric fields, pulsed white light, ultrasound, and ultrasound radiation. Some of these methods are generally not applicable commercially because they are too expensive (high pressure and pulsed electric fields), do not have consumer acceptance of efficacy (UV and pulsed white light). The mechanisms and application of these methods have been well reviewed by Lund *et al.* (2000) and Ohlsson and Bengtsson (2002).

Chemical technologies can be divided into gas-phase sanitation and liquid-phase sanitation based on the physical state of the chemical used. Examples of gas-phase sanitation include ozone and chlorine dioxide. One of the difficulties in the application of gas-phase technologies is that a special in-line closed system is needed for the treatment of produce. These

applications could also pose an employee safety issue. The most widely used chemical treatment in the fresh-cut produce industry is chlorinated water.

In addition to these active control measures, other factors important in the prevention of microbial spoilage include raw material quality, processing technologies good manufacturing practice (GMP), packaging, and temperature management. High-quality raw materials can both reduce the potential for surface contamination and maximize the plant self-defense system. Diseased or damaged products are difficult to prevent and treatment and can contaminate products with low levels of microbes. Zhuang *et al.*, (2003) found that during storage yeast populations were significantly higher on cut honey dew melons having soft tissue than firm melons that were firm. It is commonly known that a climacteric fruit, the increase in respiration just prior to full ripening generally coincides with a major reduction in fruit resistance to pathogens. Damaged cells have greater rates of subsequently leading to cellular senescence or death and increased susceptibility to fungal colonization.

Methods for Detection and isolation of organisms that causes spoilage on vegetable

The methods used to detect and isolate spoilage microorganisms are mainly based on cultural procedures. For example, for fresh-cut fruit O'Connor Shaw *et al.* (1994) extracted microorganisms from the fruits (1:5 dilution) using sterile 0.1% peptone water and 0.5% sodium chloride, macerated this preparation by stomaching for 1 min and using the following methods for enumerating different microorganisms: standard methods agar (SMA) with incubation at 25°C for 3days for aerobic plate counts; dichloran rose Bengal chloramphenicol agar with incubation at 25°C for 5days for yeasts and molds; Man, Ragusa and Sharpe (MRS) agar with anaerobic incubation at 30°C for 6days for lactic acid bacteria. Ukuku and Fett (2002) enumerated microbes on cut melon (20g), using plate count agar (PCA) and incubation at 30°C for 3days for mesophilic aerobic bacteria; PCA+ crystal violet at 30°C for 3 days for Gram-negative bacteria; *Pseudomonas* isolation agar and incubated at 27°C for 3days for *Pseudomonads*; MRS agar with 0.08% sorbic acid and incubation at 30°C for 3days for lactic acid bacteria and (Zapek malt agar (CMA) for yeast and molds Allende *et al.*, (2002) enumerated microbes on mixed vegetable salads (30g) by plating homogenates in peptone saline on: PCA and incubating at 22°C for 3days for total psychotropic bacteria; MRS agar and incubating at 30°C for 3days for lactic acid bacteria; yeast glucose chloramphenicol agar and incubating at 30°C for 3days for yeasts; violet red bile glucose agar and incubating at 37°C for 2days for *Enterobacteriaceae*. In the fresh-cut produce industry, 3m petrifilm methods are widely used to enumerate total plate counts, coli forms, lactic acid bacteria, and yeasts and molds because of convenience and minimal need for incubator and operating space. Specificities and detailed operating procedures of many of these methods are described by Downes and Ito (2001) and Sapers *et al.*, (2005).

Microbiological Spoilage Defects of Fresh-cut fruit and vegetables

Microbiological spoilage defects of fresh-cut fruit and vegetables include microbial colony formation or visible

microbial growth mainly due to microorganism proliferation, off-
aroma and off-flavor formation mainly due to fermentation of
sugar, soft-rot/water soak and sliminess due to enzymatic
pectolyzation, and discoloration. For example, O'connor-shaw *et al.*, (1994) observed mold growth at 14days on cut pineapples held at 4°C and at 4 days when held at 20°C. White mold colony formation was observed at 11days on cut cantaloupe held at 4°C and at 7 days on cut honeydew held at 8.5°C. Visual evidence of bacterial spoilage of cut cantaloupes result from the presence of bacteria colonies, slime, and Juice turbidity and off odors (Sapers *et al.*, 2001). Mixed lettuce stored in bags with on oxygen transmission rate (OTR) of 15ml became in edible with 4days at 7°C due to the off-odor an unacceptable taste that were described as alcoholic and fermented (Jacxsens *et al.*, 2003). Mixed bell peppers held at 7°C were rejected by a trained sensory panel within 6days due to an acid odor and taste. Fresh-cut cantaloupe held at 4°C developed on off-odor within 11days, and mixed vegetables salad held at 4°C were spoiled by off-odors within 7days (Allende *et al.*, 2002). Shredded carrots packaged in a modified atmosphere and held at 10°C developed off-flavors and became slimy.

Another very common defect of fresh-cut vegetable attributed to microbiological spoilage is water soak/soft rot. The decay of fresh-cut celery segments strode at < 5°C in sealed film bays begins with water soaking at the cut surface and slimy moisture accumulation inside the bags. In a salads mix, endive and lolo blonde developed soft rotting more rapidly than the other components. Water soaking has been most commonly associated with spoilage of cut cantaloupe, honeydew, and watermelon (Ukuk and Fett, 2002). Especially under abusive storage temperature (>4°C), although there is no direct evidence that this results from the activity of pectolytic bacteria .studies have revealed that spoilage microbes such as *Gluconobacter* can cause discoloration of whole produce, and fungal spoilage has discolored cut apples treated with antioxidants.

MATERIALS AND METHODS

Materials

All materials used in this work are of analytical grade. See attached on Appendix 1

Collection of Samples

A total of 6 samples of carrot, Tomatoes, green beans, cabbages, cucumber and Onions were collected in a polythene bag from Eke Awka market in Awka South Local Government Area of Anambra state, Nigeria. The samples was taken to the laboratory for analysis.

Isolation of Bacteria by Spread Plate method

Bacteria counts were determined after imposing main and sub treatments. Main treatments were washed with ordinary tap water and washing with sterile distilled water. The sub treatment were peeling of the outer covering. The salad samples were put in a different conical flask containing sterile distilled water and placed on shaker for 10 minutes to maintain a uniform mixture. Now, the isolation was carried out using ten fold serial dilution and spread on nutrient agar, Macconkey agar plate.

Purification of isolates

Isolates obtained were purified by sub culturing onto sterile nutrient agar plates.

Identification of isolates

Isolates were characterized on the basis of morphological analysis, biochemical test and Gram's reaction. Catalase test, motility test, coagulase test, Indole test, spore test, methyred test, Indole test, spore test, citrate test, voges proskauer test, citrate test, glucose test, lactose test, maltose test and mannitol test as was done by Cruckshank *et al.*, (1986). The isolates were identified according to the scheme of Holt *et al.*, (1984).

GRAM STAINING

This is the most important widely used procedure for characterizing bacteria. It was first described by Christian Gram. This method divides the bacteria into two groups, Gram positive which is purple in colour and Gram negative which is pink in colour. This technique is based on the ability of bacteria to retain primary stain (crystal violet dye) during decolourisation with alcohol or acetone . Gram positive bacteria retain primary stain while Gram negative bacteria are decolourised by alcohol and takes up the red colour counter stain. A smear of an isolate was made on a clean slide and allowed to dry. It was then heat fixed by passing the smear through the bursen burner, this is done to enhance the sticking of the organism on the microscope slide. The smear was flooded with crystal violet and left for 60sec before washing off with water . Lugols iodine was added and allowed to stand for 60 sec before being washed off and decolourised with alcohol for 10 secs. The slide was then washed off, stained with safranin for 30 sec washed off and allowed to air dry . A drop of immersion oil was added to the slide which was then viewed under the microscope using the x 100 objective lens.

MOTILITY TEST

Each bacteria isolated was separately inoculated into a semi-solid medium using sterile straight wire and incubated at 37°C for 24h. Migration of the isolates away from the line of inoculation was a positive result while lack of migration away from the line of inoculation indicated a negative result.

CATALASE TEST

This test is used to detect the enzyme catalase which protects the bacteria from hydrogen peroxide accumulated which can occur during aerobic metabolism. Catalase breaks the hydrogen peroxide into oxygen and water. The organism was picked and emulsified on a clean slide. A drop of 3% hydrogen peroxide was added to the slide. The presence of sustained bubbles indicated a positive result while their absence indicated a negative result.

COAGULASE TEST

This is used to distinguish pathogenic *Staphylococcus aureus* which produces the enzymes coagulase from *Streptococcus* which do not produce coagulase. Coagulase causes serum to clot by converting fibrinogen to fibrin. One milliliter plasma was dropped on a clean slide and the organism emulsified in it. The dumping of the organism within 0 seconds indicates a positive result.

CABOHYDRATE FERMENTATION TEST

This test is used to detect organism which utilize different sugar as sources of energy with the production of acid and or gas. The sugars used were glucose, maltose and lactose. Peptone water broth was prepared. Bromothymol blue indicator was added to the broth in three separate conical flasks containing glucose, maltose and lactose. The above solution (peptone water broth + indicator) was added at equal proportions. Five milliliters of the mixture was then dispensed into Bijou bottles. Durham tubes were added and the bottles were sterilized in the autoclave at 121°C for 15 min. After cooling, the test organism was inoculated into each of the Bijou bottle and inoculated for 24h. Acid production was indicated by a change in colour of the mixture while gas production was indicated by bubbles in the Durham tubes.

INDOLE TEST

This test was carried out to determine the organism that break down the amino acid tryptophan into indole. The test organism was incubated in sterile test tubes containing peptone water and incubated at 37°C for 48h. 0.5ml of kovac reagent was added and mixed to stand for 10 min. The development of a pink color indicated a positive result.

SPORE TEST

Bacteria film was made on a slide and heat fixed with minimal flaming. The slide was placed in the rim of a beaker of boiling water, with the bacteria film upper most. The film was flooded with a 0.05% aqueous solution of malachite green when large droplet have been condensed on the underside of the slide and left to act for 60 sec while the water continue to boil. The slide was washed in cold water and treated with 0.5% safranin solution and left for 30 sec. The slide was washed with clean water, dried and viewed under the microscope. This method colored the spore green and the negative bacillia red

METHYL RED TEST

The test organism was introduced into glucose phosphate peptone water and incubated at 37°C for 48h. 5drops of methyl red reagents were added, mixed and the result read. A red coloration indicated a positive result while a yellow coloration indicated a negative result.

CITRATE UTILIZATION TEST

The medium used was simmone citrate agar. The test is used to identify each organism which of the organism can utilize citrate as the sole source of carbon for metabolism. It is used in the differentiation of the organism in the enterobacteriaceae and other genera. Bijou bottles were used for the test in saline

preparation of the organism was inoculated inside the citrate medium and incubated at 37°C for 24h. A change in color from green to blue indicates a positive result

VOGES PROSKAEUR TEST

The test organism was introduced into glucose phosphate. Peptone water was incubated at 37°C at 48h. 5 drops of Barrites A (alpha naphthol) and Barrite B (potassium hydroxide) reagent were added, mixed and the result read. A pink burgundy coloration indicated a positive result

Total viable count

One millimeter each of the enriched samples was serially diluted and 0.1ml aliquot of the serially diluted sample (10^7) was introduced into sterile plates and sterile nutrient agar added. Duplicates plates were prepared. Ketoconazole was introduced at a concentration of 0.05mg/ml to inhibit fungal growth. Incubation was carried out in an inverted position at 30°C for 24h after which the bacteria colonies that developed were counted and result recorded. Each colony was sub cultured and stored in sterile nutrient agar for characterization and identification.

RESULTS

In general, the bacteria lead on the salad vegetable varied. The total viable count ranges from 1.83×10^7 cfu/g to 3.26×10^7 . Carrot had a total viable count of 3.26×10^7 and it is the vegetable with the highest bacteria load.

Tomatoes had 2.43cfu/g, green beans had 1.83cgu/g, cabbage had 2.93cfu/g, cucumber had 2.83cfu/g and onions had 2.43cfu/g. all the salad sample had microorganism in them. Some had gram positive while some had gram negative bacterial organisms. The morphology and biochemical characteristics of the bacteria isolates from the salad samples were shown in Table 2. The organisms were characterized and identified as the species of *Staphylococcus*, *Bacillus*, *Salmonella*, *Esherichia coli*, *Pseudomonas* and *Staphylococcus aureus*.

Table 1: Total viable count of the salad vegetable sample

Sample	Type of sample	Total viable count (cfu/g)
1	Carrot	3.26×10^7
2	Tomatoes	2.43×10^7
3	Green beans	1.83×10^7
4	Cabbage	2.93×10^7
5	Cucumber	2.83×10^7
6	Onions	2.43×10^7

Table 2: Morphology and Biochemical characteristics of the Isolate from Carrot, Tomatoes, Cabbage , Green beans, Cucmber, Onions

Sample	Isolate	Form	Gram reaction	Motility test	Catalase test	Coagulase test	Indole test	Spore test	Methyl red test	Voges praskaeur test	Citrate utilization test	Glucose	Lactose
Carrot	<i>Staphylococcus sp</i>	Coccus in cluster	+	-	+	-	-	+	-	+	+	+	+
Tomatoes	<i>Bacillus sp</i>	Single rod	+	+	+	+	+	-	+	-	-	+	+
Cabbage	<i>E. coli</i>	Blue cluster rod	-	+	+	-	+	-	+	-	-	+	+
Green beans	<i>Salmonella sp</i>	Short rod	-	+	+	-	-	-	+	-	-	+	-
Cucumber	<i>Pseudomonas sp</i>	Single cocci	-	+	+	+	-	+	+	-	+	+	+
Onions	<i>Staphylococcus sp</i>	Cocci in cluster	+	-	+	-	-	+	-	-	+	+	+

+ = Positive result
- = Negative result

III. DISCUSSION

Vegetables that are used as salad have been implicated as a cause of food poisoning and thus, they are hazardous to the health of the consumers who are infected with many types of disease. This could be linked to the fact that most of these vegetables are consumed without being subjected to thorough washing (Lund, 1992). The result obtained from this research work showed that there is a lot of bacteria count on these salad vegetables. From the result that was got on total viable count of 3.26×10^7 , Tomatoes has 2.43×10^7 , green beans has a viable count of 1.83×10^7 , cabbage has 2.93×10^7 , cucumber has 2.83×10^7 and onions has 2.43×10^7 . Carrot had the highest bacteria count and has higher than the total viable count of samples that was analyzed and reported by Uzeh *et al.*, ((2009). Carrots are usually harvested from the soil and these will result to it been contaminated with soil pathogens. Tomatoes has bacteria pathogens in it and the organism that was isolated was *Bacillus*, a gram positive organism. Cabbage has *E. coli* in it and the bacteria load is high. Green beans has a low bacteria lead and the organism isolated from it was *Salmonella* while cucumber and onions was analyzed and *Pseudomonas* and *Staphylococcus* was found in the salad vegetables. The result got in this research work agreed with the analysis done by Abdullahi and Abdulkareem, (2010).

Contamination of these organism might arise from washing the vegetables with contaminated water or handling by infected marketer. The presence of these organisms can cause food borne diseases in consumers of these product.

IV. CONCLUSION

Carrot has the highest bacteria count while green beans has the lowest bacteria count. These bacteria organisms can serve as an indicator for the need to promote awareness about the possible health hazard that could be due to poor handling of these vegetables. Therefore, there is the need for regulation bodies to ensure that microbiological standards are established and

practiced by farmers and marketers for the handling and distribution of salad vegetables.

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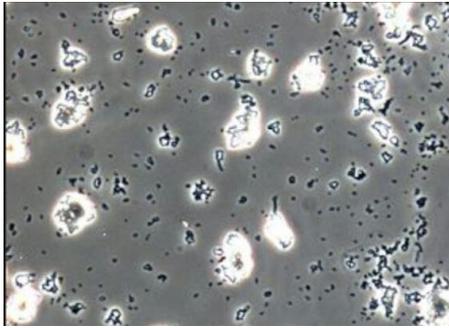
Correspondence Author – Oji, Promise Chukwuma, ojipromise@gmail.com, N/A, +234 8068356706.

APPENDIX

Materials needed

Nutrient agar
MacConkey agar
MRS agar
Petri dish
Distilled water
Conical flask
Syringes
Masking tape
Test tubes
Wire loop
Glass slides
Weighing balance
Autoclave
Bunsen burner
Hydrogen peroxide

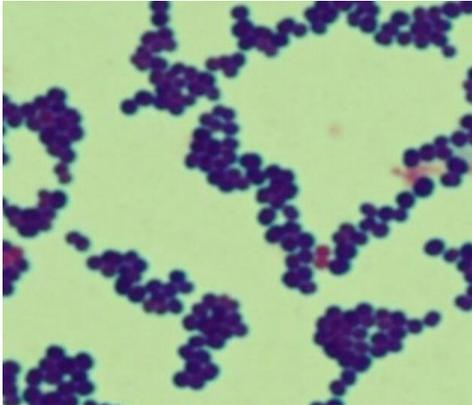
MICROSCOPIC VIEW OF BACTERIA FOUND IN SALAD VEGETABLE



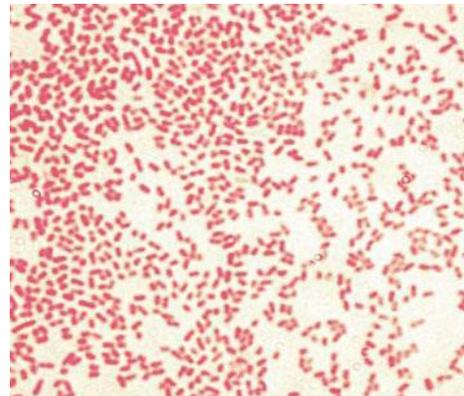
E. Coli



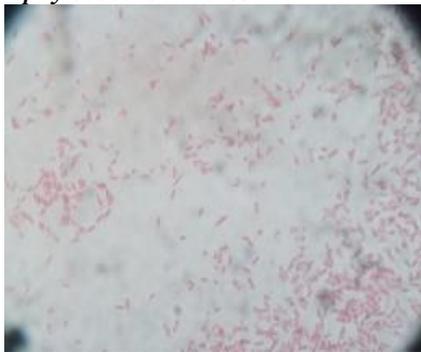
Bacillus anthracis



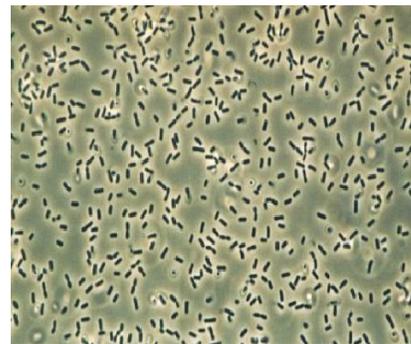
Staphylococcus aureus



Pseudomonas aeruginosa



Salmonella typhis



Bacillus subtilis

Effect of yield, quality attributes and cost of rice (*Oryza sativa L.*) variety under System of rice intensification (SRI) Organic & Conventional methods of rice cultivation.

Shivkant Shukla, Joanna Bloese, Tapan Ray

Abstract- System of Rice Intensification (SRI) paddy was introduced to offset the heavy cost of Conventional paddy cultivation. To decrease the cost of cultivation in Conventional paddy, to increase profits of the farmers in rice cultivation by decreasing the use of fertilizers, pesticides and minimizing water use by scientific water management in the face of labour scarcity, SRI paddy was introduced in Madagascar. In Conventional paddy the spacing of 20x15cms was followed and 20-25 days seedlings were used, and whereas, in SRI paddy cultivation, the wider spacing of 25x25cms was followed and by 8-12 days seedlings were used. Although large number of labour were needed for weed management in Conventional paddy, minimal labour was required for weed management in SRI paddy because of using weeders and machinery for weed management. While large amount of water to the tune of 2"-5" inundation was required for Conventional paddy cultivation, a film of water up to 1" only is maintained throughout in SRI paddy cultivation. The use of pesticides was heavy in Conventional paddy cultivation, where as the pest management is done without chemical pesticides in SRI paddy cultivation. The profits attained due to SRI paddy cultivation was higher as compared to Conventional paddy cultivation, therefore, SRI paddy was called as poor farmers' crop.

Index Terms- System of Rice Intensification (SRI) method, Conventional cultivation practices, Weed management, Pesticide management, Comparative cost analysis.

increases yield, saves water, reduces production costs, increases income and that these benefits have been achieved in 40 countries. SRI paddy was introduced for the benefit all the farmers. And as conventional paddy cultivation was oldest method of rice cultivation. The Conventional method needs extra labour and a lot of fertilizers, The Conventional paddy cultivation practices also had undergone changes due to changing times where, the cumbersome practices were replaced. The interest of the farmers in cultivating rice by using Conventional method has decreased as large numbers of farmers was using fertilizers and pesticides in the method of Conventional paddy cultivation to increase the production of rice. Farming with modern methods is also expensive using outside inputs. It was observed that, farmers adopting Conventional methods could increase their production only by using expensive inputs such as chemical fertilizers, pesticides and hybrid seed. It is becoming increasingly difficult for the community to afford these things. It is also known that using chemicals is harmful to the environment. a new method of growing rice is designed for increasing rice production which can use the organic compost, and also the local seed. This method is called "System of Rice Intensification" (SRI). In this context, a field experiment was carried out at the research farm of Nature Bio- Foods Ltd. (A Subsidiary of LT Foods Ltd.) DAAWAT group, the experimental site is located at 28.990°N 77.022°E 224.15m above mean sea level Sonipat district of Haryana. Experiment was conducted on effect of yield, quality attributes and cost comparison of cultivation.

I. INTRODUCTION

Rice is staple food for millions of people in the world particularly in developing countries. Globally rice is covering about 160 million ha with 685 million tons of production annually (FAO, 2009). Out of this, Asia accounts for 90% of the production and consumption. A System of Rice Intensification (SRI) is a combination of several agronomic practices including changes in nursery management, age of seedling transplanted, organic nutrient management, alternate drying and wetting and mechanical weed management (Uphoff, 2002). This system was first developed in Madagascar by Fr. Henri de Laulanie and spread to many parts of the world during the 1990's thanks in large part to Dr. Norman Uphoff. SRI is an alternative to water intensive and high chemical input practices. Although proven effective in Madagascar, modified SRI systems adapted to various geographical areas have proven difficult to evaluate and are controversial. Proponents of SRI claim its use

II. METHODOLOGY

The study on two methods of paddy cultivation i.e., Conventional and SRI was undertaken in Sonipat, where both these methods were practiced. kamaspur village was selected for demonstration; two farmers selected for the supervision for cultivating paddy with Conventional and SRI methods. Four split plot design and total of 12 treatments replicated 3 times. The field irrigated by both natural precipitation and well water. and used standard pest monitoring techniques to evaluate pest levels in treatment plot on a weekly basis from time of transplanting to harvest, Plant height, Tillers, Insect and disease observation taken at 30, 60 & 90 days after transplanting (DAT) and at harvest.

III. FINDINGS

General characteristics of demonstration field:

Two acre (87120ft*) area was selected for demonstration. area upland plain, sandy loam soil and Water type (Ca +Mg-HCO₃) was found. to be of old age and middle age group whereas in SRI paddy farmer are found to be of younger age group. The average family size of Conventional paddy farmer was middle and large whereas the average family size of SRI Paddy farmer was medium. While Conventional paddy respondent was found to be educated (60%), the SRI paddy cultivator was found to be educated (90%). The average land holding of conventional paddy farmer was 3-5 acres, whereas, the average land holding of SRI paddy farmer was 4-6 acres.

Nursery management:

There are some differences between the SRI paddy and Conventional paddy in nursery management. While the SRI paddy cultivation needed 2kgs of seed per acre for nursery management, the Conventional cultivation needed 16kgs of seed per acre for nursery management. The cost of the nursery management in SRI paddy cultivation was 168 rupees per acre whereas, for the Conventional paddy nursery management it was 1250 rupees per half acre. Therefore, the farmers gained Rs 1082 per acre due to SRI cultivation up to nursery stage.

Germination percentage index was calculated using the following equation:

Germination rate is the average number of seeds that germinate over the 5- and 10- day periods.

$$\text{Germination (\%)} = \frac{\text{Number of seeds that germinated}}{\text{Number of seeds on the tray}} \times 100$$

86 seeds germinated in a tray of 100 seeds after 10 days, then

$$10\text{-day germination (\%)} = \frac{86}{100} \times 100 = 86\%$$

Method of transplanting:

There are major differences between the SRI and Conventional paddy cultivation in the method of transplanting. The method of transplanting in SRI cultivation needed 5-8 no's

of labour per acre, while the Conventional paddy cultivation needed 10-12 no's of labour. The wider spacing was followed between the plants and rows in SRI paddy (25x25cms) as compared to Conventional paddy (20x15cms). Therefore, the cost of transplanting incurred in SRI paddy was 1200 rupees per acre, whereas, in Traditional paddy the cost was double more to that of SRI method i.e., 2400 rupees per half acre. Therefore, was a gain of Rs 1150 per acre for transplantation only due to SRI method of cultivation.

Weed management:

By using the Cono-weeder free of cost supplied by the Nature Bio-Foods Ltd., the SRI farmer took up weed management engaging any external labour, three time were engaged 2-3 labour for hand weeding per acre costing Rs600, while in the Conventional cultivation method the farmer engaged 10-12 no's of labour per acre costing Rs2500 per acre. Therefore, the SRI farmers gained Rs 1900 per acre for weed management.

Method of harvesting:

The crop attained maturity earlier by ten days for harvesting in SRI paddy (112 days) as compared to Conventional method of cultivation (125 days). But, the expenditure incurred was observed to be same in SRI paddy as well as in Conventional paddy cultivation methods for crop harvesting which was Rs.1500 per acre.

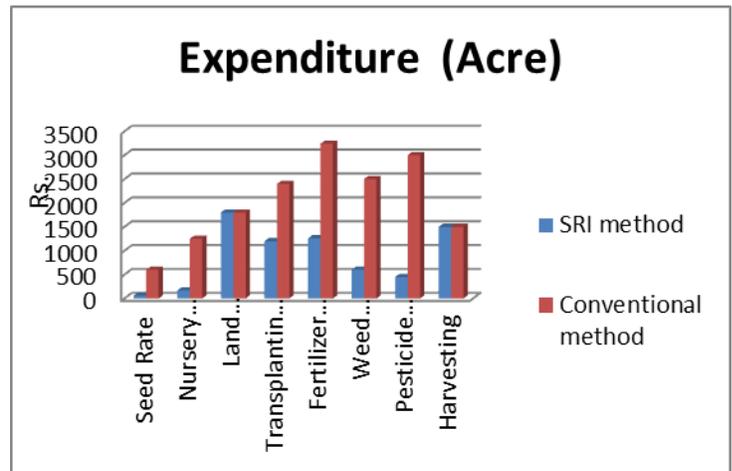
Yield and cost of cultivation:

The yield differences were observed in case of SRI and Conventional paddy cultivation methods. While the farmer following SRI method could get 25-26 bags of rice per acre, the farmer practicing the Conventional method of paddy cultivation could get only 16-18 bags of rice per acre. It was observed that in one bunch of paddy panicles of Kranti in SRI paddy method there were 3500-3700 grains, while in Conventional method, only 2400-2600 grains were observed. The total cost of cultivation per acre for SRI method was Rs.7038, while in Conventional paddy it was Rs.16290. Therefore, the profits gained due to SRI cultivation was Rs.9252 per acre.

The cost and expenditure of SRI paddy and Conventional paddy cultivation of sample farmers are given in the table as shown below

Table: The cultivation cost of SRI and Conventional paddy methods
(n = 60)

S.No	Cultivation Practices	Expenditure (SRI method)	Expenditure (Conventional method)
1	Seed Rate	Rs60	Rs600
2	Nursery management	Rs 168	Rs1250
3	Land preparation	Rs 1800	Rs1800
4	Transplanting management	Rs 1200	Rs2400
5	Fertilizer management	Rs1260	Rs3240
6	Weed management	Rs600	Rs2500
7	Pesticide management	Rs450	Rs3000
8	Harvesting	Rs1500	Rs1500
	Total	Rs7038	Rs16290



In the table shown above, it was observed that the Cost of production Qtl. of SRI paddy was Rs.270.69, whereas in Conventional paddy it was Rs.626.53. It was observed that in Conventional, many costs were incurred for land preparation and chemical fertilizers. In SRI paddy cultivation, less expenditure was observed in case of weed management and pesticide management. In Conventional paddy cultivation method, it was observed that there was much cost for fertilizers followed by pesticide management. Less cost per acre was incurred for SRI method for nursery management as compared to Conventional method. The land preparation costs and harvesting costs incurred

for both the methods were same. The advantage of SRI method was seen in case of reduction in cost of cultivation, higher yields obtained per acre and lesser duration for harvesting the crop. Therefore, it is concluded that the SRI method of cultivation is advantageous to the paddy farmers as compared to Conventional method.

Growth parameters:

The plant geometry and spatial configuration is a crucial factor, which influences the growth, yield attributes and seed quality parameters of the genotypes. The results obtained on plant height at 30, 60 & 90 DAT and at harvest are presented.

Table: Response of method of cultivation variety of Kranti rice on days to 50 % flowering, yield attributes and seed yield (mean data of 2014- 2015).

Treatments	Variety	Days to 50 % flowering	Number of filled grains panicle	Number of unfilled grains panicle	Number of grains panicle	Panicle length (cm.)	Plant height (cm.)	1000 grain weight	Seed yield (q/ac)	Straw yield (q/ac)	Harvest Index (%)
O1	Kranti	91.3	167	13	156	21.8	80.4	24.8	24.6	3.57	89.8
C1		86.5	142	26	132	19.8	72.5	23.2	19.8	2.98	84.3

Table: Effect of seed quality attributes of Kranti rice (mean data of 2014- 2015).

Treatments	Variety	Other Grain %	MBD	MAD	Immature (%)	Red grain % Paddy	Dead grain	Green % in head rice	Chalky % in head rice	DD in head rice	Head rice %	Broken %	Total yield	Quality points	Amylose %	Length	Breadth
O1	Kranti	0	13.0	13.0	0.20	0	0.5	0.80	7.00	5.80	77.04	1.30	78.34	96.72	24.7	5.36	2.42
C1		1	14.76	13.90	1.18	1.5	1.0	1.1	8.60	6.20	79.05	2.02	72.18	89.86	19.10	4.98	2.12

O1 - Organic method, C1 – Conventional method

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Social Injustice from the Presence of the Bauxite Mining Companies. Study in Tayan Hilir, Sanggau District

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Abstract- The problems by the presence of mining companies is not only inflicting damages to nature, but also causing damages to the social environment. This research aims to study the social injustice by the presence of mining companies in Tayan Hilir of Sanggau District in Indonesia. This research used the qualitative approach with a descriptive method. This research data retrieval used purposif technique in which the data was taken from both the informant of the companies and the relocated communities. Then, it was processed using qualitative analysis with described the social injustice by the presence of mining companies. The results explain the social injustices of government policies which favoured the compannies by giving capital and supports which lead them more superior and acting half "force" against the the communities. Whereas, the communities who have limited information and power to bargain got harmed in economical side. They lost their livelihood that was previously available, this occurs because the new area of relocation is not suitable for their livelihood. Based on facts, the land concessions in Semerah village did not match with the contract agreement. The company offered a relocation area but it is remote and there are no public facilities. In addition, ownership status of the land is not clear.

Index Terms- Social Injustice, Mining Companies, Land Concession

I. INTRODUCTION

The unrenueable natural energy resources spread in some areas, as described by Febriansyah, Artha; Novianti Vera; Ikhsan (2013:395. Criminal Acts in mining. Proceedings of the "law in development policies in Indonesia) that potential natural resources and metallic mineral reserves spread over 460 locations in western and eastern of Indonesia. Similarly, West Kalimantan also reserves natural resources especially gold mines, lead, iron, manganese, zircon, koalin and ball Clay. The Data Base of Energy and Mineral resources, Distamben West Kalimantan Province in 2011, explains that primary mining areas containing mineral material type such as bauxite are in Ketapang and Sanggau with total amount 622,921 million tons. Due to the very rich minerals, the investors are attracted to invest in mining because it promises huge advantages that should not be missed. Based on regulation No. 4 of 2009 about mining and minerals, regional chief of Sanggau district published permissions to 36 bauxite companies with areas of 517.175 hectares. Particularly, Tayan Hilir in 2012 gave permissions to the 16 bauxite companies. The large areas of mining has also impacted on lands of the local communities. The companies stated "having business license" by "half-forced" performing various efforts in order to

make spots that were suspected containing minerals in the communities lands submitted to the companies through land concessions.

Potential of mining minerals are explored and exploited, indeed, it also can add revenue to the State. But in future, it will impact badly on nature by making giant spots. It is due to mining is done by digging from inside the earth. Exploiting mines from land surfaces can not only damage nature but also undermine the community order surrounding the mining area. Tragically, the domination of right for business by the companies for a long period of decades is detrimental to the communities, which in turn making the communities unable to pull back their land that has been handed over to the companies.

Impact of the presence of mining companies also occurred in Tenggarong as described by Apriyanto and Harini (2013:290. Lib, geo. ac.id./ojs/index.php) and Fatmawati. (2014:164. Familial Bond of Multi-ethnic Society Based on Wisdom Culture Throug Social Network in Anticipation The Inter Ethnoc Cobflicts) based on the results of the research by the presence of coal mining in Loa Ipuh Darat Tenggarong, the negative impact is environmental damages such as contamination of the river, and large spots due to the excavation of coal. The growth of the community economy looks insignificant compared to the advantages gained by the companies. It is also described by Pertiwi and Dharma (2011:1. <http://respository.ipb.ac.id/handle/123456789/48181>) research results regarding the presence of coal mining in Sempaja Utara Samarinda which showed that the mining activities increased problems to communities as they cause erosion, floods, and contamination of water, air and soil. The natural damages indicator is dwindling of Karang Mumus River due to erosion of forest areas.

Problems arisen from the existence of mining companies that directly related to the residents are about land concessions. This case happened in Embaloh and Semerah village of Tayan Hilir. The residential relocation price area did not match to the companies bid and are incomparable to the land being sold. The location of relocation was also far away in remote villages. The deal points according the contract that has been agreed together apparently incompatible with the reality. The companies did not keep their promises.

The phenomenon of land cases occurred in tayan hilir also occured in other areas, for example agrarian problems. This problem elicited a prolonged conflict because the communities felt marginalized in their own land as sources of livelihood. Of course the communities have been manipulated by the power of capitalist as explained by Purbaya, Bawor dan Nurmala Dewi, Sisilia (2014:22. <http://www.mitrahukum.org/wp-content/uploads/2014/08/jurnal-04.apdf.pdf>). Seizure of lands by

having business permits *modus operandi*, while they have capital power to influence policies of natural resources that can secure their interests. These practices constituted a form of criminalization to public by a very strong corporation. Although the residents had made efforts of communication and discussion to the Government or the companies, in fact it was failed because their bargaining power was weak which made their aspirations unaccommodated.

The problems of land concession between the mining companies and residents in Dusun Embaloh and Dusun Semerah until now has not been settled, especially regarding the mismatch of land relocation either place or size, thus leading to huge losses for the residents and become a marginalization for their livelihood right.

Based on the indications that have been presented, the purpose of this paper is to discuss the indication of social injustice afflicting the residents by the presence of mining companies in district of Tayan Hilir through social justice perspective. Analysis of social justice is meant, according to John Rawls, 1972 (Ife, Jim & Tesoriero, Frank, 2008:106) seeking to apply the principle of equality in freedom and equality in chance to progress. In fact, the opposite condition occurs to residents around mines, an inequality -domination of economic structure and control of land by mining companies-exists.

II. RESEARCH METHODS

This research uses a qualitative descriptive method. This method describes a social phenomena in the area of bauxite mining in Tayan Hilir related to community land concession by mining companies. The primary data was obtained from the informants of the residents, mining companies, community leaders and some residents who knew the exact problems of land concessions. It was supported using the technique of collecting data through observation and interview. The observation techniques observed the location of the mining area and residential area as well as the area of land affected by the mining exploration. The interview activity has dug up information from the residents, the community leaders, the companies and the Government by using in-depth interview technique. The secondary data obtained through documentations and study of the literature pertaining to research objectives. The research data analysis was processed using qualitative analysis by describing the existence of social injustice in the presence of mining companies in Tayan Hilir.

III. DISCUSSION

Relocation Case of Bauxite Mining Company in Desa Tanjung Bunut

The relocated areas were Sei Merah Dusun Piasak, Desa Pedalaman (13 Families) and Dusun Embaloh in Desa Tanjung Bunut (105 families). The initial relocation area was Bukit Sembilan Belas, Dusun Embaloh Desa Tanjung Bunut. However, this relocation planing caused numerous problems especially from residents of Embaloh, Desa Tanjung Bunut. It because the location did not match the contract agreement with the companies.

Recently, bauxite mining in the region faced serious problems related to the relocation plan, particularly to areas in Embaloh. There are several issues that arise so that the relocation cannot be done between PT. Aneka Tambang, as owner of the concession permission, and the residents in Embaloh. The relocation from companies are placed on dissatisfactory locations, far from road access and public facilities such as markets, schools and hospitals. The resident considered the draft relocation may not be similar to their area, which is very strategic and fertile. In addition, several ex-mining companies in some areas left lands that cannot be replanted.

The unilateral actions of the companies by diverting land concession to a new location indicated an unclear ownership status on the new relocation area. Regarding this, Embaloh residents do not have legal certainty, thus it was difficult to utilize the lands to support their economic needs, social life and culture. The residents needed the certainty of ownership status for the new area. This uncertainty made residents unable to cultivate the previous land as livelihood and worried they would be moved forcefully to other unfertile location for farmland.

Natural resource management can add revenue to the State. Of course the residents looked forward to the presence of mining companies on their areas as it could improve their welfare through absorbing the local labors. In addition, the economic resources could also be managed by the residents. The residents expected new jobs, areas of trades and services, and accessible roads to connect isolated areas. In contrast, the presence of the mining companies has inflicted damages to the natural, social, economic and cultural. The following are examples of social injustice on communities due to the presence of mining companies.

The Injustice on communities by Government policy as the permission giver

The management of mining were derived from Government policy issued regulations as on law of Minerba or law no. 4 of 2009, it states that "the mining is some or all phases of activities in research, management and concessions of mineral or coal that includes the general investigation, exploration, feasibility studies, construction, mining, managements and refining, transports, selling and activities after mining". It is confirmed again in Article 6 and 7 that the management of mining, the authorities to conduct the management of mining is the Central Government, provincial governments and district/city governments. Then by Regulation No. 75 of 2001 about the issues of Decision power letter of Mining can be implemented by the Minister, the Governor, and the Mayor based on the authority mining area.

The local government authorities to give permission to companies allegedly contained "fraud". The local Government gave permission to companies which did not meet the requirements without looking to the situation and condition of the areas. As the Sanggau Government had given permission, 16 in total, to mining companies in 2012. This is the source of problems of mining management which was "already" given to the companies. The companies utilizes its own money power to "negotiate" with the authorities for their advantages. According to informants in Tayan Hilir, among 16 companies that had gotten permissions, they damaged hundreds of hectares of landscapes, agriculturals and plantations. The land became

infertile and could not be cultivated either for plantations and farmland. The area became abandoned without reconditioning. The suspected companies that has "pocketed permission" from Government conduct exploration and exploitation on residents lands which were suspected to contain minerals. As explained by Bawor Purbaya, Tandiono and Nurmala Dewi, Sisilia (2014. <http://www.mitrahukum.org/wp-content/uploads/2014/08/jurnal-04.-apdf.pdf>) explained that the existence of plantation and mining companies indicates manipulation practice on government regulation in various ways. The residents who have limited information and bargaining position have loss and become "victim" because of the power of companies' capital. The greatest loss is the problem of unmatched compensation for the land price. Finally, the residents become marginalized on their own land. Righteously, the Governments should "be on the side of communities" as their welfare.

Government's promises to improve local welfare through the presence of mining companies has become questionable. Whether the presence of companies can improve the economy of residents? Or just a few of them. For example, the labors recruitment left an unanswered question. Based on the result from an informant in Embaloh, he stated that the company previously promised labours recruitment would be recruited from local communities, but they ignored the promise. Instead, labors were brought in from the city. Their reason was that the local communities did not meet the technical requirements as mining labors. Therefore, the Government cannot yet be the facilitator to provide jobs for residents.

Injustice of access opportunities in economical resources between companies and local communities

Indonesia development goals are to improve society welfare and social justice. Those are aimed to be sustainable development as described by Tjokrominoto, Moeljarto (2008:12) that sustainable development will be realized through interlinkages among aspects of nature, socio-economic and cultural. Ecologically, the preservation of natural environment must not be damaged by humans. But in fact, the environment has been damaged as described by the Ife, Jim & Tesoriero, Frank (2008:53) through the declining of natural resources, the loss of biodiversity, while on the other hand, increasing of air pollution, increasing of nuclear and other toxic waste would lead the extinction of human civilization itself.

Community as a subject of development is none but the partner for both Government and entrepreneurs, especially not the victim of the development itself. Therefore, social justice has not impacted to the communities life rights. The thought of social justice (Ife, Jim & Tesoriero, Frank, 2008:107; John Rawls, 1973) is the awareness from society to justice, honesty and equality. Here, social justice acknowledges the equality of the rights of the individuals chance of getting individual and institutional aspects of social life. Equality becomes an important aspect of getting access to develop without any stress or intimidation for those who are unable to compete the investors. The problems of environmental and nature damages as described by Hartati & Zulfa Aulia (2013:155. Mineral and Coal Mining Management Reformation. Evaluative studies of Mineral Mining management policies and coal in autonomous regions. Proceedings of law in Indonesia development policies) lay out

the active role of local governments in maximizing of mines digging also trigger social conflicts and environmental damages in communities especially regarding residents' land. From this point on, the investors have a superior position in mining managements. Government involvement by providing opportunities to investors has empowered the mining companies to control business in Tayan Hilir. Sixteen companies have spreaded across villages in Tayan Hilir with lands of more than 200 thousand hectares.

Based on an interview from an informant in Tobak village, if all mining permits operated without any control, it would negatively impact the ecology in each village. As well, it would make the communities slowly be displaced to infertile areas, remote from access to districts. The total infertile areas due to mining exploitation are on the bukit 19 is proven to be high due to CSR responsibilities in December 2012 through land revegati program. Company planted fruits such as cempedak, jackfruit, guava, durian, and rambutan. However, the observers found that the land was infertile and contained only a very small amount of topsoil. This means that areas of ex-mining are unable to be planted. This also happens in other areas so that the land was left abandoned.

Such condition raises the potential for conflicts, as reaffirmed by Habib, Ahmad (2004:23) that potential conflict in rural areas due to the companies domination on the economic resources. This injustice comes from the power of companies cutting the livelihood opportunities of communities. This condition raises the conflict between both sides. The impact of the presence of mining companies in fact has chagrined the community.

The communities "helplessness" by the power of the capitalist who can do anything in mining management, for example, land dispossession through the concession, is regarded as a deprivation of communities rights. In some cases, the current relocations leave a lot of problems. These conditions cause difficulties for communities to fulfill their daily needs, which then wedged them and omitted their livelihoods. The communities are difficult to get new livelihoods. As explained, according to Paranoan, Risal and Djaja (2013:122. The analysis of Mining Policy Impact towards the socio-economic of community in kelurahan Akroman. E-Journal Administrative Feform), most agricultural lands were turned into mining areas, most of the community lost their land, sources of life among generations.

Injustice of land concession for residents

The companies mining areas also penetrated into Sungai Jaman and Des Emberas. Thirty three families on both villages were moved to inappropriate locations. The relocations were in remote area and away from public facilities and districts. The location of previous residents was very strategic, close to public facilities and other villages. This problem resulted the rejection from residents. This is due to the incoherent deal with companies that has promised to relocate them to a more strategic location than the previous ones.

The incoherent relocation may initiate conflicts between the companies and the communities. Residents do not agree with the inappropriate relocation, so they protest the companies. This is emphasized by Purbaya, Bawor and Nurmala Dewi, Sisilia

(2014:22. <http://www.mitrahukum.org/wp-content/uploads/2014/08/jurnal-04.-apdf.pdf>) that stated conflicts of natural resources are not a conflict between two sides with an equal strength. By supports from State and money power, the companies have a stronger position on communities in social structure. Based on this argument, the author believed that marginal position of communities is social injustice by the power of authorities and companies.

Uncovering a social phenomena with potential conflicts in mining areas basically is a response from communities toward the existence of mining companies. They hope significant changes to improve the quality of their life as a part of the mining companies presence. Activities related to the social order of culture based on values and social norms, such as working together and other socio-economic activities, are degraded. now, those are shifting and turning into an individual life style. They are competing each other to dominate economic resources leading to liberal economy.

Potential conflicts originated from the conflict of interest between the companies and the residents changed to inter-residents. On one hand, the residents clashed and avoided each other. They negotiated with a profitable side, mainly the companies. On the other hand, the companies wanted their business to run smoothly. The residents could be "accomplices" of the companies as a part of newly-made Corporation. Disapproval of land concession described by a resident in the area said that some residents were accompanied by Leaders of Dayak Tobag to question the land which is not in accordance with the agreement. The residents also asked to revise the agreed contracts. However, the company argued that the relocation of land was fit to the agreement and quite decent for livelihood.

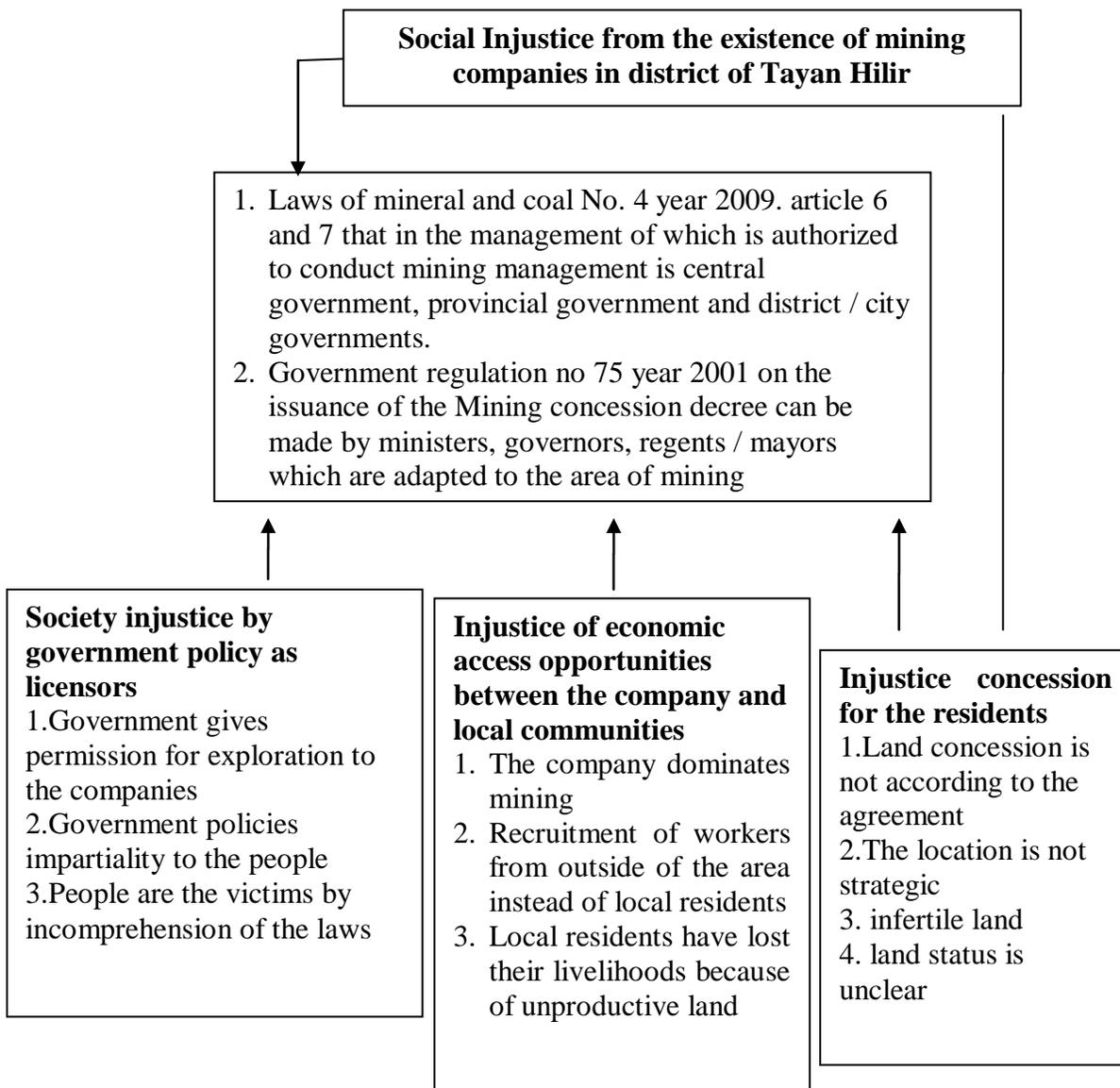
This mismatches of perspective begin from the rise of potential conflicts in the mining environment and lead to other problems by the presence of bauxite mining. As emphasized by Atok, K and Sinju, B (2009: 296) and Jenkins, Heledd (2004:23. Corporate social responsibility and the mining industry: conflicts and constructs. Corporate Social. <http://onlinelibrary.wiley.com/doi/10.1002/csr.50>) that the injustice control of various social groups such as tenure by entrepreneurs exclusively spawned a crisis of justice resulted in people being "refugees of development" marked by the loss of rights over resource management on communal land. Similarly, the potential for most vulnerable conflict in the district of Tayan Hilir is land conflict.

The existence of mining companies, PT. Aneka Tambang Tbk, PT Kapuas Bara Mineral, PT. Indonesia Chemical Alumina, PT. Kapuas Persada Prima, PT. Kalmin Lestari, based on the research results have raised some cases involving the dignity of citizens. Indeed before the presence of mining companies, the forest area was used as a source of livelihood by using plants found in the forest, animals and rivers for fishing. The

community freely used the land for farming, such as rice and vegetables, and plantation such as rubber. When the residents work the land for rice farming, they can also work on a variety of different crops such as another crops that were planted around rice fields and vegetable crops. The results of these plants can be sold to make money. When the presence of mining with the procurement of the vast land, resulting in loss of the source of livelihood of citizens. People are looking for other livelihoods such as being a miner or vehicle services (motorcycle taxis).

These economic loss is incomparable with the presence of companies that says it will improve people's welfare. When citizens lose their source of life because of the reduced land which is inoptimal for agricultural land, the only hope for the people is by getting a job in the company. In fact, bauxite industry employs very few local residents, by reasoning that local employers do not meet the requirements of expertise in accordance with company requirements. This creates new unemployments due to the existence of the company. Moving on from the phenomenon, mining has resulted in a decreased level of income for citizens. Recruitment of labor from other regions was confirmed by Yudhishtira; Krisna Hidayat, Revelation; Hadiyanto, Agus (2011 Journal of Environmental Damage Impact Assessment Due to Sand Mining activities in the Meningar village of Mount Merapi Region) where mining attracts migrants to find job so it cuts the opportunity for locals. This creates social jealousy which has potential of conflict between locals and migrants.

The phenomenon of the presence of mining companies, of course, is the public land which has been usually tilled for agriculture will be narrower or even disappear, so that the culture of cooperation and mutual assistance as well as the simple nature of the farming communities in rural areas will also be destroyed and replaced by consumer culture, which can emerge new social problems. In fact, the presence of Bauxite mining companies in the district of Tayan Hilir still leaves the environmental damage and the degradation of the social environment issues; in other words, it is destructive to the economic, social and local culture. The impact of the existence of mining towards the local residents is that they have to bear the heavy burden of life because of damaged natural environment which means a loss of biological resources — the foundation of their life. That means mining does not have any significance on the increasing of income of local residents. But, the presence of mines are considered as one alternative to increase the productivity of foreign exchange to finance the government, with the possibility of turning a blind eye to the natural damage and social environment damage to the surrounding areas. The injustice conditions that occurs will be described more details in the schematic of bauxite mining below:



Schematic of Mining Existence Injustice in Tayan Hilir, 2015

Significance that mining can improve the welfare of society requires further study. As Fatmawati (2011: 12) and [Triscritti, Fiorella. \(2013:438. Mining, development and corporate–community conflicts in Peru. \(<http://cdj.oxfordjournals.org/content/48/3/437.full>\)](#) explains that the existence of the (group of) employers will marginalize the vulnerable groups, so that it will create new poverty for the people of lower classes. Application of justice in the environment management must be seen within the framework of what becomes the environmental rights and what becomes the human rights, in this case is in the form of the fulfillment of the right of one party to the other party. Since humans are born, people have got the right to survive in their environment. In the context of justice, human beings have an obligation to maintain, preserve, protect, and conserve the environment, so that people can be assessed as fair to the environment.

In fact the presence of bauxite mining companies in the district of Tayan Hilir still leaves the issue of environmental degradation. Foreign exchange earnings are not comparable to the results of mining damage to nature and the environmental damage caused. So it becomes destructive to the economic, social and local culture. The impact of mining forces the local residents to bear the heavy burden of life because of the damaged natural environment, which means a loss of biological resources that have been the foundation of their life. That means mining does not have the significance on increasing the income of local residents. Nevertheless, currently the presence of mines are considered as one alternative to increase the productivity of foreign exchange to finance the government, with the possibility of turning a blind eye to the natural damage and social environment damage in surrounding of mined areas.

IV. CONCLUSIONS

Based on the explanation above, the conclusion of this paper is that the presence of mining companies in the Tayan Hilir, Sanggau Regency has created injustice for the society. Mining companies superior position as the financier makes the getting privileges from the government to the benefit of their companies; on the other hand, the community remaining in a weak position turns into the injured party, eventually they have been marginalized in their own livelihoods and life. As in cases involving the relocation of citizens "displaced" by the company, their new locations are not representative; the relocation placed them in the far remote location and lack of public facilities, besides it closes the opportunities for the source of life and livelihoods. The fact that since the presence of the mining, social justice has not reached the rights of the people who live around the mines.

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Functional Analysis of Clause Complex in the Language of News Websites Texts: A Comparative Study of Two Articles

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Abstract- This paper aims to attempt systemic functional analysis of clause complex in news texts adopting Hallidayan linguistic perspective. News language may contain lexical and grammatical ambiguities that arise because of the use of technical terms that may cause confusion among their readers. Because news texts are written, they have more complex grammars and do not use pauses, stresses, intonations and tones of speech as those in spoken language. Here lies the reason behind the difficulty of meaning that people might face and then they try to interpret it in more than one meaning. According to Leech (1981:30), “*An expression is said to be ambiguous when more than one interpretation can be assigned to it*”. Now, comes the role of clause complex to resolve the problems by analyzing the modes of meaning in those texts.

The term clause complex in Systemic Functional Linguistics (SFL), according to systemicists such as Halliday, Matthiessen and Eggins, does not refer to a sentence; since that term can be used for both spoken and written language whereas a sentence can be only used in written language. S. Eggins (2004:255) mentioned that “*while the sentence is an orthographic unit of written language, the clause complex is a grammatical and semantic unit, and it is a unit that occurs in both spoken and written language.*” Halliday and Matthiessen (2014:436) state that “*The sentence is the highest unit of punctuation on the graphological rank scale and has evolved in the writing system to represent the clause complex as the most extensive domain of grammatical structure.... We will use the term **sentence** to refer only to this highest-ranking graphological unit of punctuation.*”

There are two systems involved in the formation of clause complexes. One is Tactic System or Interdependency and the other is Logico-Semantic relation and all of which operate within clauses. Clause complex consists of two or more interdependent clauses. They are made of paratactically or hypotactically related clauses that are connected together in systematic and meaningful ways. When we put many clauses together, the meaning is strengthened. As pointed out by Halliday and Matthiessen (2014:430)

“*Semantically, the effect of combining clauses into a clause complex is one of **tighter integration in meaning**: the sequences that are realized grammatically in a clause complex are construed as being sub-sequences within the total sequence of events that make up a whole episode in a narrative*”.

Systemic Functional Linguistics is assumed to have effective tools to resolve the vagueness and difficulties in language by providing functional and systemic analyses.

Therefore, clause complexes can help us simplify the structural and grammatical meanings of the texts of news through studying the tactic and logico-semantic relations of those texts.

The purpose of this paper is to analyze two news articles using Systemic Functional Grammar and show their clause structure patterns and how the patterns construe the meaning using descriptive and analytical methods only. The two news articles are selected from two news website; namely www.Al Jazeera.net and www.Al Arabiya.net on October 24, 2015. The mode of all the scripts under consideration is written texts. Besides, the themes, lexicogrammatical system as well as metafunctions of the texts will be explored during the analysis.

Though both texts belong to the same genre (news), they exhibit a little bit different display of clause complexes. **AJE** article shows more hypotactic percentage than **ARE** article does. Both texts favour extension and enhancement in their lexicosemantic relations. Extension and enhancement are used to refer to the sequential and causal relations in the occurrence of story. Regarding types of projection, the **AJE** text uses more hypotactic projections than the **ARE** text does and conversely the **ARE** text has more parataxis than the **AJE** text as the percentage shows for them respectively: hypotaxis: **AJE** (74%) and **ARE** (63%) and parataxis: **AJE** (26%) and **ARE** ((37%). This technique is used to provide their addressees with the main sense of the event. In brief, SFL is an effective tool for uncovering the meanings that lie behind the lines of texts.

Index Terms- Systemic Functional Grammar, Clause Complex, News websites Texts, Logico-Semantic Relations, Tactic System

I. INTRODUCTION

Language is used to express the needs and intentions of the speakers. Language structure and language functions go hand in hand to build up the intended meaning and purpose of the communication among any society members. We use language for many purposes such as talking about events, or expressing what our feelings to others. Language is said to serve many different purposes through the linguistic structures that carry the meaning potential.

Language has metafunctions that are central to the way the grammar works in the language system. These three functions express experiential (ideational), interpersonal and textual meanings. In order to understand the full functionality of any

utterance it is necessary to consider all of these three meanings simultaneously.

The paper compares two website news articles and aims at identifying the main similarities and differences of the aforementioned three systemic principal types of meanings that will be examined later.

The articles are selected from two popular news website: <http://english.alarabiya.net/> <http://www.aljazeera.com/> and they report the same factual event of a war-conflict story involving Russian intervention in Syria. Both of the papers are addressed to the same audience and accordingly are expected to represent a similar style of a common tabloid reporting.

The analysis is comparatively done by adopting a lexicogrammatical examination and a summary of style, context and register of both texts.

The referencing used throughout my paper is as follows: **AJE:** Al-Jazeera English website, <http://www.aljazeera.com/> and **ARE:** Al-Arabiya English website, <https://english.alarabiya.net/>, § 1: paragraph one, § 2: paragraph 2 etc. The articles will be written at the appendix at the end of this paper.

II. THREE LINES OF MEANING: METAFUNCTIONS

Halliday (1994:34) draws the attention to the importance of making three distinct functions [Subject, Actor, and Theme] in the clause saying that “each one of them forms part of a different functional configuration, making a strand in the overall meaning of the clause”. The strands of meaning are as follows:

- I. *The Theme functions in the structure of the clause as a message. The Theme is the point of departure for the message.*
- II. *The Subject functions in the structure of the clause as an exchange. It deals with speech roles in exchange as giving and demanding.*
- III. *The Actor functions in the structure of the clause as representation. A clause has meaning as a representation of some process in ongoing human experience.*

Table1. Three lines of meaning in the clause by Halliday and Matthiessen (2014:83)

Metafunction	Clause as	SYSTEM	Structure
Textual	Message	THEME	Theme ^ Rheme
Interpersonal	Exchange	MOOD	Mood [Subject + Finite] + Residue [Predicator (+ Complement) (+ Adjunct)]
Experiential	Representation	TRANSITIVITY	process + participant(s) (+ circumstances), e.g. Process + Actor+ Goal

It is the structure as a whole that construes the meaning. Process + Actor +Goal is a configuration that is referred to as a structure in Systemic Functional Grammar. A clause is an entity that is composed of three elements. Each element of the clause construes a meaning. The three lines of meaning are referred to as metafunctions.

2.1 Experiential Metafunction analysis

As well as using language to interact with people, we clearly use it to talk about the world, either the external world – things, events, qualities, etc. – or our internal world – thoughts, beliefs, feelings, etc. Halliday introduced the clause as a multifunctional construct consisting of three metafunctional lines (textual, interpersonal and experiential). The three metafunctions contribute equally to the overall meaning of a clause as a whole. The meaning of a clause is a configuration of those three meanings.

From the experiential perspective, language comprises a set of resources for referring to entities in the world and the ways in which those entities act on or relate to each other. Halliday and Matthiessen (2014:212) clarifies this point as saying “*And experientially, the clause construes a quantum of change in the flow of events as a figure, or configuration of a process, participants involved in it and any attendant circumstances.*” The experiential metafunction can be classified generally as a *process (realized by verbal group), participants (realized by*

nominal group) and circumstances (realized by Prepositional or adverbial phrase).

Systemic functional grammar highlights language use in context. Therefore, language **use** is highly emphasized by Halliday (1970:1) “we shall consider **language** in terms of its **use**”.

2.1.1 Participants, processes and circumstances – comparative analysis

2.1.1.1 AJE § 5 and ARE § 3

Russia launched an air campaign in late September ostensibly against ISIL and other "terrorist" groups, but the FSA say most of the air strikes are targeting them and other moderate opposition groups. **AJE**

Russia (Participant/ Actor) launched (Material process) an air campaign (Participant/ Range) in late September (Circumstance of time) ostensibly (Circumstance of manner) against ISIL and other “terrorist” groups (Recipient) ...

‘Moscow began an aerial campaign in Syria on September 30, saying it was targeting ISIS and other "terrorists". **ARE**

Moscow (Participant/ Actor) began (Material Process) an aerial campaign (Participant/ Range) in Syria (Circumstance of location) September 30 (Circumstance of time) ...

Although these two clause complexes are about the same factual event, that is, Russian intervention in Syria, they are tackled from different perspectives.

The primary difference between the clauses is the choice of lexis to describe the material processes. AlJazeera.net used the verb “launched” and AlArabiya.net adopted the verb “began”. Also, the choice of lexis between “Russia” and “Moscow” has been carefully selected.

The material process “launched” indicates that Russia conducted extensive air strikes abruptly but intentionally. It is the ‘doer’ of the action.

Material process “began” implies that Moscow was the initiator of the action on Syrian rebels and also indicates that there might be a price to pay for the action. It is the actor in this clause complex as it intentionally started the assault by beginning it. The verb “began” also might suggest that it is Moscow that started attacking Syrian rebels. The role of lexis is played here by using the word “terrorism” inside the inverted commas to question the Moscow intention of war. This indicates the negative impression of Al-Arabiya stance from the Russian roles in Syria.

2.1.1.2 AJE § 3 and ARE § 1

Sergey Lavrov's offer on Saturday was immediately rejected by Syrian rebel factions, which dismissed the idea they could cooperate with Russia while it supported President Bashar al-Assad. **AJE**

Sergey Lavrov's offer (Participant/Goal/Nominalization) on Saturday (Circumstance of time) was (Finite/ Past) immediately (Circumstance of manner) rejected (Predicator/ Material Process) by Syrian rebel factions (Participant/ Actor)...

Syria's Western-backed opposition on Saturday rejected a Russian offer to assist them against the Islamic State of Iraq and Syria (ISIS) group and dismissed Moscow's call for new elections. **ARE**

Syria's Western-backed opposition (Participant/Actor/ Nominalization) on Saturday (Circumstance of time) rejected (Material process) a Russian offer (Participant/ Goal) ...

In this comparative analysis, the same information is presented differently leaving different impressions on readers about the Russia's proposal to help Syria's rebel factions and their rejection to it.

AJE uses a material process in a passive clause to highlight the goal of the clause, that is, the offer that was rejected. The focus is on the action rather than the actor. **AJE** in its presentation limited itself to the fact that Russia offer to Syrian rebels was refused. The passive is actually used here to show what happened to the Sergey Lavrov's offer and this is called in Functional Grammar as the “**process of happening**”.

ARE, on the other hand, uses an active material process to highlight the “**process of doing**”, that is, the rejection of the Russian offer. The use of the expression “**Syria's western-backed opposition**” implies that not only did Russia intervene in Syrian affairs, but some western super powers were also involved. The mentioning of the words “Russia” and “western-backed opposition” indicate that Russia might face a fierce reaction by the opposition rebels loyal to the West. Al-

Arabiya.net is clearer than Al-Jazeera.net in specifying who is rejecting the Russian offer. The combination of the two verbs “rejected” and dismissed” in this situation are reflecting the Al-Arabiya negative opinion from Russia's roles in Syria.

2.1.1.3 AJE § 2 and ARE § 7

Russia's Foreign Minister says his country is ready to support the Free Syrian Army (FSA) with air strikes and cooperate closely with the US in fighting the Islamic State of Iraq and the Levant (ISIL) group and other factions. **AJE**

In this clause we have projecting and projected clauses. But this is in the form of reported and reporting.

Russia's foreign minister	Says	his country is ready to support the Free Syrian Army (FSA) with air strikes ...
Sayer	Verbal process	
α : Reporting		β : Reported

The comments came after Russia's Foreign Minister Sergei Lavrov said Saturday that Moscow was ready to support Syria's "patriotic opposition, including the so-called Free Syrian Army, from the air". "The main thing for us is to approach the people fully in charge of representing these or those armed groups fighting terrorism among other things," he told Rossiya 1 television station. **ARE**

Russia's Foreign Minister Sergei Lavrov	Said	Saturday that Moscow was ready to support Syria's "patriotic opposition..."
Sayer	Verbal process	
α : Reporting		β : Reported

Both of the compared clauses refer to the reported speech of the Russia foreign minister about his country's readiness to aid the Syrians against the “terrorist groups”.

AJE in its presentation of the verbal process “says” in the present time to refer to the ongoing Russian offer to support the Free Syrian Army with airstrikes. Unlike **ARE**, **AJE** remains unbiased of the event description in this clause complex.

ARE adopted a different path in its picturing of the event of Russia's supposed support to Syrian militants. It uses lexis such as “patriotic opposition” satirically because Russia stance is known to be by the side of the existing regime and the Syrian regime calls all those against it as “terrorists”. The question is “*which is the patriotic opposition then?* Secondly, **ARE** uses that Russian Foreign minister used the expression “the so-called Free Syrian Army” to show that Russia underrates the Free Syrian Army military strength and hence calling it like alleged army by using the nominal group “the so-called Free Syrian Army”.

2.1.1.4 AJE § 11 and ARE § 13

Russia wants Egypt and Iran to play a role in bringing a solution to the conflict in Syria, which has raged on since 2011.

AJE

||| **Russia (Participant/Senser) wants (Mental Process: Desiderative) Egypt and Iran (Participant/ Actor) || to play (Material process) a role (Participant/ Goal) in bringing a solution to the conflict in Syria..(Circumstance) |||** [clause nexus] (Halliday, 2014:586)

Russian Foreign Minister Sergei Lavrov and his Egyptian counterpart Sameh Shukri have agreed to continue cooperation in order to help find a political solution to the Syria conflict, the Russian Foreign ministry said on Saturday. **ARE**

||| **Russian Foreign Minister Sergei Lavrov and his Egyptian counterpart Sameh Shukri (Participant/Senser) have agreed (Mental Process: Desiderative) || to continue (Material process) cooperation (Goal).... |||**

Both of the clauses refer to mental processes. They are both hypotactic material processes with clause nexuses to express their experiential meanings.

AJE uses the mental process verb “want” to mark Russia’s need to get support for its stance in Syria. Additionally, the using of the material process verb “play” in the clause nexus shows that Russian regime has the incentive to change the game rules in Syria by getting more players “allies”. Also, by the mentioning of “Egypt and Iran” in this context, **AJE** overtly wants to tell readers about the type of players that Russia wants. Basically, Russia as well as the current regimes in Egypt and Iran also support Syrian President Bashar Al-Assad publicly and this may explain the Russian cooperation with them.

ARE in this sentence shows more neutral stance.

2.2 Interpersonal Metafunction Analysis

Interpersonal meaning handles speaker’s roles in exchange. Personal interaction is focused on in this case. It deals with speech roles in exchange as giving and demanding. Halliday calls this function as the ‘*language as action*’. Halliday and Matthiessen (2014:30) convey that “*This kind of meaning is more active: if the ideational function of the grammar is ‘language as reflection’, this is ‘language as action’. We call it the*

interpersonal metafunction, to suggest that it is both interactive and personal”.

Bloor and Bloor (2004:11) also state that “*Language is used to enable us to participate in communicative acts with other people, to take on roles and to express and understand feelings, attitude and judgements. This metafunction is known as the interpersonal metafunction.*”

The news articles basically are about real events and stories and these events are reported mostly using statements that are most naturally expressed by declarative sentences. The two articles in this paper mainly use uncomplicated Finite declaratives.

Most of the declarative clauses are Finite and refer to actions took place in the past. There are few sentences in both articles in present tense. There are three sentences in present tense in **ARE** article and two in **AJE** ranging from present tense to present perfect.

The analyzed news articles report information that has happened in the reality using declarative clause complexes. As a result, the interpersonal relationship between the addresser (news website staff) and the recipient (readers) involve a **choice** by the article writers to offer information (news) only. That’s why systemic grammar focuses on the role of choice in meaning making. Halliday and Matthiessen (2014:23) mention the importance of paradigmatic (choice) in the language as “*Of course, structure is an essential part of the description; but it is interpreted as the outward form taken by systemic choices, not as the defining characteristic of language. A language is resource for making meaning, and meaning resides in systemic patterns of choice.*”

2.2.1 Analysis of Mood

When the clause is regarded as an exchange, the general interpersonal organization is made up of two major components: Mood and Residue. It is the element Mood which goes in debate. The modal Adjuncts also add interpersonal meaning to the clauses. In SFL, Halliday and Matthiessen divide the Modal Adjuncts into Mood Adjuncts and Comment Adjuncts.

In the two articles in question, **AJE** has used two Modal Adjuncts in the article (§ 3 and § 5) respectively.

Sergey Lavrov's offer	On Saturday	Was	Immediately	Rejected	by Syrian rebel factions
Subject	Circumstantial Adjunct	Finite	Mood Adjunct	Predicator	Adjunct
Mood				Residue	

Mood Adjuncts allow the editors of the **AJE** news website to express the assessment of events. The assessment in the above clause negatively criticize the Russia’s interference in Syria and

its role is not welcome by the rebels who immediately rejected the Russia’s offer to help them.

Russia	Launched		an air campaign	in late September	ostensibly	against ISIL
Subject	Finite	Predicator	Complement Object	Circumstantial Adjunct	Comment Adjunct	Adjunct
Mood			Residue			

In the paragraph (§5), the writer expresses his personal and subjective assessment of the event of ‘air campaign’ to show that

the Russian airstrikes seemingly target the terrorist groups while they are hitting the Free Syrian Army and other rebels groups that fight Bashar Al-Assad army.

ARE uses only one modal adjunct in paragraph (§5) to describe the attitude of Samir Nashar, who is member of the Syrian National Coalition, towards Russian offer.

Samir Nashar, a member of the Syrian National Coalition, the opposition's main political body	Was	equally dismissive	of an alliance between moderate rebels and Russia
Subject Nominal group Complex	Finite	Mood Adjunct	Circumstantial Adjunct
Mood		Residue	

Except the above three examples, both articles abstained from using modality that could impose the ideology of the writers on their readers.

The interpersonal analysis of the two articles of **AJE** and **ARE** clearly shows that both passages did not impose their opinions in the information presented. Both articles are similar in interpersonal metafunction related to issues of acceptability of information, and the level of message credibility that writers share with their recipients. After analyzing the differences in interpersonal meaning of the articles, it can be summed up that both passages only project objectivity of the proposition. However, **AJE** article seems to be focusing on the offer of the Russian airstrikes to the Free Syrian Army rebels against ISIL while **ARE** article attempts to highlight the rejection of that offer of Russia by the majority of rebels.

2.3 Textual Metafunction Analysis

The Theme functions in the structure of the clause as a message. The Theme is the point of departure for the message. Eggins (2004:35) describes the textual meaning in the following way:

*“Third simultaneous strand of meaning that enables texts to be negotiated; textual meaning. In describing the structural configurations by which the clause is organized as a message, we will recognize that one major system is involved, that of **Theme**, with a configuration of the clause into the two functional components of a **Theme** (point of departure for the message) and a **Rheme** (new information about the point of departure).”*

Textual Meaning express the relation of language to its environment, either verbally (said or written) or non-verbally (context). They are influentially affected by the discourse mode. To analyze the textual domain of meaning in the target articles, the researcher will start from meaning from examining the functional category of Theme and then he will proceed to show how patterns of Theme development and constituents of Rheme

helped to build up the textual coherence and cohesion in both passages.

2.3.1 Topical Sentence

Theme is defined by Matthiessen et al as “the point of departure of the clause as message. It sets up an orientation or local context for each clause. This local context typically relates to the method of development of the text”, (2010:222).

I will investigate the opening sentences in passages in order to infer the writer’s point of departure for the whole texts.

AJE (§1)

Russian FM Sergey Lavrov	Says	He	is ready to work with the opposition forces ...
Sayer	Verbal process		
Theme	Rheme	Theme	Rheme

ARE (§1)

Syria's opposition	Western-backed	On Saturday rejected a Russian offer ...
Unmarked Theme		Rheme

Both articles’ opening sentences adopt a different angle on presenting their messages.

AJE passage uses the projection (reported speech) that shows neutral quoting. The Theme is contained in the projected clause because the projected clause contains the Theme as Halliday and Matthiessen (2014:443) state that “the secondary clause is projected through the primary clause, which instates it as (a) a locution or (b) an idea.” So, we find that the **Theme** is in **projected clause** that indicates the Russian foreign minister’s readiness to work with the opposition forces. The subject and Theme are conflated.

ARE passage on other hand begins its article with a nominal group as subject and Theme.

Thus the **AJE** (§1) is about the support that Russia offers to rebels. Therefore, the Theme is neutral.

ARE (§ 1) discusses the rejection of the Russian offer. The sentence draws the attention to the rejection rather than the offer itself. It also dubs the rebels who rejected the offer as loyal to the western countries, which in fact are against Russia actions in Syria. Therefore, it is concluded that the Theme is negatively implied and somehow leaves a negative first impression of the Russian offer.

2.3.2 Topical Theme

In English, the topical Theme is basically located in the last part of the Theme. Bloor and Bloor (2004:72) state that “The so-called **topical Theme** in any clause is the first constituent that is part of the meaningful structure of the clause. To put it another way, we can say that the topical Theme always represents a *Participant, Circumstance or Process.*”

The opening sentences introduce the main direction of what is to follow in the texts.

The Themes	AJE article	ARE article
Russia Offer And the opposition reaction	§1 Russian FM Sergey Lavrov	§2 Russia
	§2 Russia's Foreign Minister	§4 Moscow
	§3 Sergey Lavrov's offer	§ 9 Lavrov
	§4 Russia	§ 16 the Russians
	§ 6 Russia	§ 21 Russian Foreign Minister
	§ 9 Offer	§ 12 I
	§ 11 Lavrov	
	§ 12 Russia	
	§5 we	§ 1 Syria's Western-backed opposition
	§ 7 Samir Nashar, a member of ...	§ 3 we
		§ 15 Nashar
		§ 18 Syria
		§ 20 the country

Looking at the Themes in the texts, we will find out that both articles select mostly simple Themes with **AJE** article (91.6%) and **ARE** article (95.8%). They basically adopt nominal groups as subjects.

2.3.3 Thematic Progression

Thematic progression is about managing the flow of discourse for creating a coherent text. The meaning is achieved by two main elements in the text; that is, coherence and cohesion. Cohesion helps to organize discourse. The term refers to the connectedness of the surface elements in the text. The cohesive resources include reference, substitution/ellipsis, conjunction and lexical cohesion. Eggins (2004:33) mentions that “The cohesive resource of reference refers to how the

a. Types of taxis

Types of taxis	<Primary clause >	<Secondary clause>
1. Parataxis	1 (initiating)	2 (continuing)
2. Hypotaxis	α (dominant)	β (dependent)

b. Logico-semantic relations

1. **Expansion: the secondary clause expands the primary one**
 - a. Elaboration (=)
 - b. Extension (+)
 - c. Enhancement (x)
2. **Projection: the primary clause projects the secondary one.**
 - a. Locution (“)
 - b. Idea (‘)

3.1 Clause complex analysis

The clause complex analysis of the news texts reports will be as follows:

writer/speaker introduces participants and then keeps track of them once they are in the text.”

Usually, the Theme choice produces a coherent and cohesive text. Both texts use also textual Themes, as Conjunctions (e.g. ‘but’, ‘while’, ‘also’, ‘and’, ‘when’ and ‘after’,) to connect their clauses.

Eggins (2010:324) mentions three methods of Theme development of text. They are (i) Theme reiteration, (ii) the zig-zag pattern and (iii) the multiple-Rheme pattern.

Because texts with the same genre basically share similar patterns of thematic progression, both news article favour the pattern of **Theme reiteration** that is the Theme is repeated several times over several clauses. “One basic way to keep a text focused (i.e. cohesive) is to simply reiterate an element,” (Eggins,2004:324). This type of Thematic Progression patterns is used in short factual events. Both news texts prefer such a Thematic pattern to project a clear and strong topical focus.

III. CLAUSE COMPLEX

The term, clause complex, refers to the grammatical and semantic unit formed when two or more clauses are linked by tactic and logico-semantic relations. “This integrating of a series of events into a subsequence is a feature of narratives in general, including not only fictional stories but also narrative passages in biographical recounts, news reports and other kinds of text where past experience is construed in terms of a time-line,” (Halliday and Matthiessen, 2014:430). The analysis will also include the embedded projections because they add to the meaning of the texts. In support of this, Halliday and Matthiessen state that the use of such constructions “is important in the creation of discourse; one of the central uses of nominal groups with embedded projections is in the representation of arguments, as in newspaper reports and scientific discourse.” (2014: 534)

The system of clause complex that was proposed by Halliday can be depicted as follows:

AL-Jazeera.net Text: Russia offers Free Syrian Army air strikes against ISIL

- 1 (a) α ||| Russian FM Sergey Lavrov says
- (b) “β α || he is ready
- (c) xβ || to work with the opposition forces and the US against the armed group. |||
- 2 (a) α ||| Russia's Foreign Minister says
- (b) “β α || his country is ready
- (c) xβ 1 || to support the Free Syrian Army (FSA) with air strikes
- (d) +2 || and cooperate closely with the US in fighting the Islamic State of Iraq and the Levant (ISIL) group and other factions. |||

3 (a) α ||| Sergey Lavrov's offer on Saturday was immediately rejected by Syrian rebel factions,
(b) = β α || which dismissed the idea
(c) ' β α || they could cooperate with Russia
(d) + β || while it supported President Bashar al-Assad. |||

(4) (a) 1 ||| "Russia is bombing the Free Syrian Army
(b) +2 α || and now it wants
(c) ' β α || to cooperate with us,
(d) + β || while it remains committed to Assad? |||

5 (a) "1 ||| "We don't understand Russia at all,"
(b) 2 || said Lieutenant Colonel Ahmad Saoud, a spokesman for the Division..., according to the AFP news agency. |||

6 (a) 1 ||| Russia launched an air campaign in late September ostensibly against ISIL and other "terrorist" groups,
(b) +2 α || but the FSA say
(c) " β || most of the air strikes are targeting them and other moderate opposition groups. |||

7 (a) 1 ||| Samir Nashar, a member of the Syrian National Coalition, the opposition's main political body, said
(b) "2 ||| "80 percent" of strikes had hit the FSA. |||

8 (a) "1 ||| "Instead of talking about their willingness to support the Free Syrian Army, they should stop bombing it,"
(b) 2 || he said. |||

9 (a) α ||| The offer of air strikes in support of the FSA came
(b) x β ||| as Lavrov and US Secretary of State John Kerry spoke on about organizing talks between the Syrian government and the opposition. |||

10 (a) α ||| In a telephone conversation held at the request of the US side, the Russian foreign ministry said on its website
(b) " β α || that the two men had also discussed tapping the potential of other countries in the region
(c) x β || to push the political process forward. |||

11 (a) α ||| Lavrov also spoke to his Iranian counterpart Mohammad Javad Zarif about the need
(b) ' β x β || to strengthen their cooperation in order
(c) α || to bring stability and security to the Middle East. |||

12 (a) α ||| Russia wants Egypt and Iran
(b) ' β α || to play a role in bringing a solution to the conflict in Syria,
(c) = β || which has raged on since 2011. |||

AL-Arabyia.net Text: Syrian rebels reject Russian help against ISIS

1 (a) α ||| Syria's Western-backed opposition on Saturday rejected a Russian offer
(b) ' β 1 || to assist them against the Islamic State of Iraq and Syria (ISIS) group
(c) +2 || and dismissed Moscow's call for new elections. |||

2 (a) 1 ||| "Russia is bombing the Free Syrian Army
(b) +2 α || and now it wants
(c) ' β α || to cooperate with us,
(d) + β || while it remains committed to Assad? |||

3 (a) "1 ||| We don't understand Russia at all!"
(b) 2 || said Lieutenant Colonel Ahmad Saoud, a spokesman for the Division 13 rebel group. |||

4(a) α ||| Moscow began an aerial campaign in Syria on September 30, saying
(b) " β || it was targeting ISIS and other "terrorists". |||

5.(a) α ||| But moderate and Islamist rebels say
(b) " β 1 || they have been the target of Moscow's strikes,
(c) +2 α || and that the campaign is intended
(d) x β α || to prop up President Bashar al-Assad's regime
(e) + β || rather than eradicate ISIS. |||

6 (a) simplex Samir Nashar, a member of the Syrian National Coalition, the opposition's main political body, was equally dismissive of an alliance between moderate rebels and Russia.

7 (a) "1 + β ||| "Instead of talking about their willingness to support the Free Syrian Army,
(b) α || they should stop bombing it,
(c) 2 ||| " he told AFP. |||

8. (a) simplex "Eighty percent of the Russian strikes are targeting the FSA."

9(a) α ||| The comments came
(b) x β α || after Russia's Foreign Minister Sergei Lavrov said Saturday
(c) " β α || that Moscow was ready
(d) x β || to support Syria's "patriotic opposition, including the so-called Free Syrian Army, from the air". |||

10 (a) 1 ||| "The main thing for us is to approach the people fully in charge of representing these or those armed groups fighting

- (b) “2 || he told Rossiya 1 television station. |||
- 11 (a) “ α ||| Lavrov also told the station
(b) β || that he hoped to see political progress in Syria and a move toward new elections. |||
- 12 (a) “1 α ||| "I am convinced
(b) “ β 1 || that most serious politicians have learned their lessons
(c) +2 || and with regards to Syria a correct understanding of the situation is developing,"
(d) 2 || he said. |||
- 13(a) α ||| "This gives us hope
(b) “ β α || that the political process will move forward in the foreseeable future, by using outside players,
(c) $x\beta$ || to have all Syrians sit at the negotiating table." |||
- 14(a) “1 ||| "Of course, it's necessary to prepare for both parliamentary and presidential polls,"
(b) 2 || he added. |||
- 15(a) α ||| Nashar said
(b) “ β 1 || the proposal of new elections now was absurd
(c) +2 α || and accused Moscow of trying
(d) + β || "to circumvent the demands of the Syrian people for Assad's departure". |||
- 16 (a) “1 α ||| "The Russians are ignoring the real facts on the ground, with millions
(b) $x\beta$ α || who have been displaced inside and outside Syria,
(c) $x\beta$ || where cities are destroyed every day,"
(d) 2 || he said. |||
- 17(a) clause simplex "What elections are they talking about holding under such circumstances?"
- 18(a) α ||| Syria last held presidential elections in June 2014,
(b) $x\beta$ || with Assad re-elected for a seven-year term with 88.7 percent of the vote. |||
- 19 (a) 1 ||| The election was dismissed by the opposition
(b) +2 || and condemned internationally. |||
- 20(a) 1 ||| The country last held parliamentary elections in May 2012,
(b) +2 α || and it is in theory due
(c) $x\beta$ || to hold its next legislative vote in 2016. |||

- 21(a) “ β α ||| Russian Foreign Minister Sergei Lavrov and his Egyptian counterpart Sameh Shukri have agreed
(b) $x\beta$ || to continue cooperation in order
(c) xy || to help find a political solution to the Syria conflict,
(d) α || the Russian Foreign ministry said on Saturday. |||
- 22(a) α ||| In a separate telephone conversation later on Saturday, Lavrov and Iranian Foreign Minister Mohammad Javad Zarif agreed
(b) $x\beta$ || to strengthen their cooperation
(c) xy || to bring stability and security to the Middle East. |||
- 23 (a) “ β 1 ||| The telephone conversation was at Moscow's request
(b) +2 || and followed Lavrov's talks with the United States, Saudi Arabia and Turkey about Syria in Vienna on Friday,
(c) α || the ministry said in a statement on its website. |||

Taxis in both articles

Taxis		AJE Text	ARE Text
Hypotaxis	Projection	8 (47%)	11 (42%)
	Expansion	9 (53%)	15 (58%)
	Total	17 (74%)	26 (63%)
Parataxis	Projection	3 (50%)	6 (40%)
	Expansion	3 (50%)	9 (60%)
	Total	6 (26%)	15 (37%)

Logico-semantic relations

Logico-semantic relations	Sub-categories	AJR Text	ARE Text
Projection	Locution	7 (63.6%)	14 (82.3%)
	Idea	4 (36.3%)	3 (17.6%)
	Total	11 (48%)	17 (41%)
Expansion	Elaboration	2 (16.6%)	0
	Extension	5 (41.6%)	12 (50%)
	Enhancement	5 (41.6%)	12 (50%)
	Total	12 (52%)	24 (59%)

Basic Clause Complex analysis of AJE and ARE News Texts

Clause complexes		
	AJR Text	ARE Text
No. of words in text	354	551
No. of sentences in text	12	23
No. of ranking clauses	35	61
No. of clause	0	3 (13%)

simplexes		
No. of clause complexes	12 (100%)	20 (86.95)
No. of clause complexes of 2 clauses	4 (33%)	7 (35%)
No. of clause complexes of 3 clauses	5 (42%)	6 (30%)
No. of clause complexes of 4 clauses	3 (25%)	6 (30%)
No. of clause complexes >4 clauses	0	1 (5%)

The tables display the results of clause complex analysis for both texts. This last table shows a difference in the proportion of words to sentences (by dividing number of words by the number of sentences): **29.5 AJE** news article and **23.9** in **ARE** news article. **ARE** text uses a larger number of words to communicate more with readers and make the event more telling.

The table of Taxis displays relations of interdependency in both texts. As the table shows, the number of tactic relations are more than the number of sentences. This happens due to the layering and nesting.

Most of the paratactic relations in the **ARE** Text are composed of extensions. This indicates that **ARE** uses many extensions to refer to the succession of events (clause 1, 2, 5, 12, 15, 19, 20 and 23) to make the readers feel conscious of what happened. In **AJE** article, all the paratactic expansions are also extensions (clauses 2,4,6) to indicate how the actions are made up in the text.

Both texts used different proportions of taxis and lexico-semantic relations. Al-Jazeera.net text exhibits around (74%) of hypotaxis and (26%) of parataxis whereas Al-Aarabyia.net article displays about (63%) for hypotaxis and (37%) for parataxis. However, compared to its size, **AJE** text employs more hypotaxis (74%) than **ARE** text which shows only (63%) of its clauses. Both texts prefer using hypotactic relations than paratactic ones so as to provide their readers with the central theme of the event. My interpretation of the **AJE** text with regards to its use of more hypotaxis than **ARE** Text is that it has fewer number of sentences than **ARE** text and it tries to bring the reader closely to the main sense without much more details. Halliday and Matthiessen (2014: 520) mention the functions of tactic relations as saying “*But the idealized function of the paratactic structure is to represent the wording; whereas with hypotaxis the idealized function is to represent the sense, or gist.*” Hypotaxis requires the reader to pay more attention to comprehend the text meaning than parataxis. Eggins (2004:338) explains that “*Hypotaxis is generally more common in written text because dependency relations require more care by the writer to construct and more effort by readers to interpret than parataxis. The hierarchic organization of information demanded by hypotaxis also offers the writer a resource for offering readers a more closely controlled logic between events.*”

Regarding the subcategories of projections and expansions, both texts behave similarly with slight differences. Projections in

both articles tend to use locutions more than idea as the percentage (**AJE** TEXT :63.6% and **ARE** TEXT :82.3%) shows respectively. This tendency is used to tell the readers exactly who says what to whom to the readers (quoting) and to explain what others say (reporting). Expansion also adopts a similar style. Enhancement and extension are the clear preferences in expansion highlighting the sequential and causal relations in the occurrence of story.

IV. REGISTER ANALYSIS: FIELD, MODE AND TENOR

The elements of context (field, tenor and mode) determine the choice of register which indicates the degrees of formality in language use. “Bye and large, characteristics of the field predict experiential meanings, those of the tenor predict interpersonal meanings, and those of the mode predict textual meanings” Halliday (1985). Matthiessen *ibid* mention the register as “*A variety of language determined by a particular set of values of the context; it is determined by what the speaker is doing socially. The principle controlling variables are field [of discourse] (type of social action), tenor [of relationship between speaker and listener] (role relationships), and mode (symbolic organization).*”

The three variables of register will be mentioned briefly.

Field refers to the subject matter or topic of discourse. It answers the question: “What is happening?”. Matthiessen et al (2010:95) have stated that “*Field is concerned with what’s going on in context; “what’s going on” covers the activity and the domain of experience. The activity is the social and/ or semiotic process that the interactants in the context are engaged in. The domain of experience is the field of discourse that they range over—the subject matter, or “topic”.*”

Tenor refers to the participants in a speech situation and the social relation existing between the addresser and the addressee including relations such as formality (Formal/Informal), or power (commander /soldier), Affect (degree of like, dislike or neutrality). Matthiessen (2010:217) mentions that “Tenor systems in context resonate with **interpersonal** systems in language”.

Mode is the symbolic organization of the text, and it refers to the channel of communication “The mode of discourse is realized by the textual function of language, which organizes our experiential and interpersonal meanings into a linear and coherent whole,” (Butt et al, 2003: 39).

Register	AJE Article	ARE Article
Field	The article is about the Russian willingness to offer help to Syrian rebels to fight ISIL	The article is about the rejection of the Russian offer to Syrian rebels to fight ISIS.
Tenor	This website news article addresses different range of people concerned about Syria war and those people are usually English-speaking. The	The ARE article also addresses the same concerned people. Writers do not take an authoritative stance only informing readers about the event. Information is

	vocabulary used here are formal and mainly political terms. The interpersonal views are not imposed in the article.	provided in a relatively objective manner.
Mode	As clauses show, both articles are written texts that use only declarative sentences to provide information. Lexicogrammatical choices do not impose any views on the reader. Tenor and field are linked to achieve the texture.	

V. NOMINALIZATION AND AMBIGUITY

Halliday considers that there are two kinds of expressions: congruent, also called non-metaphorical; and incongruent, or metaphorical. Generally, it is considered that people, places and things are realized by nouns; actions by verbs; circumstances are realized by prepositional phrases and adverbs, and so on. This relationship is normal. The way we use the language differs and the meaning may be realized differently. This different realization constitutes the grammatical metaphor.

Halliday (1985: 321) states that “The selection of metaphor is itself a meaningful choice, and the particular metaphor selected adds further semantic features”. Metaphor is one of the most interesting phenomena in this language system. In order to get the real meaning of the metaphors, we need to put them in their proper contexts. Halliday (1994: 340) provides an easy and simple concept of metaphor as “**a word is used for something resembling that which it usually refers to**”.

Consider the following examples:

ARE text

- I am convinced that most serious politicians have **learned their lessons...**
- ...by **using outside players**, to have all Syrians sit at the negotiating table.

AJE text

- the two men had also discussed **tapping the potential** of other countries in the region to **push the political process** forward.
- Russia wants Egypt and Iran **to play a role** in bringing a solution to the conflict in Syria....

In these examples, metaphors are “**learned their lessons...**”, “**using outside players...**”, “**tapping the potential...**”, and “**to play a role...**”. they are all transferred from concrete to abstract senses.

Grammatical metaphor means a substitution of one grammatical class, or one grammatical structure by another. For example, *Moscow call* instead of *Moscow called*. This means that the metaphorical bearer is not a word but a normal utterance of an expression.

Halliday (1985) divides the grammatical metaphors into two types: the first is the *ideational* type, that reflects the *field*, and the other is the *interpersonal* one, that reflects the *tenor*. Grammatical metaphor can cause lexical density and syntactic ambiguity as can be noticed from the sentences above.

VI. CONCLUSION

This paper compares two news articles from news websites: **AL-Jazeera.net** and **AL-Arabyia.net**. The two news articles are about the same event related to Russian intervention in Syria and how it is perceived by the Syrian rebels.

The articles are addressed to the same type of readership. Hence, both articles display the same technique in reporting and use the same written mode. Most of the declarative clauses are Finite and refer to actions took place in the past.

As can be seen in the analysis, both articles are written texts that use basically declarative sentences to provide information. Coherence and cohesion are achieved by a linkage of elements of both field and tenor.

Analysis of clause complex of both articles show that they exhibit different proportions of taxis and lexico-semantic relations. Al-Jazeera.net text exhibits around (74%) of hypotaxis and (26%) of parataxis whereas Al-Aarabyia.net article displays about (63%) for hypotaxis and (37%) for parataxis. Hypotactic relations have been used more than paratactic ones in both articles so as to provide the readers with the central theme of the event since hypotaxis helps the writer to make events logically connected. Eggs (2004:338) state that “*Hypotaxis is generally more common in written text because dependency relations require more care by the writer to construct and more effort by readers to interpret than parataxis. The hierarchic organization of information demanded by hypotaxis also offers the writer a resource for offering readers a more closely controlled logic between events.*”

Finally, Systemic Functional Grammar can be used as an effective tool to study and compare news texts.

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Appendix 1

- [1] ALJAZEERA.NET TEXT by www.Al Jazeera.net on October 24, 2015
- [2] Russia offers Free Syrian Army air strikes against ISIL
- [3] Russian FM Sergey Lavrov says he is ready to work with the opposition forces and the US against the armed group. Russia's Foreign Minister says his country is ready to support the Free Syrian Army (FSA) with air strikes and cooperate closely with the US in fighting the Islamic State of Iraq and the Levant (ISIL) group and other factions.
- [4] Are Russia and the US escalating the war in Syria?
- [5] Sergey Lavrov's offer on Saturday was immediately rejected by Syrian rebel factions, which dismissed the idea they could cooperate with Russia while it supported President Bashar al-Assad.
- [6] "Russia is bombing the Free Syrian Army and now it wants to cooperate with us while it remains committed to Assad? We don't understand Russia at all," said Lieutenant Colonel Ahmad Saoud, a spokesman for the Division 13 rebel group, according to the AFP news agency.
- [7] Russia launched an air campaign in late September ostensibly against ISIL and other "terrorist" groups, but the FSA say most of the air strikes are targeting them and other moderate opposition groups.
- [8] Samir Nashar, a member of the Syrian National Coalition, the opposition's main political body, said "80 percent" of strikes had hit the FSA.
- [9] "Instead of talking about their willingness to support the Free Syrian Army, they should stop bombing it," he said.

- [10] Russian-brokered talks
- [11] The offer of air strikes in support of the FSA came as Lavrov and US Secretary of State John Kerry spoke on about organising talks between the Syrian government and the opposition.
- [12] In a telephone conversation held at the request of the US side, the Russian foreign ministry said on its website that the two men had also discussed tapping the potential of other countries in the region to push the political process forward.
- [13] Lavrov also spoke to his Iranian counterpart Mohammad Javad Zarif about the need to strengthen their cooperation in order to bring stability and security to the Middle East.
- [14] Russia wants Egypt and Iran to play a role in bringing a solution to the conflict in Syria, which has raged on since 2011.

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ALARABYIA.NET TEXT By

www.Al Arabiya.net on October 24, 2015

Syrian rebels reject Russian help against ISIS

Syria's Western-backed opposition on Saturday rejected a Russian offer to assist them against the Islamic State of Iraq and Syria (ISIS) group and dismissed Moscow's call for new elections. "Russia is bombing the Free Syrian Army and now it wants to cooperate with us, while it remains committed to Assad? We don't understand Russia at all!" said Lieutenant Colonel Ahmad Saoud, a spokesman for the Division 13 rebel group.

Moscow began an aerial campaign in Syria on September 30, saying it was targeting ISIS and other "terrorists".

But moderate and Islamist rebels say they have been the target of Moscow's strikes, and that the campaign is intended to prop up President Bashar al-Assad's regime rather than eradicate ISIS. Samir Nashar, a member of the Syrian National Coalition, the opposition's main political body, was equally dismissive of an alliance between moderate rebels and Russia. "Instead of talking about their willingness to support the Free Syrian Army, they should stop bombing it," he told AFP. "Eighty percent of the Russian strikes are targeting the FSA."

The comments came after Russia's Foreign Minister Sergei Lavrov said Saturday that Moscow was ready to support Syria's "patriotic opposition, including the so-called Free Syrian Army, from the air". "The main thing for us is to approach the people fully in charge of representing these or those armed groups fighting terrorism among other things," he told Rossiya 1 television station. Lavrov also told the station that he hoped to see political progress in Syria and a move toward new elections. "I am convinced that most serious politicians have learned their lessons and with regards to Syria a correct understanding of the situation is developing," he said. "This gives us hope that the political process will move forward in the foreseeable future, by using outside players, to have all Syrians sit at the negotiating table." "Of course, it's necessary to prepare for both parliamentary and presidential polls," he added. Nashar said the proposal of new elections now was absurd and accused Moscow of trying "to circumvent the demands of the Syrian people for Assad's departure".

"The Russians are ignoring the real facts on the ground, with millions who have been displaced inside and outside Syria, where cities are destroyed every day," he said. "What elections are they talking about holding under such circumstances?" Syria last held presidential elections in June 2014, with Assad re-elected for a seven-year term with 88.7 percent of the vote. The election was dismissed by the opposition and condemned internationally. The country last held parliamentary elections in May 2012, and it is in theory due to hold its next legislative vote in 2016.

Cooperation with Egypt and Iran

Russian Foreign Minister Sergei Lavrov and his Egyptian counterpart Sameh Shukri have agreed to continue cooperation in order to help find a political solution to the Syria conflict, the Russian Foreign ministry said on Saturday. In a separate telephone conversation later on Saturday, Lavrov and Iranian Foreign Minister Mohammad Javad Zarif agreed to strengthen their cooperation to bring stability and security to the Middle East.

The telephone conversation was at Moscow's request and followed Lavrov's talks with the United States, Saudi Arabia and Turkey about Syria in Vienna on Friday, the ministry said in a statement on its website.

Office Design and its impact on employees' productivity: Evidence from Islamic Banks of Karachi

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Abstract- It has been observed by several researchers that office design has an impact on employee's productivity. But in the context of Pakistan this effect was not identified up to higher extent, especially in the banking sector. Therefore the major reason for writing this paper is to analyze the impact of office design on the employees of Islamic banks operating in Pakistan, and after studying prior research work a systematic research model was developed having eight independent and one dependent variable. However collecting data from the Islamic banks was not easy, but through the analysis of prior research work we became able to develop closed ended questionnaire which were circulated among the employees of Islamic banks. The type of investigation we performed was causal and after the analysis of collected data through SPSS we have found that data is reliable for conducting research and through the implementation of regression on the selected data we have concluded that all the factors associated with the office design except office furniture, office equipment and communication does not have any impact on employees productivity in the Islamic banking sector of Pakistan.

I. INTRODUCTION

It has been observed that there is a huge impact of working environment on job related activities of employee. Positive outcomes as well as negative outcomes of job related activities are the result of factors which are associated with working environment of employee. (Chandrasekar, 2011) But due these factors which are responsible for affecting employee activities are in a continuous change since last decades because of continuous change in information technology, change in social environment and change in the flexible manners of performing work. (Hasun & Makhbul, 2005)

Another research work revealed that productivity of employees is directly related with their emotional as well as physical aspiration to work and if they are motivated then their productivity will be increased. Moreover it has been also highlighted by the research that availability of appropriate work environment is also a potent factor in decreasing the rate of absenteeism and this decrease will produce the positive impact on the level of productivity of employee. (Boles, Pelletier, & Lynch, 2004) But some other researchers investigated this phenomenon more deeply and argued that positive effects will be seen on employee's productivity when organization became able to implement the strategy for work place environment strategy properly. It includes proper use of job design, machine design and environment and facilities design. (Burri and Halander, 1991)

As current era is full of competition therefore employers are quite aware about their workforce and therefore they can easily utilize effective working environment in order to motivate their employees. Not only these factors related with environment at workplace also affect life styles, fitness and health of employees and also their work-life balance. But if organization does not able to arrange these factors appropriately then they will create the negative impact not only upon employees productivity but also on their health, life styles and work life balance. (Chandrasekar, 2011) Therefore organizations are trying to provide effective working environment as it will not only increase the productivity of the employees but also became reason for the increase of productivity at organizational level. (Naharudding & Sadegi, 2013) Research work done in mid nineties indicated that employees who are disturbed by the work place environment are always seems to be complaining about the discomfort and lack of satisfaction due to workplace. Some of the common factors which can cause this discomfort and lack of satisfaction are effect of lighting, ventilation and noise. (Evans & Cohen, 1987) Research work conducted in 2008 reveals that functional comfort must be provided to employees at their workplace and if organization does not able to provide the functional comfort then it will produce negative affects not only on work but also on the health of the employee. (Chandrasekar, 2011)

Statement of Problem: In current times it has been realized by the organization that there is a high importance of comfort of employees in workplace environment, and they are eager to improve office design not only to take competitive edge but also to increase level of productivity and retain their effective and skilled employees. (Seghal, 2012) While the most potent variable of organizational psychology is productivity of employees and this must be continuously be monitored and improved by applying modern tools and techniques. (Borman, 2004) and in upcoming era of increased competition the success or failure of the organization will be dependent upon their ability to recruit and retain most effective workers and therefore the importance of office environment has been increased as it's treated as a tool through which organization became able to develop and support strong corporate culture and effectively engage hearts and minds of their employees (Seghal, 2012) Furthermore research conducted in US found that forty percent of the employees believe that the reason of improper design of the work place is that the organization believe that doing betterment in the workplace design will increase their cost on the other hand it has been also revealed by the research that office design does not have the priority for the organization. Moreover accumulated data of the research also indicated that one out of every five employees mark their working environment in the

range of fair to poor. While 90% of the respondents believes that in appropriate quality of work environment is affecting their attitude towards work. **(The Gensler Designs, 2006)**

But when we talk about the Pakistan's scenario the topic looks relatively news and we will find very few research works addressing the effect of office design on employee's productivity. Not only this most of the organizations operating in Pakistan are continuously neglecting the requirement and importance of office design and this ignorance is the main reason for the decrease of employee productivity and also causing frustration and lid on the level of personal growth of employees. **(Hameed & Amjad, 2009)** In the economy of Pakistan banks are treated as one of the fastest growing sector and performing job in banks is also treated as one of most challenging one. As doing job in this sector is full of stress not only because of variety of product range but also because of diversification of scope. Therefore conducive work environment is the main requirement of banking industry in order to make their employees motivated and satisfied. Therefore effective ergonomics must be provided to employees working in banking sector in order to make them generate maximum productivity. Moreover banks are service based organization and they are heavily dependent upon their employee's for the application of core competencies and also for attracting and retaining customers by providing quality based services to them. **(Awan and Tahir, 2015)**

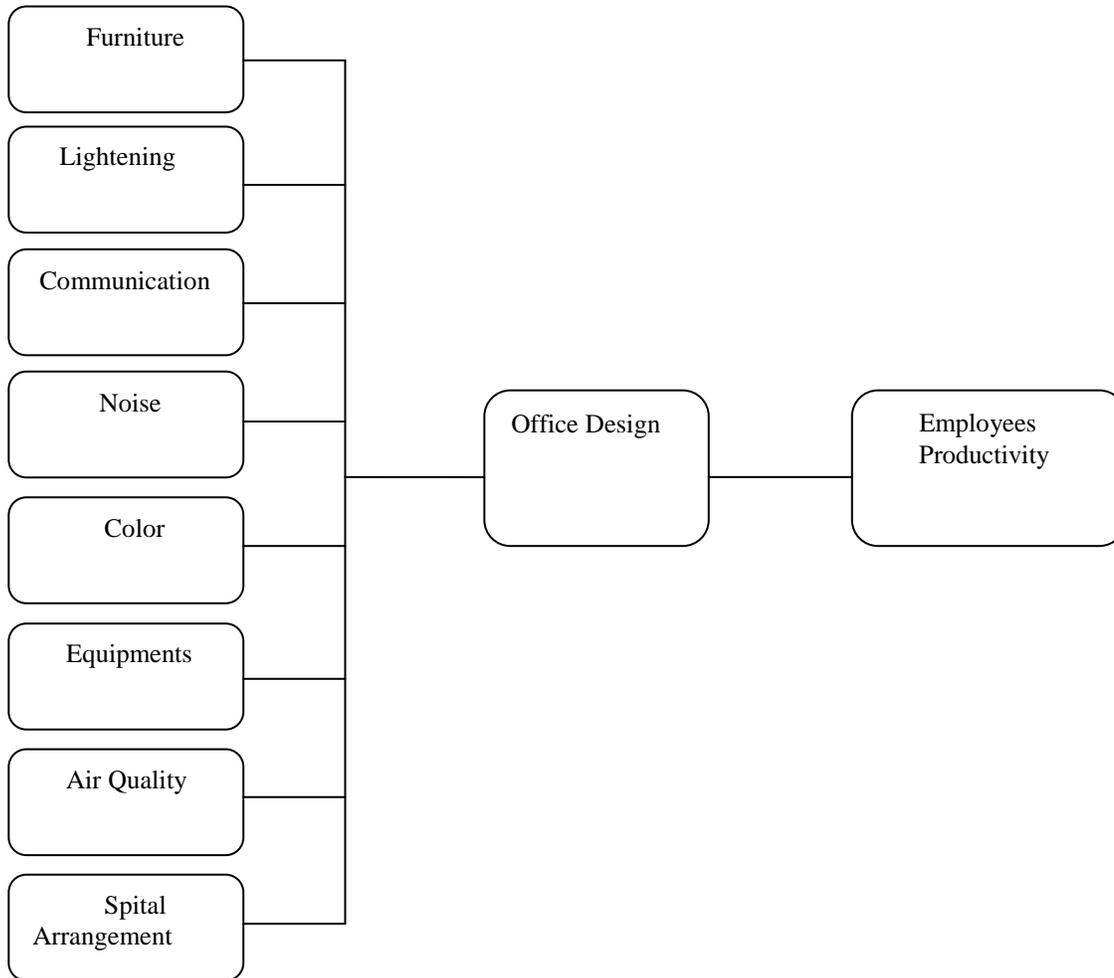
But as mentioned before in Pakistan there is no significant work done on the effect of office design on employee productivity **(Hameed and Amjad, 2009)** especially in the category of those banks which are offering Pure Islamic Banking

Services and as all of knows that Islamic banking sector is one of the top growing sectors of Pakistan. Therefore there is a need of descriptive research in order to determine the effect of variables associated with the office design on employees

Research Objectives: Objectives of this Research are as under:

1. To analyze the impact of proper lightening in on the productivity of Islamic Bank employees
2. To check the result of office furniture on the productivity of Islamic Bank employees
3. To determine the effect of office equipment on the productivity of Islamic Bank employees
4. To view the outcome of air quality on the productivity of Islamic Bank employees
5. To observer the upshot of color on the on the productivity of Islamic Bank employees
6. To measure the conclusion of communication on the productivity of Islamic Bank employees
7. To judge the consequence of noise on the productivity of Islamic Bank employees
8. To examine the outcome of spital arrangements on the productivity of Islamic Bank employees

Research Model: The research model of this descriptive research is as under:



Productivity of Employees: Research work conducted in the year 1997 provide us one of the very effective definition of employees productivity and according to the research “*Productivity is that which people can produce with the least effort*” (Rolloos, 1997) While researches conducted before 1997 also provides us some considerable definitions of employees productivity which are still coherent with the current concept of employees productivity. As for instance productivity of employee is defined as “*Output per employee hour, quality considered*”. (Sutermeister, 1976) and from these definitions we concluded that productivity is a quotient through which we can measure the level of conversion of input resources into goods and services. That means researchers indicates that increase in performance can be determined by lesser rate of absenteeism in the organization, lesser rates of early goings late arrivals and breaks taken during work, (Hameed and Amjad, 2009)

In recent times employee productivity is considered as the most potent variable from organizational perspective is performance of employee. (Borman, 2004) it is dependent not only level of sincerity and the desire of employee towards efforts but also upon level of motivation of the employee. (Sinha, 2001) While the research conducted in the year 1999 indicated that most important factor which is responsible for shaping employee performance is social status associated with the job (Howell and

Hall-Merenda, 1999) and this finding is also coherent with the findings of the research work conducted by Greenberg and Baron of year 2000 and according to these researchers social status of work produces positive impact on the level of performance and also upon career of the employee. While the research work conducted in the year 2003 research became able to figure out various factors which are shaping employee’s performance. These factors include physical work environment, expectations from performance, feedback of performance, a proper system for allocating rewards for good or bad performance, office equipments, development of skills, knowledge and job related attitudes and availability of standard operating procedures. (Naharuddin & Sadegi, 2013)

Office Design: It is defined most properly by B-Net Business Directory and according to it is “*Formation of workspace in a way which can aid in completion of work in the best way*”. (B-Net Business Directory, 2008) it can make an employee became fir or misfit with the (Cooper and Dewe, 2004) Other research conducted in the year 2005 indicated that organization must ensure the proper arrangement of factors associated with physical work environment in order decrease the effect of work stress from the employees. (McCoy and Evans, 2005) As impact of office design is a critical issue, even research work done in early nineties indicted the impact of office

design and according to the research improvement in work environment can improve the level of employee performance from five to ten percent. (Brill, 1992) Research further indicated that proper arrangement of these elements will not only decrease the level of stress but also helpful in development of proper link between activities associated with workplace. (McCoy and Evans, 2005) The importance of office design on level of preference of employees can be determined by examining the study which shows that among all the respondent of the research 31% are those which are satisfied with their jobs because of the desirable working environment while 50% are those which will prefer those organizations which will provide good working atmosphere and environment. (Hameed and Amjad, 2009)

Variables Associated with Office Design: In the research work conducted in the year 1984, researchers tried to rank all the variables of office design which are responsible for enhancement in employees motivation, satisfaction and productivity (Brill et al. 1984) and research work done in the year 1995 found that employees of a company were not happy because of levels of noise, temperature, air quality and light in the working environment, and due to this the level of productivity was also declining. (Leaman, 1995)

Furniture: Chairs, Desks, Shelves, Drawers etc all are included in office furniture and all of these are responsible for the increase and decrease of employee's productivity as well as organizational functioning. One of the most considerable issues with the purchase of office furniture is their ergonomics, and it is important as employees have to use them for all the time they are in office, (Sehgal, 1992 & Saha, 2016) and according to the research work conducted in the year 1994 fifty percent life of majority of workforce spend in their offices and this affect their performance, mental status, action ad abilities in a great manner. (Sundstrom, 1994)

Use of ergonomics furniture increases the probability that employee will feel better while using these items as if employee does not feel good while using these items his productivity will surely decline. Increased importance of ergonomics office furniture can be illustrated by narrating the lines of research work conducted in the year 1992 that organizations also consult specialist of ergonomics in order to improve ergonomics of their offices. As the ergonomics of the furniture does not only increase the productivity of employees but also reduces the chances of any incident which can harm employees, therefore employees will remain comfortable and motivated to perform better at work. (Sehgal, 1992 & Saha, 2016) As in Pakistan the normal office timings are from 9 AM to 5 PM and employees spend most of their office time in using office furniture and that's why we can understand why office furniture is one of the most potent variables in shaping the productivity. (Akhtar, Ali, Salman, Rehman & Ijaz, 2014)

Intensity of Light: Lightening is treated as one of the most important element for creating comfort for employees at work. But it depends upon the condition that, available light is helpful or harmful for the productivity. (Frank, 2000) Natural as well as artificial light affects the performance a work. (Akhtar, Ali, Salman, Rehman & Ijaz, 2014)

As most of us usually believes that the use indoor or artificial light to help us in performing those tasks which require intense visual focus, especially when there is lacking of external

light. But the recent discovery showed that light also helpful in maintaining our alertness at work. This is also supported by the research work that performance and well being of employees is also dependent upon the quality of indoor light. But only the brightness of indoor light is not significant for the performance o the employees, we also have to adjust type and quality of light required with the requirements in order to improve the working experience and productivity of employees. (Sehgal, 1992) As dim light can creates fatigue and can also harm level of productivity at work. (Saha, 2016)

Communication: The method use by the organization to publicize their goals is known as communication. (Ayatse, 2005) This is not enough prior research work conducted in the year 1997 also emphasized on the point that the success or failure of any organization is dependent up on the communication. As, communication is treated as the transfer of ideas, emotion and opinion among people (Ince & Gul, 2001) and interaction of workforce with each other most of the times result in development of new ideas and possibilities. (Orpen, 1997) Without communication it is not easy for us to understand the unfamiliar facts and stories associated with life. (Femi, 2014) Communication in office implies the transmission of information from one employee to another, and it is also responsible for shaping the routine performance of employee. Not only is this communication also an important tool for those who wish to be effective part of the work team. (Buchanan & Doyle, 1999) In organization top management use effective communication for developing and sustaining their competitive advantage in order to optimize organizational performance. (Rowe, 2001)

Noise: The type of environmental pollution which has more drastic effects then our estimation is known as Noise. Various sources of noise pollution include the noise from construction projects, noise from road traffic, air traffic and from airports. While when we talk about the effect of noise at work the noise which can disturb the work is from simultaneous conversation. But reason why we does not pay desired attention towards this is that noise does not produces visible results oftenly, and that's the reason that most of us believes that noise is not the reason for health related problems. But the recent research work also identifies that noise can also produces hazardous affect of human health. (Sehgal, 2012) As indicated by the research conducted in the year 1995 that lesser productivity, irritation and increase in the level of stress all are the outcomes of higher level of noise. (Saha, 2016) and the research conducted in the year 2001 also supports the finding s of the research work done in 1995 and according to the research of 2001 workers health and psychological well being can immensely be affected by the poor noise system. (Cooper, Dewe & O' Driscoll, 2001) Moreover study done in the year 1996 indicated that there is direct relationship between the presence of noise at workplace and increase of blood pressure of the employees which decrease the productivity of the employees. (Quible, 1996) According to the research work conducted in the year 2003 it has been proved that noise affect eh productivity at most in work environment as it cause distraction of about 71% while lightening and air cause the distraction of about 9% and 20 % respectively. (Folsom, 2003)

Color: Among all the other variables of office design, color is also treated as the one which is important in influencing

employee productivity. According to research majority of the workers pay concern towards physical effects of the color, and does not pay attention towards the psychological impacts which color creates. (Quible, 1996) But in reality color is not creating impact on human body, only but also influences their productivity and wellness as color is the variable which creates impact on human mind as well as spirit. (Baughan and Young 2001) Moreover different people associate different meanings, with the colors. As people who prefer red color treated it as the one which shows workers are energetically, aggressively and bravely. Those who prefer blue perceives that workers are loyal and faithful. Different activities need different colors and selection of inappropriate colors might result in the problems discussed above. But it is really a big challenge to administration of the office to facilitate each and everyone with their preferred colors. Therefore they must pay concern to three important variables before selecting the color for the office *a*) Function of work *b*) Physical Location and *c*) type of emotions desire. As research evaluated that different type of work require different types of colors, as working associated with advertising, software development and fashion designing will be done effectively by using warm colors in the workplace like red & orange colors. While work which requires more concentration require come cool colors like blue and green to make employee work effectively. Smart color selection of the work place not only enhance the level of creativity and productivity of employees but also decreases the fatigue and their health related issues. (Sarode and Shirsath, 2012)

Research work conducted in the year 1996 proved that there are three factors which must be kept under consideration by management before choosing the appropriate color for the work environment these three important factors associated with the work design are various types of emotion and desire, functions of work and location of the organization or department (Keeling and Kallaus, 1996) another research work also claims that selection of wrong color as per the requirement might produce negative impact on employees health and mentality in the form of headaches, eye strain etc. (Kwallek, 2002) as previous research work found that work that require piece and calm and smooth working require those colors which are the symbol of piece like green and blue while any sort of work which require creativity and implementation require those colors which initiates the requirement for instance like orange and red. (Baughan and Young, 2001)

Office Equipment: Machines and other devices used for the fulfillment of all the responsibilities and activities which are required to perform the assigned job come under office equipment. Research work conducted in the year 1996 pointed out that office equipment are the main elements which increase the productivity of employees as they enables them to produce more output in lesser amount of time but also enables them to achieve better quality of work as compared to the past. (Keeling and Kallaus, 1996) Furthermore research work conducted in the year 2000 shows that in case of office equipment company has two options i.e. they can have these weather by leasing or by purchasing as office furniture can be used for longer period of time as the result of long life time associated with them therefore its better for the organization to purchase them but in case of office equipment its not true as the use of office equipment can

be changed as the result of change in technology and as the result of requirement of different personnel having different caliber and working methods. (Quible et al, 2000)

Another research work pointed out that the criteria to judge and select the office equipment is not easy for the company as the selection of office equipment must also done in accordance with the preference and comfort of the person who are going to use these equipments and also must in accordance with the cost of achieving these equipment, their durability, their reliability and dependability in order to produce more and more comfort for the employees and in order to provide them satisfaction and to raise their efficiency and effectiveness. (Cullen, 2002)

Spital Arrangements: Research conducted in the year 2007 found that nine out of ten workers believe that there is an impact of work space quality and increase in employee's productivity. (Hughes, 2007) Therefore the use of office cubicles is not preferred by big organizations now days and companies are trying to change the form of office space in the form of smaller work stations. Companies are doing this not only to save the cost associated with cubicles, but there are some other reasons too which are forcing companies in replacing the working station with cubicles. These reason are more eco-friendly structure of cubicles with slim panels. (Chen, 2011)

But from 1940's to 1950's companies use to develop large offices for their employees in "Bull pen" fashion where we saw raw after the another of open desks with no separate division of audio or visual technology. (Sullivan, 2013) in these office there were no privacy and the offices were usually full of noise. (Lagorio-Chafkin, 2014) During these times there was minimal importance of privacy of employee at work place as no one consider this at the factor related with workers productivity. But after sometimes German introduces more open work environment, b using moveable portions as the tool for dividing the work space (Sawal, 2014) But this design is found as ineffective by those organizations which tries to implement this (Eggeres, 2012) as it was easy to some workers to create bigger portion for themselves by moving the partition in space vacated for others, moreover employees who are habitual of working on separate desk were also found disturbed by this new work settings. (Eggeres, 2012) This system did not appeal to Mr. Robert Propst and he didn't believe that this system is good for employee performance that's why he tried to understand behavior of different workers during work. (Herman-Miller, 2014) and in the year 1964 Mr. Robert Propst presented his first action plan which is the major reason for the new development in the office space design during these days, but somehow the plan was not able to create the desired impact on the (Lagorio-Chafkin, 2014) But he continue his research and in the year 1964 he became able to release much better action plan for the office layout-II which has a workspace on front side and all the other sides are covered by walls. (Sawal, 2014) The intent was to create more space and flexibility for employees at work. (Lagorio-Chafkin, 2014) and this results in the increase of productivity and this can be evident by the findings of 1988 that by that year almost 40 Millions of Americans start working in the type of work place action plan-II designed by Mr. Robert Propst. (Sawal, 2014)

Air Quality: Among all the elements which stands in last in the proper office design is the air quality. (Gilhooley, 2002) We can simple define air quality by the number of impurities it has. (Clements-Croome and Derek, 2008) There are numerous negative impacts of poor air quality on employee’s health such as problems which can cause respiratory issues, headaches and fatigue which can cause decrease in employees productivity.(Sarode & Shirsath, 2012) Moreover sensory system of human being is also affected by air quality. (Clements-Croome and Derek, 2008) Research work conducted in the year defined comfortable working environment as a place where workers can perform their work appropriately, as it’s not only clean but also have satisfactory level of temperature, humidity and ventilation. These dimensions are associated with air quality as higher level of heat at work place might results in decrease employee motivation and also can diminish the level of concentration employee to pay to work and also increase the probability of heart attacks to employees, and can also give birth to several heat related problems in employees. (Sarode & Shirsath, 2012) research work conducted in JCAHO found that 40 percent of non presence was the result of poor air quality as employee suffered due to poor air quality and found unable to attend their offices as per the schedule. (Gilhooley, 2002)

In recent times in most of the offices air conditioners are installed in order to maintain pleasant atmosphere and temperature level in the room for the maintenance of productivity of employees but there are some important factors which must kept under the consideration by the managers i.e. it has been observed that most of the overweight employees work better when the level of temperature is low and the underweight and smart workers work better under the increased level of temperature (Kelling and Kallaus, 1996)

Moreover the other research work conducted in the year 1996 indicated that the level of maintained humidity affect the level of maintained temperature in the office therefore it is suggested that administration manager must try to maintain up to 60 percent humidity in the office in order to produce pleasant effect on the employees. (Quible et al, 1996) Furthermore the research also indicate that too low humidity level in the office might result in stuck of magnetic tapes and magnetic disks while processing and when there is too high humidity then condensation of electronic

equipment can be seen. Air and its proper circulation is also the essential element of the office design it prevent inhaling of inadequate air by the workers. (Kelling and Kallaus, 1996)

Research Methodology: The purpose of research selected for this research was “**Descriptive**” in nature and the type of investigation used in order to find the relationship between independent variables and dependent variables was “**Causal**”. The Time Horizon for the research was “**Cross Sectional**” as it has been done on snap shot analysis and the unit of analysis was “**Individual**”.

Moreover Questionnaire was the tool which was used to collect data from our respondents by providing them questionnaire at their place of interest. That’s why the type of experiment we have conducted was “**Field Experiment**” and the interference of the researcher was “**Moderate**” in nature. The type of sampling we have selected for the research was “**Probability Sampling**” and the method of sampling was “**Proportionate Random Sampling**” as we have selected sample of total 300 respondent i.e. 60 (Sixty) respondents from top five Islamic banks operating in Karachi.

Statistical Testing and Evaluations: Initially we have implemented Anova Test on the collected Data in order to find out the Reliability of the Data and after implementing the data we found that data is reliable enough to conduct research as its reliability was found to be 61.4%.

Model Summary

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate
1	.811 ^a	.657	.614		.51564

Moreover in order to find out the relationship between the independent variables associated with the office design and employees productivity we have used regression on the collected data and after evaluating the data through SPSS we have found the following results.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.034	.780		5.170	.000
	Lightening	.083	.068	.073	1.228	.220
	Office Furniture	.256	.088	.267	2.895	.774
	Office Equipment	.313	.092	.360	3.421	.319
	Air Quality	.016	.051	.019	.320	.749
	Color	-.074	.072	-.061	-1.029	.304
	Communication	.901	.148	.782	6.103	.462
	Noice1	.001	.074	.001	.010	.992
	Spital Arrangement	.059	.063	.055	.939	.348

a. Dependent Variable: Employeeperformance1

As indicated by the analysis of SPSS that only three variables i.e. Office Furniture, Office Equipment and Communication has the impact on the employees productivity and all the other variables associated with the office design are not creating any impact on the employees productivity as far as Islamic Banking Sector is concerned.

II. CONCLUSION

After the analysis of finding of collected data from SPSS we have concluded that Human Resource and Administration Managers of Islamic Banks must focus on the effective use of office furniture, office equipment and communication within the department. As it is believe by most of the respondents of the research that these are the variables of office design which are creating impact on employee’s productivity.

Areas for Future Research: We have conducted the research on the “**Effect of Office Design on employees Productivity**”, but as we have mentioned in the introduction of the research there is so much room available for research within the topic. As for instance other researchers might conduct the research on the same topic by selecting developed or under developed areas of Pakistan or by emphasizing on sub variables related with the quality of air i.e. Humidity, Level of Temperature in the office etc in order to make readers understand the importance of these variables effectively.

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Rural Tourism and Sustainable Livelihoods

A Case Study of Majuli Island of Assam

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Abstract- Rural tourism is a form of tourism that showcases the rural life, art, culture and heritage at rural locations, thereby benefiting the local community economically and socially. It is a recent offshoot of tourism sector that has grown up to be a potential business in its own space. It is a significant strategy for rural development by providing an alternate source of livelihood and large scale employment in the rural areas.

The development of a strong platform around the concept of Rural Tourism is definitely useful for a state like Assam, where 86% (Census of India 2011) of the population resides in rural areas. Moreover, Assam is a conglomeration of various ethnic tribes and groups each having a distinct language, culture, festivals, songs and dances. The rural Assam has a great potentiality to attract tourists who are in search of authentic natural and cultural resources. Majuli is the largest river island in the world and is located on the Brahmaputra River. It has a great potentiality for different growing segments of tourism like Eco-tourism, Cultural Tourism, Agri-tourism and Religious Tourism. Although government has been launching various rural development and wage employment schemes for providing rural livelihood security, but due to some defect it fails to show hopeful result. So in this paper an attempt has been made to highlight the potentialities of rural tourism as a tool of sustainable livelihood to the rural poor.

Index Terms- Rural tourism, sustainable livelihood, rural development, Majuli.

I. INTRODUCTION

Rural tourism is a significant strategy for rural development by providing an alternative source of livelihood and large scale employment in the rural areas. Most of the countries of the world have recognized rural tourism as an important instrument for sustainable livelihood of the rural people.

A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future [Department for International Development, 1999].

In Assam 86 percent (population census 2011) of the population live in rural areas and more than 70 percent are dependent primarily on agriculture. But rural Assam has much to offer beyond agriculture. It has a great potentiality for different segments of tourism like eco-tourism, adventure tourism, health tourism, farm tourism, nature base tourism, cultural tourism,

religious tourism etc. Majuli is the largest river island in the world and is located on the Brahmaputra River. It has great potentiality to rural tourism development and can provide livelihood security to the rural poor's.

II. OBJECTIVES

The present study has its general objective to explore the potentiality of rural tourism as a provider of livelihood security to the people of Majuli. The specific objectives of the study are-

- I. To ascertain the trend and composition of tourist inflow into Majuli over the last five years.
- II. To highlight the various challenges faced by the tourist and providers of rural tourism services in the study area.
- III. To suggest ways for improvement of the impact of rural tourism as a perspective tool of rural development in Majuli.

III. DATABASE AND METHODOLOGY

The information regarding this study has been collected from both primary and secondary sources of data. The primary data has been collected through field survey i.e. by taking personal interview of the people involved in this business and the tourist. The secondary sources of the data are published and unpublished sources like books, journals, reports, publications, unpublished doctoral thesis, tour and travel agencies of Majuli sub-division and concerned web sites etc. Secondary data from the Tour and Travel Agencies of Majuli has been used to get an overview of the trend and composition of tourist inflow into island.

IV. AREA OF THE STUDY

Majuli is one of the sub-division of Jorhat district of Assam. It had a total area of 1250 square kilometres, but having lost significantly to erosion, it now has an area of only 650 square kilometres (Devi, 2012). The accelerated rate of shrinkage in the size of island has severe impact on the socio-economic, demographic and cultural dimensions of the population. As per population census 2011, the total population of Majuli was about 167641 with a population density of 364 persons per sq.km. Agriculture is the main source of livelihood of the people of Majuli Island. Out of the total population, a number of 49973 comprising 29.81 percent of the total population constitute the total workforce of which 80.85 percent belongs to the farmers and 2.05 percent agricultural labour and another 17.1 percent

populations were involved with tourism and other activities for their livelihood. But the agricultural productivity of the island is very poor due to heavy food visited to the island year after year. Agriculture had failed to provide livelihood security for the people of Riverine Island. Government initiated wage employment schemes also could not shown satisfactory result. Hence it has felt the necessity of alternative livelihood strategies for the people of the island.

V. DISCUSSION AND FINDINGS

5.1 Present Scenario of Tourism in Majuli:

Majuli has a great potentiality for different growing segments of tourism like Eco-tourism, Cultural Tourism, Agri-tourism and Religious Tourism etc. Every year, a large number of foreign and domestic tourists have come to the island. It has provided employment to the local residents in a diversified way in terms of rendering various services to the tourists. So tourism business may be an alternative livelihood for the rural poor's and will provide stable income. Majuli, the melting spot of tribes and communities like Ahoms, Kacharies, Brahmins, Kalitas, Konch Rajbongshis, Bonias, Koibatras, Nepalis, Kumars, Bengalis and Rajasthanis etc has been the cultural capital and the cradle of Assamese civilization for the past five hundred years.

Table 1: Trend and Composition of Tourist Inflow into Majuli over the last five years.

Year	No of tourist inflow		
	Domestic	Foreigner	Total
2010-11	37897	6267	44164
2011-12	39947	6849	46796
2012-13	41963	7376	49339
2013-14	43732	7973	51705
2014-15	46768	8031	54799

Source: Tour and Travel Agencies, Majuli

The above table shows an increasing trend of both domestic and foreign tourist inflow into the Majuli Island over the last five years.

The satras set up there, preserve antiques like weapons, utensils, jewellery and other items of cultural significance. Pottery is done in Majuli from beaten clay and burnt in driftwood fired kilns in the same mode as carried out by the people of the ancient Harrappan Civilisation. Sociologists have stressed on the preservation of these unique people, whose culture and dance forms are untouched by modernism. The handloom work of these tribes is also internationally famous. The satras have also honed certain art and craft traditions, which can now be found only here. In Natun Samuguri satra for example, one can still find the craft of mask-making; and in the Kamalabari satra, the finest boats are made. A wetland, Majuli is a hotspot for flora and fauna, harbouring many rare and endangered avifauna species including migratory birds that arrive in the winter season. Among the birds seen here are: the Greater Adjutant Stork, Pelican, Siberian Crane and the Whistling Teal. After dark, wild geese and ducks fly in flocks to distant destinations. The island is

almost pollution free owing to the lack of polluting industries and factories and also the chronic rainfall.

5.2 Tourism and Livelihood Opportunities in Majuli:

Rural tourism has made important contributions to rural incomes both at the level of the individual farmer and more widely in the local community. While not necessarily substituting for agricultural income, it has delivered supplementary income to the rural farmers of the region through facilitating inter-sectoral linkages. So it can be seen as a stable source of livelihood. It raises rural income level. With the rise of income their education, health etc will rise. The price of the agricultural land will rise. Demand for other goods and services will increase and there will be improvement in the public services. Through the increased flow of tourists, local small businessmen will be benefited. The rural people will learn to develop healthy environment with proper sanitation, roads, electricity, telecommunication, etc. They will learn to preserve the natural habitats, bio-diversity historical monuments. Market for agro products and handicrafts will develop in area and the farmers and artisans will develop a direct contact with the customers. Along with this, increasing level of awareness, growing interest in heritage and culture and improved accessibility and environmental consciousness is also increasing the importance of rural tourism.

Besides the farm activities various non-farm activities like handloom, textiles, sericulture, products using cane, bamboo, bell metal and brassware has contributed towards the development of tourism in the island through which both foreign and domestic tourist knows about the cultural entity and background of Majuli. Again by selling these items directly to the tourist, producers can earn a large amount of money. There is a large potential market for farm-based rural tourism especially for foreign tourists in Majuli.

5.3 Current Challenges of the Tourism promotion in Majuli:

Despite immense tourism potential that the region shows, it has not been able to cash in on the same failing even in the domestic market. There are, however several reasons for this

Inadequate Infrastructure:- Highly inadequate road links, extremely poor transport connectivity, lack of air and rail services, inadequate financial infrastructure, weak telecommunication infrastructure, etc has restricted the growth of tourism in Majuli. Most of the places of tourist attraction are not by the road side, and approach roads are in bad condition. This is a strong discouraging factor, which works against a good inflow of the tourist. Apart from the infrastructural bottleneck, inferior food quality, lack of well arranged package tour, poor service at the hotels and tourist guest houses, lack of facilities like good hotels and tourist lodges, affordable and reliable communication network, etc have been hampering the expected development and promotion of tourism in the region.

Absence of Tourist Guides:- Majuli virtually does not have any trained guides placed in important places of tourist attraction. Consequently, as the tourists arrive at such a place there is hardly anyone to satisfy the inquisitiveness of the tourists. The Department of Tourism initiated a programme to train tourist guides. The effort did not yield good result as most of the trainees left the job. Some of them found other means of

livelihood while others found it to be less paying because of the poor inflow of the tourists to the region.

Lack of Coordinated Efforts:- There is a palpable lack of coordination among several agencies like Department of Tourism and Department of Archaeology in handling the demands of the tourists in places of both historic and religious importance.

Underdeveloped Human Resource:- The tour operators, hoteliers, transporters, tourist guides etc are not trained enough to provide detailed information to the tourists regarding the region which obviously is a barrier in the path of development of tourism industry in Majuli.

Thus despite abundance of natural beauty, the flow of incoming tourist has been marginal for the reasons of the lack of infrastructural and other related facilities in various tourist spots in the region.

5.4 SOME SUGGESTIVE MEASURES

Tourism, thus, can be considered as a stable source of livelihood in the region. Some recommendations can be made in the following ways-

- Proper planning of master plans needs to be prepared with specific objectives be integrated with Majuli's overall economic and social development objective.
- Government intervention is necessary to enhance the contribution of tourism for providing livelihood security and poverty reduction.
- Maintains proper co-ordination and monitoring amongst various agencies and bodies of tourism.
- Private sector partnerships and public-private partnerships should be incorporated.
- Proper development of infrastructure, tourist facilities, enhancement of communication networks etc.
- Enhancement of the role of media in promoting tourism.
- State government should provide proper infrastructure for rural tourism in Majuli.

VI. CONCLUSION

Tourism is an industry, which brings the world together, leads to enrichment of knowledge, exchange of culture and fosters international understanding. It is one of the largest industries in the world in terms of revenue and employment generation. Peoples all over the world are growing more interest to rural tourism or nature base tourism. The new approach of

tourism can be a path to employment generation and economic development. Majuli is enriched with numerous attractive and diverse tourist resources, which is spread over different areas of the island. It is also regarded as the gold mine of tourism. If this resources would be utilized in proper way for attracting tourist, it will generate a considerable extent of livelihood opportunity and stable income to the rural poor's of the island.

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The Effect of Financial Management on Financial Performance of the Presbyterian Church Guest Houses in Rwanda

Case Study: Bethany Guest House

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Abstract- This research intended to establish the effect of financial management on the performance of the Presbyterian Church guest houses in Rwanda; it was based on the case study of Bethany guest house. This study was guided by the general objective of evaluating the effect of financial management on the performance of the Presbyterian Church guest houses, the specific objectives were: to analyse the effect of financial literacy on the profit of Bethany guest house; to examine the effect of financial innovation on the profits of Bethany guest house and to examine the effect of financial mobilisation of Bethany Guest house.

The target population of the study was 132 who were staffs of Bethany guest house, customers and suppliers. A sample of 80 respondents was randomly selected using the simple random sampling and stratified sampling method. The researcher used questionnaires to collect data and the collected data was analyzed using Microsoft excel program and the quantitative data was presented using tables and graphs while the qualitative data was presented using descriptions in line with objectives of the study. Findings from the study showed that the financial section lacked the necessary skills to manage finances especially based on the fact that very few people were trained in financial management. Furthermore, the study revealed that there existed significant relationship between all the predictors (financial literacy (.02), financial innovations (.000) and financial mobilization (.006), and profitability of Bethany guest house. Thus, financial literacy, financial innovations and financial mobilization can significantly predict profitability of Bethany guest house. Since the obtained p values are less than the significance level (.000, .006 and 0.02 <.05), the study concluded that there is a significant positive relationship between financial literacy, financial innovations and financial mobilization and profitability of Bethany guest house. The profitability of Bethany guest house could thus be affected by how effectively an organization has been engaged in financial literacy, financial innovation and financial mobilization. Among other recommendations the study recommends are skilling the staff in financial management as well as strengthening customer care services.

Index Terms- Financial Management & Financial Performance

I. INTRODUCTION

C1.1. The background of the study
Churches around the world have been known for providing services that help people in different circumstances. In general, churches focus on spiritual aspects of life such as evangelism and other social activities. Naturally these activities are never implemented without financial inputs and so churches have to engage in income generating activities that aim at raising resources to finance the initiatives. It is against this background that the Presbyterian Church in Rwanda introduced the Bethany guest house as a way of generating revenue to sustain its initiatives.

1.1.1 The Presbyterian Church in the Rwandan history

The Presbyterian Church in Rwanda (EPR) is one of the protestant reformed churches in the world. This reformation took place in the 16th century. Presbyterian Church in Rwanda was approved by the Ministerial decree no 500/08 on November 08, 1962 and was also published in the official government journal no 22 of 1/112/1962.

The mission of the Presbyterian Church in Rwanda is to evangelize people by proclaiming the love and salvation offered by God through his son Jesus Christ. Secondly it is to manifest the love of God through concrete actions of human and social development. In the social development actions, the Presbyterian Church in Rwanda established guest houses to participate in the country development in general and to resolve its financial problems in particular.

1.1.3 Bethany guest house in Rwanda

Bethany guest house is one of the five guest houses of the Presbyterian Church in Rwanda. It was constructed in 1987. It is located near Lake Kivu in Karongi District, Western Province about 124 kms from Kigali. Its location has been credited as favorable for tourists and other persons who want to retreat.

The guest house operates under the Presbyterian Church regulation especially in trading services. During the genocide of 1994, the business activities were stopped at Bethany guest house. In 1998 the center restated its activities and the infrastructure were expanded to accommodate more clients. In 2001 the business of Bethany increased due to the tarmac road

Kigali - Karongi. This led to an increased number of tourists going to Karongi, especially those who desired to stay at Bethany. In addition to the infrastructure expansion, Bethany guest house constructed a new four floor building in order to respond to the increased number of clients.

1.2. Problem Statement

Experience has shown that the development of guest houses can be an effective component of an economic development package. Guest houses like Bethany have the capacity to help overcome financial challenges that institutions like the Presbyterian Church faces.

Despite the fact that the infrastructure at Bethany guest house was reconstructed to meet the expanding number of clients and the profit goes up. However, the success of Bethany is not well known. Undoubtedly, there is still a gap in the financial management of the Presbyterian Church Guest houses. This study titled "the effect of financial management on the performance of the Presbyterian Church guest houses in Rwanda; intended to examine the effect of financial management practice on the performance of Bethany guest house.

1.3 Objectives

1.3.1 General objective

The main objective of this research was to examine the effect of financial management on the performance of the Presbyterian Church guest houses in Rwanda

1.3.2 Specific objective

The study was guided by the following specific objectives;

1. To analyse the effect of financial literacy on the profitability of Bethany guest house
2. To examine the effect of financial innovation on the profitability of Bethany guest house
3. To examine the effect of financial mobilisation on the profitability of Bethany Guest house

1.3.3 Research questions

The research aims at responding to three main questions:

1. What is the effect of financial literacy on profitability of Bethany guest house?
2. What is the effect of financial innovation on profitability of Bethany guest house?
3. What is the effect of financial mobilisation on profitability of Bethany Guest house?

II. THE LITERATURE REVIEW

2.1 The theoretical framework

The study was based on the theory of financial management systems and other ideas incorporated to it from the theories of financial literacy and the theory of financial innovation and financial mobilization.

2.1.1 Financial literacy theory

Financial literacy is mainly used in connection with personal finance matters. Financial literacy often entails the knowledge of properly making decisions pertaining to certain personal finance areas like real estate, insurance, investing, saving, tax planning and retirement. It also involves intimate

knowledge of financial concepts like compound interest, financial planning, the mechanics of a credit card, advantageous savings methods, consumer rights, time value of money. (Justin Marlowe 2014)

2.1.2 Financial innovation theory

Financial innovation is the act of creating and then popularizing new financial instruments as well as new financial technologies, institutions and markets. It includes institutional, product and process innovation. (Oliver Wyman and Clifford Chance LLP,2012)

For Bethany guest house the financial innovation, some customers use the credit card when they pay what they consume in the guest. Bethany guest house use financial technology on buying furniture or paying taxes.

2.1.3. Financial mobilization theory

The resources mobilization is the process by which resources are solicited by the program and provided by donors and partners.

In Bethany guest house; there is financial mobilization provide the financial prudence where the responsible is sensible and careful to avoid unnecessary risks in their business.

The prudence concept, do not overestimate the amount of revenues recognized or underestimate the amount of expenses. It is also conservative in recording the amount of assets, and not underestimates liabilities. The result should be conservatively-stated financial statements

In Bethany guest house all transactions of expenses and revenues were recorded daily in the book value.

2.1.4 Financial management systems

A financial management system is the methodology and software that an organisation uses to oversee and govern its income, expenses, and asserts with the objectives of maximizing profits and ensuring sustainability.

It is the processes and procedures used by an organisation's management to exercises financial control and accountability. These measures include recoding, verification and timely reporting of transactions that affect revenues, expenditure, asserts and liabilities. (Jacky Diamond and Poker Khemani, 2005)

1. The Effects of Profit

For this study, the researcher wanted to know how the profit has participated in success of Bethany guest house; and what has been the consequences even if it will realize the loss?

A positive effect of companies generating operational profits is the ability for companies to expand and grow their operations. Companies often reinvest a certain amount of profits earned from current operations into new business opportunities or expanding current operations to increase business output. For Bethany guest house; the research has found how a profit participates in growing of the Presbyterian guest houses.

2. Challenges faced by the financial management system in Bethany Guest house in meeting the profits.

Bethany guest house has infrastructures which need to be renovated. Some materials are old or not meeting the standard; they needs to be changed. The road going to the center from the main road to Bethany guest house should be tarmac. Observing

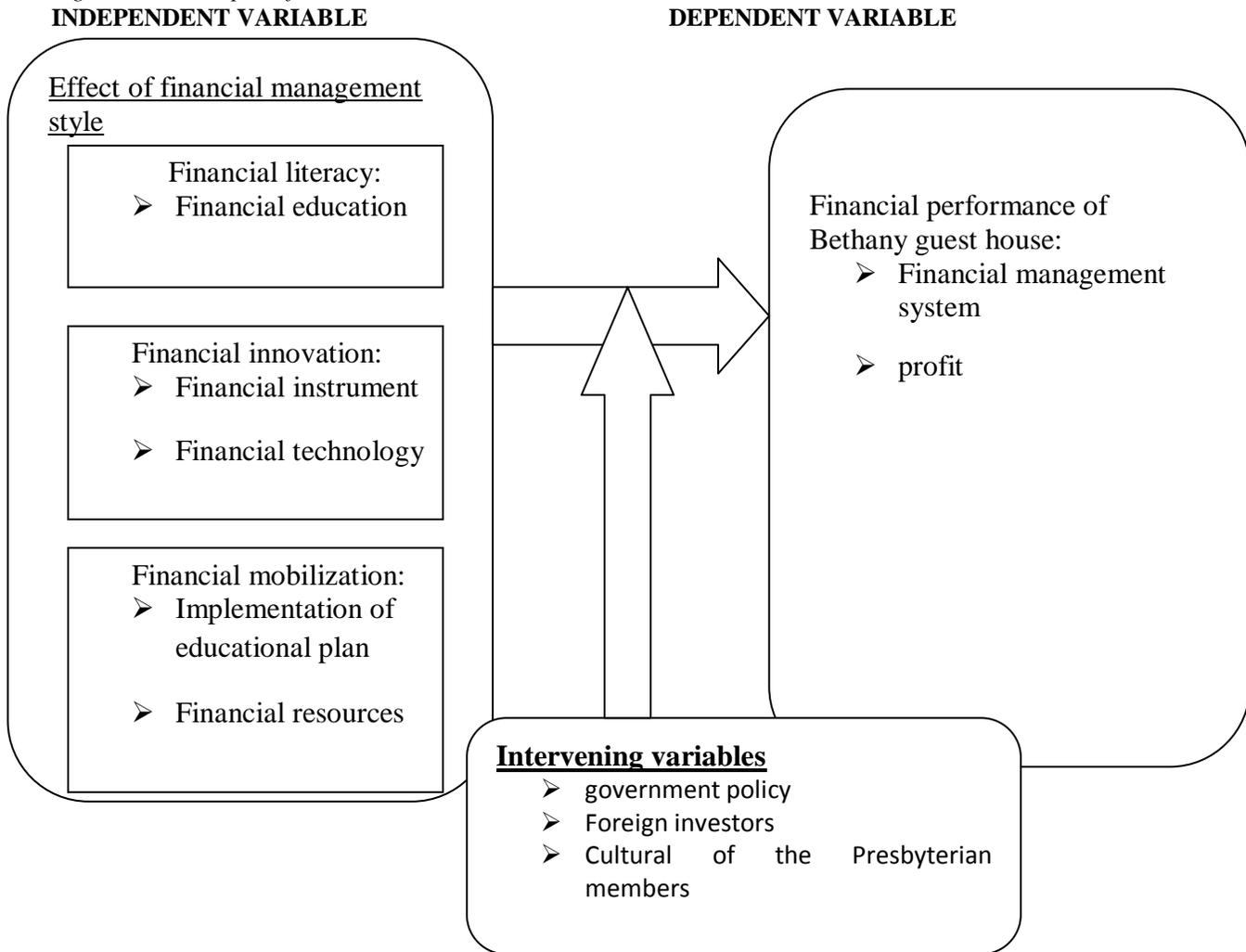
the competence of the staff and services they should deliver, you find that the staff needs to be empowered in order to meet the needs of the customer, because training and developing employees Bethany guest house improve in its services delivery and consequentially the income will increase.

Today many guest houses are coming up as competitors to Bethany guest house. This becomes a challenge to Bethany guest house, Bethany guest house has no access of permanent internet connection, due to the electricity which is not constant. In addition to this the website of Bethany guest house doesn't have enough information.

2.2 Conceptual framework

The conceptual framework shows the linkage between financial management style and the financial performance of Bethany guest houses; with regard to other studies conducted, the effect of financial management style was taken as an independent variable and the financial performance of Bethany guest houses as dependent variable. Taking into account the fact that the more development of financial management style there is, the more the performance of Bethany guest houses increases; there is a link between the dependent and the independent variables as illustrated below

Figure 2.1: Conceptual framework



The framework above shows a causal relationship between the effect of financial management style (independent variables) and financial performance of Bethany guest houses (dependent variable).

III. RESEARCH METHODOLOGY

3.1 Introduction

In detail this study presents the tools and techniques that were used to investigate the research issues in the field. It includes spelling out the area of the study and study population. It further describes the methods and techniques used in choosing the sample size and selection instruments like questionnaire,

interviews and documentation to be used. It also includes data processing, analysis and problems that were encountered in this research, finally this chapter provides the back ground against which the findings and conclusions of the study will be examined and appreciated regarding their reliability and validity.

3.2 The research designs

According to Churchill (1992), a research design is a framework or a plan for the study used as a guide in collecting and analyzing data. Therefore, the researcher used descriptive method design which is a method of collecting information by interviewing or administering a questionnaire to a sample of individuals. This study used qualitative and quantitative, statistic, analytic and comparative method design. After being collected the data will be analyzed.

3.3 The target population

This research study was conducted among 200 people in the following categories: staff of Bethany guest house, customers and suppliers, in order to get the effect of profit in success of Bethany guest house. The questionnaire and interview was given to 132 people.

3.4 Sampling techniques and illustrations

The sample size has been determined by using Alain Bouchard formula as follow:

We have $n_c = n : (1+n : N)$ where $n_c =$ The sample to be determined;

$$n_c = 1 + \frac{n}{N} = 1 + \frac{N+n}{N} = \frac{N}{1} \times \frac{N}{N+n} = \frac{N \times n}{N+n}$$

$N =$ the number of whole population ; $n = 132$, the target of population, $N = 200$, the total population , $n_c =$ the simple size

$$n_c = 1 + \frac{132}{200} = 1 + \frac{200+132}{200} = \frac{200}{1} \times \frac{200}{200+132} = \frac{200 \times 132}{200+132}$$

$$; n_c = \frac{26400}{332} = 79.5 \cong 80$$

According to the formula given by Bouchard, in our study, the simple size is conducted on 80 respondents classified in the category of staff, customers and suppliers. The selection of respondents was done by Simple random sampling. While selecting the sample size of the study, the researcher selected 18 respondents among staff, 44 among customers and 18 among suppliers.

In the study, the researcher used the purposive sampling technique to choose specific respondents whom he expected to have the information regarding the research topic. Simply, the researcher chose the people who have knowledge about business and profit regarding to the topic.

3.5 The Instruments

Both primary and secondary of data was used. The primary data collection is interviews and questionnaires given to the staff of the Presbyterian Church guest house, customers and suppliers. The secondary data were all information collected from library, journals, internet newspapers and financial report from Bethany guest houses.

3.6 Data collection procedures

The data collection process was done through field visits, telephone, interviews, observation and review of existing literatures. The researcher used different method such us questionnaire, interview, observation method.

IV. DATA ANALYSIS AND PRESENTATION OF FINDING

4.1. Profile of respondents

Based on the findings, respondents at vocational trainings participated in this research at a highest rate of 30%. The respondent at secondary level are 27,5%. Those at university level are 26,2% , respondents at primary level represent 13,7% and those at adult education represent 0,2%.

4.1.1. Gender of respondents

The study has shown that male were 51 which is equivalent to 63.7% of the selected sample population while females were 29 equivalents to 36.3%.

4.1.2. Age of structure of the respondents

Respondents were divided into 4 age groups, from 25 up 65 years old. The majority of respondents were between 25 to 35 years old who represent 40% of respondents and 35 to 45 years old who represent 25%, 45 to 55 years old who represent 6.3% of the respondent and 55 to 65 years old who represent 8.7% of respondent

4.1.3. Experiences level

Based on the findings, 72.2% of respondents represent the person who was not trained in financial management. 23.8% of respondents have got the training in financial management. Also the study shows that 12,5% of respondents were trained in accounting, 8.8% of respondents are trained in saving, 7.5% of respondents were trained in investing, 3.8% of respondents were trained in tax planning and 1.2% of respondents were trained in insurance. This explains that in the area of financial management there are few persons who were trained in.

4.2 The effect of financial management on the performance of Bethany Guest House

Findings have shown that the majority of respondents are in the range of the age between 25 and 65 years with the total of 80 respondents which present 100 % of the whole respondents. The majority of the respondents is male gender and presents 63.7 % of the whole respondents while the majority respondents are aged between 25years old and 35 years old which represent 40% of the whole number of respondents. According to the educational level of respondents, the study showed that the large number of respondents followed the vocational training 30% of the whole respondents are the results shows that the majority of respondents are single 52.5% . The married represent 40%.

4.2.1. The effect of financial literacy on profit of Bethany Guest House.

The results shown that 76, 2% of respondents represent the category of people who was not trained in financial management. This explains that those 23, 8% are the ones in charge of financial management for Bethany guest house.

Based on the analysis in the tables, in the financial management, there are few persons who were trained in financial management 12, 5%, while the others were not trained in this area of finance. However, maybe there are some persons who can get the job in financial management without being trained in

financial management. This can create mismanagement system at Bethany due to the unskilled people in the financial management. Tools used in communication at Bethany

The researcher wanted to know the tools of communication used at Bethany guest house in order to collaborate and provide good services to the customers and suppliers. Based on the data provided by the table 9, the service offered at Bethany is mostly on the accommodation 28, 8% restaurants 27, 5% and conferences 22, 5%. Other services have to be improved such as swimming 12, 5%, ironing 5% and internet 2, 5%.

The tool used mostly in communication at Bethany is internet and news paper; while television, radio and mobile phone come in the second step. Good communication can improve more the business at Bethany and being reached by many clients in our days of technology, where internet is the most tools used in communication over the world.

The result show that the correlation between financial literacy and profitability of Bethany Guest house is presented in table below where there we establish the relationship between financial literacy and profitability of Bethany quest house, correlations, and Regression squared were computed.

Table 4.10.a: Correlation between financial literacy and profitability of Bethany Guest House

Pearson correlation	Profitability of Bethany Guest house

	Profitability of Bethany guest house	1.000
Financial literacy	Training in Financial Management	.27
	Better Services delivery to customers and suppliers	.48
	Good communication with customers and suppliers	.43

Source: Primary data, 2015

According to the findings presented in table above, the relationship between various financial management attribute and profitability of Bethany guest house was determined. The relationship between the extent to which Bethany guest house respondents are trained in financial management and profitability of Bethany guest house was .27, better services delivery (.48) and good communication with the customers and suppliers (.43). Although there was notable relationship, the correlation between financial literacy attributes and profitability of Bethany guest house was generally weak. In order to establish the extent to which the predictive variable influences the variability of the dependent variable, adjusted r^2 was determined.

Table 4.10.b: Model Summary for Financial literacy and profitability of Bethany guest house

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.626(a)	.39	.226	.70158

Predictors: Financial literacy attributes

Source: Primary data, 2015

As shown by the model summary in table adjusted R squared is .226. This shows that financial literacy to some extent influences the variability of financial profitability. Thus, various financial literacy attributes can be used to predict financial profitability of Bethany guest house. The findings proved that there is a positive correlation between independent variables and dependent variable with $R = 0.626$ and the research confirms that 39 % ($R^2 = 0.39$) of the variation in financial profitability of Bethany guest house can be explained by the variation in financial training received by the workers, better services delivery to the customers and suppliers and to the best methods of communication with the customers.

4.2.2. The effect of financial innovation on profit of Bethany guest house

The study explains that the tools which attract customers and let people to come at Bethany Guest house. Those tools are:

the lack Kivu view which comes at the first step, while the customer care comes at the last stage.

It could be excellent if customer care could occupy more than lack Kivu view. This could increase the number of client at Bethany Guest house.

The Christian faith based also is another important tool which attracts clients at Bethany Guest house. According to the table no 11 in chapter 4, 87% of respondents said that, financial innovation system exist at Bethany Guest house. Also the study has shown that the suppliers of Bethany Guest house receive the command order for Bethany guest house at 78% before sending their furniture as shown in the table no 12 in chapter 4 and the delivery note is given at Bethany Guest house at 66, 2% as the table no 13 in chapter 4 demonstrates it; when furniture is bought in gross quantity. For the 33%, the delivery note is not needed because the furniture is bought in details..

At Bethany guest house, 85% of respondents said that the invoice is given to Bethany guest house after purchasing some

furniture. The 15% which remains explain that some furniture was purchased where they have no invoice.

The study has demonstrated that at Bethany, two main modes are used in payment. Cash payment 46, 2% and check bank payment 45%. Even if the cash payment facilitates the easier payment, it can facilitate the loss of money too, where money cannot reach to the account. The use of visa card which is on 2, 5% and mobile money, should be encouraged to be used at Bethany us tool of payment as the technology advances and discourages the cash payment.

The study has demonstrated that Bethany guest house established the payment request before expending money at the rate of 53% of respondents. The remaining percentages can explain that Bethany does not do the payment request regularly before expending money. Briefly the business at Bethany is well done because all accounting document were done and given to the supplier or clients. Concerning the kind of audits used at Bethany in order to improve the financial innovation, the study has demonstrated that Bethany uses both audits (internal and external).

The result shows that the correlation between financial innovation and profitability of Bethany Guest house is presented in table below where the correlation between financial innovations and profitability of Bethany guest house was established.

Table. 4.21.a: Correlation between financial innovations and profitability of Bethany Guest House

Pearson Correlation		Profitability of Bethany Guest House
	Profitability of Bethany Guest House	1.000

Financial innovations		
Existence of tools attracting clients		.56
Presence of innovation system		.44
Establishment of the commend order to the suppliers		.30
Give the delivery note		.28
Invoice given after purchasing		.34
Mode of payment		.42
Payment request before expending money		.27
Kind of Audits used		.41
Ways used to improve the financial innovation		.57
Existence of personal in charge of customer care		.49

Source: Primary data, 2015

Referring to the findings presented in table 21.a, upon determining the relationship between various financial innovations attributes, the study established a positive relationship between profitability of Bethany guest house and the existence of tools attracting clients (.56), presence of innovation system (.44), establishment of the commend order to the suppliers (.30), Give the delivery note (.28), Invoice given after purchasing (.34), Mode of payment (.42), Payment request before expending money(.27), Kind of Audits used (.41), Ways used to improve the financial innovation (.57) and existence of personal in charge of customer care (.47). The correlations showed some level of relationship between financial innovations and profitability of Bethany guest house although a moderate one. In order to establish the extent to which the predictive variable influences the variability of the dependent variable, adjusted r^2 was determined.

Table 4.21.b: Model Summary for Financial innovations and profitability of Bethany guest house

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.823 (a)	.677	.128	.71676

Predictors: Financial innovations

Source: Primary data, 2015

As shown by the model summary in table 21b, adjusted R squared is .128. This shows that financial innovations to some extent influence the variability of financial profitability. Thus, various financial innovations can be used to predict profitability of Bethany guest house. The findings proved that there is a positive correlation between independent variables and dependent variable with $R= 0.823$ and the research confirms that 67.7 % ($R^2 = 0.677$) of the variation in financial profitability can be explained by the variation in financial innovations of Bethany guest house. Therefore, the financial innovations have positive effect on profitability of Bethany guest house.

4.2.3. Effect of financial mobilization on the profitability of Bethany Guest House

Mobilization plays a good role in improving and pulling resources together within the business. This job of mobilization of customers normally is done through good care services provided. This study shows that, 41, 2 % of respondents have shown the necessity of a person in charge of customer care management at Bethany Guest house and 20% of respondents said that , in order to provide a better services the person will mobilize customers at Bethany guest house. But in order to have a good mobilization of customers, the level of the personnel of the staff, look at on the competitors and the location of Bethany guest house all of these need to be taken into consideration. The decision makers should reject any of these elements.

On the reduction or discount for regular customers, the study has shown that 85% of respondents said that there is a reduction or discount for regular customers at Bethany guest house. This is good for Bethany guest house to maintain their clients. According to the money receiver at Bethany guest house, it is better to have one person in charge of receiving money in order to make the financial management efficient. In order to be efficient in management, Bethany guest house uses different programs 30% sage 100, 22, 5% of Microsoft excel and 21, 2% of Microsoft word. This is a good culture to use those programs to record all financial data at Bethany Guest house.

This study has demonstrated that revenue of Bethany guest house are based on two main services such as restaurant 49,6% while accommodation gave 47,1%. In year 2013 the income of Bethany Guest house decreased from 33, 2% in 2012 to 31% in 2013. But in year 2014 it has increased from 31% to 35, 8%. This implies that the Bethany guest house improved its financial management uses. The calculation of the gross profit at Bethany was high in year 2012 comparing to other years.

The balance sheet and the cash flow of Bethany Guest House show clearly that in 2013, the incomes decreased from 33.2% in 2012 to 31%. Even if those revenues increased in 2014 from 31% to 35.8%, the study shows that the management committee had not been aware of this situation. The researcher advises to review the system of management used by our guest house.

In Bethany guest house the business operations are realized according to the expenses. Those expenses are the amount of assets consumed from the performance of business operations and thus are the opposite of revenue. The major cost used are : Transport cost, salaries, water and electricity, petty cash, tax paid, communication, maintenance, office furniture, restaurant furniture and cost of material. The study shows that the expenses

in 2012 were 26.6%, in 2013 were 35.9% while they were 37.4% in 2014.

Considering the financial report 2012 -2014 of Bethany guest house, the study realized the positive result because the expenses were higher than revenues. The calculation of the working capital shows that the business has been running well at Bethany guest house. This explain that there is a profit. It is interesting to indicate that the guest house has the audit. The findings show that the internal audit is regularly done by EPR while the external audit is made by the cabinet of auditors and Rwanda Revenue Authority.

4.2.4 The shortcomings faced by Bethany Guest house the way forward

Bethany Guest House meets different challenges due to its geographical location, its system of management and the fiscal context of the country. The study shows five main challenges scored as follows: the ccompetition with other hotels 48.7%, the lack of experience of employees 15%, the management system 13.8%, Inflation 12.5%, and low educational of employees 10%. Another challenge is the lack of clients because of their belief. In fact, there are some clients who go elsewhere simply because they don't agree with the doctrinal way of the church. The interviewees added the inadequate service on the list of challenges met by Bethany Guest House.

The ways to put forward are the replacement of the employees, the review of prices the introduction of new product and the increase of the marketing level. Our findings show also that the Bethany guest house must do a regular maintenance of the infrastructure.

The result shows that the correlation between financial mobilization and profitability of Bethany Guest house is presented in table below where the correlation between financial mobilization and profitability of Bethany guest house was established.

Table 4.28.a: Correlation between financial mobilization and profitability of Bethany Guest House

Pearson Correlation		Profitability of Bethany Guest House
	Profitability of Bethany Guest House	1.000

Financial mobilization	Presence of personal in charge of marketing	.36
	How does Bethany mobilize its customers	.11
	Appreciation of its services	.23
	Discount for regular customers	.18
	Accounting program used	.09

Referring to the findings presented, the strength of the association between various financial mobilizations attributes and profitability of Bethany guest house was varied. The study established a positive relationship between profitability of Bethany guest house and the presence of personal in charge of marketing (.36), how does it mobilize its customers (.11), appreciation of its services (.23), discount for regular customers (.18) and the accounting program used(.09).

The overall results showed that there was some level of association between financial mobilization and profitability of Bethany guest house. In order to establish the extent to which the predictive variable influences the variability of the dependent variable, adjusted r^2 was determined.

Source: Primary data, 2015

Table 4.28.b: Model Summary for Financial mobilization and profitability of Bethany guest house

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.606(a)	.37	.188	.70464

Predictors: Financial mobilizations

As shown by the model summary, adjusted R squared is .188. This shows that financial innovations to some extent influence the variability of financial profitability. Thus, various financial innovations can be used to predict profitability of Bethany guest house. The findings proved that there is a positive correlation between independent variables and dependent variable with $R = 0.606$ and the research confirms that 37 % ($R^2 = 0.37$) of the variation in financial profitability can be explained by the variation in financial mobilization of Bethany guest house. Therefore, the financial innovations have positive effect on profitability of Bethany guest house.

The analysis of the effect of financial management on profitability of Bethany guest house is done by using Regression model as it is mentioned in table 29.

In the multiple regression models we determine the relative importance of each Independent Variable in predicting Dependent Variable, regression model equation was computed. Constant and the standardized coefficients (B) (the coefficients of the estimated regression model) were used to interpret the parameter coefficients.

Table 4. 29: Coefficients of the factors influencing the profitability of Bethany guest house

Model	Predictors	Standardized Coefficients	Sig.
		Beta	
1	(Constant)	2.17	

	Financial literacy	0.029	.02
	Financial innovations	0.016423	.000
	Financial mobilization	0.01137	.006

Source: Primary data, 2015

A constant term (2.17) is interpreted as the profitability level that would be expected if all three independent variables (financial literacy, financial innovations and financial mobilization) were equal to zero. The result in the regression model implies the following: all independent variables, namely financial literacy, financial innovations and financial mobilization are positive as the model shows. This means that they provide positive predictive values implying that if the result of the variable (parameter) is 100% increased, and then the profitability (dependent variable) increases by the magnitude of the co-efficient of the independent variable. This is a direct proportionality. In regard to the nature of relationship between profitability and various predictors, the study, as shown by Table 29 summarizes the level of significance (sig.) for all the predictors.

The study revealed that there existed significant relationship between all the predictors (financial literacy (.02), financial innovations (.000) and financial mobilization (.006), and profitability of Bethany guest house. Thus, financial literacy, financial innovations and financial mobilization can significantly predict profitability of Bethany guest house.

Since the obtained p values are less than the significance level (.000, .006 and 0.02

<.05), the study concluded that there is a significant positive relationship between financial literacy, financial innovations and financial mobilization and profitability of Bethany guest house. The profitability of Bethany guest house could thus be affected by how effectively an organization has been engaged in financial literacy, financial innovation and financial mobilization.

V. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

5.1.1. The effect of financial literacy on profit of Bethany Guest House.

The results show that 76, 2% of respondents represent the category of people who was not trained in financial management. This explains that those 23, 8% are the ones in charge of financial management for Bethany guest house.

In the financial management, there are few persons who were trained in financial management 12, 5%, while the others were not trained in this area of finance. However, maybe there are some persons who can get the job in financial management without being trained in financial management. This can create mismanagement system at Bethany due to the unskilled people in the financial management.

Tools used in communication at Bethany

The researcher wanted to know the tools of communication used at Bethany guest house in order to collaborate and provide good services to the customers and suppliers. Based on the data provided, the service offered at Bethany is mostly on the accommodation 28, 8% restaurants 27, 5% and conferences 22, 5%. Other services have to be improved such as swimming 12, 5%, ironing 5% and internet 2, 5%.

The tool used mostly in communication at Bethany is internet and news paper; while television, radio and mobile phone come in the second step. Good communication can improve more the business at Bethany and being reached by many clients in our days of technology, where internet is the most tools used in communication over the world.

5.1.2. The effect of financial innovation on profit of Bethany guest house

The study explains that the tools which attract customers and let people to come at Bethany Guest house. Those tools are: the lack Kivu view which comes at the first step, while the customer care comes at the last stage.

It could be excellent if customer care could occupy more than lack Kivu view. This could increase the number of client at Bethany Guest house.

The Christian faith based also is another important tool which attracts clients at Bethany Guest house. According to the table no 11 in chapter 4, 87% of respondents said that, financial innovation system exist at Bethany Guest house. Also the study has shown that the suppliers of Bethany Guest house receive the command order for Bethany guest house at 78% before sending their furniture as shown in the table no 12 in chapter 4 and the delivery note is given at Bethany Guest house at 66, 2% as the

table no 13 in chapter 4 demonstrates it; when furniture is bought in gross quantity. For the 33%, the delivery note is not needed because the furniture is bought in details.

At Bethany guest house, 85% of respondents said that the invoice is given to Bethany guest house after purchasing some furniture. The 15% which remains explain that some furniture was purchased where they have no invoice.

The study has demonstrated that at Bethany, two main modes are used in payment. Cash payment 46, 2% and check bank payment 45%. Even if the cash payment facilitates the easier payment, it can facilitate the loss of money too, where money cannot reach to the account. The use of visa card which is on 2, 5% and mobile money, should be encouraged to be used at Bethany as tool of payment as the technology advances and discourages the cash payment.

The study has demonstrated that Bethany guest house established the payment request before expending money at the rate of 53% of respondents. The remaining percentages can explain that Bethany does not do the payment request regularly before expending money. Briefly the business at Bethany is well done because all accounting document were done and given to the supplier or clients. Concerning the kind of audits used at Bethany in order to improve the financial innovation, the study has demonstrated that Bethany uses both audits (internal and external). Based on the table 19 in chapter 4, the financial innovation on the profit at Bethany, has been classified by the study as follow: - qualification of personnel which represents 33% of respondents:

- Acknowledgement of competitors occupies the second place by 30% of respondents
- Improve the marketing takes 27, 5%.

If these 3 ways could be fulfilled, the financial innovation on profit at Bethany guest house will go higher. Both 3 ways have to be used together, not separately.

To conclude, at Bethany guest house there is an effect of financial innovation on profit, because it has many tools which attracts clients and financial documents were used to improve the financial management.

5.1.3 The effect of financial mobilization on profit of Bethany guest house.

In this section, the study demonstrated that 93,8% of respondents said that at Bethany there is a person in charge of marketing. The person in charge of marketing in business is very important person. Any business can improve if it has not that person.

Also mobilization plays a good role in improving and pulling resources together within the business. This job of mobilization of customers normally is done through good care services provided. This shows that, 41, 2% of respondents have shown the necessity of a person in charge of customer care management at Bethany Guest house and 20% of respondents said that, in order to provide a better services the person will mobilize customers at Bethany guest house. But in order to have a good mobilization of customers, the level of the personnel of the staff, look at on the competitors and the location of Bethany guest house all of these need to be taken into consideration. The decision makers should reject any of these elements.

On the reduction or discount for regular customers, the study has shown that 85% of respondents said that there is a reduction or discount for regular customers at Bethany guest house. This is good for Bethany guest house to maintain their clients. According to the money receiver at Bethany guest house, it is better to have one person in charge of receiving money in order to make the financial management efficient. In order to be efficient in management, Bethany guest house uses different programs 30% sage 100, 22, 5% of Microsoft excel and 21, 2% of Microsoft word. This is a good culture to use those programs to record all financial data at Bethany Guest house.

This study has demonstrated that revenue of Bethany guest house are based on two main services such as restaurant 49,6% while accommodation gave 47,1%. In year 2013 the income of Bethany Guest house decreased from 33, 2% in 2012 to 31% in 2013. But in year 2014 it has increased from 31% to 35, 8%. This implies that the Bethany guest house improved its financial management uses. The calculation of the gross profit at Bethany was high in year 2012 comparing to other years.

The balance sheet and the cash flow of Bethany Guest House show clearly that in 2013, the incomes decreased from 33.2% in 2012 to 31%. Even if those revenues increased in 2014 from 31% to 35.8%, the study shows that the management committee had not been aware of this situation. The researcher advises to review the system of management used by our guest house.

In Bethany guest house the business operations are realized according to the expenses. Those expenses are the amount of assets consumed from the performance of business operations and thus are the opposite of revenue. The major cost used are : Transport cost, salaries, water and electricity, petty cash, tax paid, communication, maintenance, office furniture, restaurant furniture and cost of material. The study shows that the expenses in 2012 were 26.6%, in 2013 were 35.9% while they were 37.4% in 2014.

Considering the financial report 2012 -2014 of Bethany guest house, the study realized the positive result because the expenses were higher than revenues. The calculation of the working capital shows that the business has been running well at Bethany guest house. This explain that there is a profit. It is interesting to indicate that the guest house has the audit. The findings show that the internal audit is regularly done by EPR while the external audit is made by the cabinet of auditors and Rwanda Revenue Authority.

5.1.4 The shortcomings faced by Bethany Guest house the way forward

Bethany Guest House meets different challenges due to its geographical location, its system of management and the fiscal context of the country. The study shows five main challenges scored as follows: the ccompetition with other hotels 48.7%, the lack of experience of employees 15%, the management system 13.8%, Inflation 12.5%, and low educational of employees 10%. Another challenge is the lack of clients because of their belief. In fact, there are some clients who go elsewhere simply because they don't agree with the doctrinal way of the church. The interviewees added the inadequate service on the list of challenges met by Bethany Guest House.

The ways to put forward are the replacement of the employees, the review of prices the introduction of new product and the increase of the marketing level. Our findings show also that the Bethany guest house must do a regular maintenance of the infrastructure.

5.2. CONCLUSION

This research has been carried out in the area of financial management under the title "the effect of financial management on the performance of the Presbyterian church guest houses, a case study for Bethany Guest House". The general objective was to evaluate the effect of profits on the performance of the Presbyterian Church's guest houses in financial management.

To achieve this major objective, the researcher used the following specific objectives:

To analyse the financial management systems for realising profit on the performance of Bethany guest house.

To find out how the revenues and expenses contribute to the financial literature, financial prudence, financial mobilisation and financial innovation of Bethany guest house

To examine the challenges faced by Bethany Guest house in meeting the profits on the performance by Bethany guest house.

The research report has been organized into five chapters. After a general introduction, the researcher looked at existing related literature for clarifying key concepts of the study. The third chapter dealt with methodological approaches while the fourth one was about data analysis and presentation of findings. The last chapter dealt with the discussion of the results, the general conclusion and recommendations.

To carry out this study, the researcher adopted interpretive research paradigm using a descriptive research design. Mixed methods combining both qualitative and quantitative approaches were used to assess the effect of profits on the performance of the Presbyterian Church guest houses. Thus, the researcher attempted to respond to three research questions related to three objectives of this research.

Concerning the first objective about the analysis of the financial management systems for realising profit on the performance of Bethany guest house, respondents very highly appreciated the system of management used by Bethany Guest House.

The researcher pointed out some strengths of Bethany Guest house. Some of them are the customer care service, the geographical location which attracts clients, good collaboration with the clients who accept to deliver their articles on credit, and the updated accounting program used is Microsoft Excel and sage 100.

For the second objective about how the revenues and expenses contribute to the financial literature, financial prudence, financial mobilisation and financial innovation of Bethany guest house, it has been found that the restaurant and accommodation are the highest benefit services for Bethany Guest House. Conference room and other services like swimming, internet and telephone must be improved because their present respectively 2.9% and 0.4% of all revenues. The balance sheet and the working capital of Bethany Guest House show clearly that in 2013, the incomes decreased from 33.2% in 2012 to 31%. Even if those revenues increased in 2014 from 31% to 35.8%, the

study shows that the management committee had not been aware of this situation.

Concerning the challenges, Bethany Guest House meets different challenges due to its geographical location, its system of management and the fiscal context of the country. The study shows five main challenges which are: the competition with other hotels, the lack of experience of employees, the management system, inflation and low educational of employees. Another challenge is the lack of clients because of their belief. The interviewees added the inadequate service on the list of challenges met by Bethany Guest House.

The ways to put forward are the replacement of the employees, the review of prices the introduction of new product and the increase of the marketing level. Our findings show also that the Bethany guest house must do a regular maintenance of the infrastructure.

The study revealed that there existed significant relationship between all the predictors (financial literacy (.02), financial innovations (.000) and financial mobilization (.006), and profitability of Bethany guest house. Thus, financial literacy, financial innovations and financial mobilization can significantly predict profitability of Bethany guest house.

Since the obtained p values are less than the significance level (.000, .006 and $0.02 < .05$), the study concluded that there is a significant positive relationship between financial literacy, financial innovations and financial mobilization and profitability of Bethany guest house. The profitability of Bethany guest house could thus be affected by how effectively an organization has been engaged in financial literacy, financial innovation and financial mobilization.

5.3. RECOMMENDATIONS

i. We recommend that the management committee of Bethany Guest House should increase its efforts in advertising on television, internet, newspapers and radio. To attract more clients, the Presbyterian Church should add new buildings, buy touristic boats and engage new staff which can deal with shortcomings revealed by the study.

ii. To review the system of management used by Bethany guest house for analyzing the financial management

iii. To improve its customer care services and make a good road which goes to Bethany from the main road.

iv. To make a comparative research among faith based guest houses in order to continue building more strong business in our society.

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New meaning for old knowledge- Reinvigorating Participatory Approaches to Conservation and Sustainable Management of Biodiversity and Ecosystem Services

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Abstract- People's Biodiversity Register (PBR) documents diverse aspects such as biodiversity and ecosystems services in a location Narwana Village Panchayath, Kangra District, Himachal Pradesh, status of folk (traditional/indigenous/local) knowledge, their applications, history, ongoing changes and forces driving changes in biodiversity resources, gainers and losers in these processes and people's perceptions of how these resources should be managed. A number of PBRs have been prepared in different parts of India beginning 1995 through initiatives of NGOs and educational institutions working with local communities and village councils and other administrative bodies, like State Biodiversity Board and National Biodiversity Authority. These attempts have been motivated by a desire to promote decentralized systems of management of natural resources and to create the basis to equitable sharing of benefits of commercial utilization of folk knowledge of uses of biodiversity. The documents bring together important locality specific information on biodiversity resources and ecological processes affecting them. They lead to recognition of conservation oriented local practices such as for instance, protection of sacred groves. They help to mobilize local communities to prudently manage local biodiversity resources in ways that would promote equitable Benefit Sharing and social justice. There are many encouraging signs globally, as well as within India, the Convention on Biological Diversity, and the subsequent National Biodiversity Act of 2002 intends to promote decentralized democratic systems of governance and institutions of co- management of natural resources incorporating aspects like PBR will have an important role to play in promoting conservation, sustainable use and equitable sharing of benefits of biodiversity resources in the coming decades. It is however important to recognize that not all folk knowledge may be valid, not all folk practices wise, and it is important to create systems of careful assessment of the knowledge practices. Whereas it is important to document knowledge in PBRs, it is equally important to engage with this knowledge as well as the community knowledge holders for these documentations to be effective in management of our bio-cultural diversity and ecosystems.

Index Terms- Biodiversity; Traditional; Ecological Knowledge; Convention on Biological Diversity; People's Biodiversity Registers;

I. INTRODUCTION

The People's Biodiversity Register (PBR) Programme is an attempt to record biological resources, associated traditional ecological knowledge, people's folk knowledge and perception of the status, uses, history, use of Biological Resources, but the organization differs among the different streams of knowledge. Folk knowledge is maintained, transmitted, and augmented almost entirely in the course of applying it in practice; it lacks a formal, institutionalized process for handling. Folk ecological knowledge and wisdom are therefore highly sensitive to changing relationships between people and their eco-logical resource base (Gidgil et. al. 1993). Today, both are eroding at a fast pace for two reasons: firstly, people now have access to newer resources such as modern medicines and are no longer as dependent on local medicinal plants and animals as before; and secondly, people are increasingly losing control over the local resource. However, folk knowledge and wisdom, with their detailed locality- and time-specific content, are of value in many contexts. They must therefore be supported in two ways: by creating more formal institutions for their maintenance and, most importantly, by creating new contexts for their continued practice (Preeti Singh 2014). The program of "People's Bio-diversity Registers" (PBR) is such an attempt.

It is a program of documenting how lay people, primarily rural and forest-dwelling communities, understand biological resources and their ecological setting. The information recorded relates to present status as well as changes over recent years in distribution and abundance; factors affecting such change, including habitat transformations and harvests; known uses; and economic transactions involving these organisms. The document also records the perceptions of local people about ongoing ecological changes, their own development aspirations, and preferences as to how they would like the resources and habitats to be managed. We summarize here our experience of developing the concept and organizing the preparation of PBRs in different parts of India, the resultant understanding, and the interest that this program has generated. The People's Biodiversity Register is a programme of organizing information available in the domain of slow science on the status, uses and management of the living resources. This is the information with practical ecologists, people who deal with living resources as a part of their daily

subsistence activities - as grazers, as fisher folk, as basket weavers, hunters etc. It is information with simple folk, who are nevertheless specialists of slow science (Gadgil et. al. 1993), such as tribal medicine practitioners, healer, or expert honey gatherers. It is also information with more sophisticated practitioners of slow science such as physicians trained in Ayurvedic colleges. The information may be purely orally transmitted or contained in palm leaf manuscripts or in printed Ayurvedic texts. The information may be guarded as secret, as certain herbal remedies are or may be very widely known - as the use of turmeric as an antiseptic is all over India. This information may be documented in full, or as claims that only partially reveal the information. It needs to be collated, verified, synthesized and made available to the society at large, as well as fed back to the village communities.

In PBR's process involving a collaboration between people working in the organized sector (e.g., educational institutions, government agencies, and NGOs) and the practical ecologists, peasants, herders, fishers, and traditional healers (all in the un-organized sector), is as significant as the product: the recorded information. A subset of the information collected, especially that pertaining to medicinal and other economic uses, has been recorded by ethnobiologists working in academic institutions and for the pharmaceutical industry and other commercial interests. In this process, however, the local people are treated as anonymous informants; they receive no particular credit for their knowledge, and the information is accumulated with little reference to particular localities and times. The PBR process, on the other hand, aims to record the information with full acknowledgment of the source; it thereby serves as a possible means of sharing of benefits that may flow from further economic utilization of such information. Another subset of the information recorded in PBRs is collected during "Participatory Rural Appraisal" (PRA) exercises that feed into decentralized development planning. Generating good information for such participatory development is also an objective of PBRs; the PBRs differ from PRAs in their greater emphasis on recording all pertinent knowledge, including changes over the recent past, and in giving specific credit for the information collected. Although we have so far completed only one round of PBRs in any one locality, FRLHT expect it eventually to become an ongoing process of monitoring ecological change and generating the necessary information for locally adaptive management of living resources.

Narwana Village Panchayath situated in Kangra District in the Western [Himalayas](#) region of [Himachal Pradesh](#), **GPS Coordinates: 32.1738027** Latitude, **76.3867737** Longitude. The Economy of Narwana Village Panchayath consists mostly of agriculture and animal farming. It's included in the research

because that place rich in the Traditional knowledge, entire spectrum of ecological and social regimes. Local Health Traditions should be regarded and established as a valuable traditional system. The various herbal formulations prepared and used by traditional vaidyas and other information must be documented systemically so as to avoid the gaps in the traditional knowledge and traditional crops.

II. MATERIALS AND METHODS

The study site Narwana Khas Village Panchayath, Kangra District Himachal Pradesh selected as to represent the entire spectrum of ecological and social regimes within the state of Himachal Pradesh. National Biodiversity Authority (NBA) has been working in close collaboration with State Biodiversity Boards (SBBs), research/educational institutions, State Governments and civil society organizations to provide technical support for the constitution of BMCs and preparation of PBRs.

The first task of the FRLHT coordinators was to select the study sites that would represent the entire research spectrum. After study areas were selected, field investigators were chosen from among college or university-level science teachers or workers of rural development or environment-oriented NGOs. Many of these people are from nearby localities, and have considerable previous familiarity with the study sites. The field investigating teams worked closely with, and often included, some of the local residents. The principal investigators of the program, college teachers, university teachers, Community members, BMC members and school teachers. There were government officials, and many individuals engaged in development activities on their own.

The methodology of field investigations included the following components: Status of biodiversity resources such as populations of medicinal plants, cultivars of fruit trees or freshwater fishes. Various factors such as harvests from natural populations, changes in agricultural practices or discharge of industrial effluents, affecting the biodiversity resources. Ongoing involvement of local communities/ individuals in sustainable use and conservation of biodiversity resources, such as systems of regulated grazing on pastures, maintenance of varieties of fruit plants like jackfruit on farm bunds or protection of fish in sacred ponds. Local knowledge, widely shared and publically disclosed of properties and uses of biodiversity resources e.g. Drought-resistance of a certain cultivar, methods of preservation of food or use of certain plants in treating human or livestock diseases. Local knowledge only partially disclosed; for instance, a claim that a particular medicine woman knows of a cure for asthma.

III. RESULTS

Table-1 Overall Result of the PBR Documentation Work in Narwana Village Panchayath

Description	Narwana Village Panchayath, Kanra District, Himachal Pradesh
Population detail	Total: 2532, Male: 1341, Female: 1191

Geographical Position	GPS Coordinates: 32.1738027 Latitude, 76.3867737 Longitude
Geographical Area	363-83-71 hectare
Climate: Rainfall, Temperature, Other weather pattern	The climate is sub-humid. The temperature varies from 15° C - 30° C and dips to 0 degree. The January month is coldest while the June as hottest month. Most of the rainfalls occur during July-September. Average annual rainfall ranges from 1800 to 2500 mm. Snowfall is experienced rarely.
People and Culture	Most of the people belong to Hindu and Muslim communities. No Christians are reported.
Total Forest Area	123 acres
Total Cultivated Area	64 acres
Total Biodiversity Management Committee Member	7 Members
Total Healer	15 healers
Total Remedies	115
Total Disease	80
Total Plant use	125
NTFP based livelihood activities	A significant Tribal population of Gaddi depends on collection and trading of Non-Timber Forest Produces for their livelihood.
Animal Husbandry	Livestock e.g. Jersey cow (hybrid) and local breed of buffalo and Goat and Sheep are the other important vocation of the villagers.

Figure-1 Map of Study Area



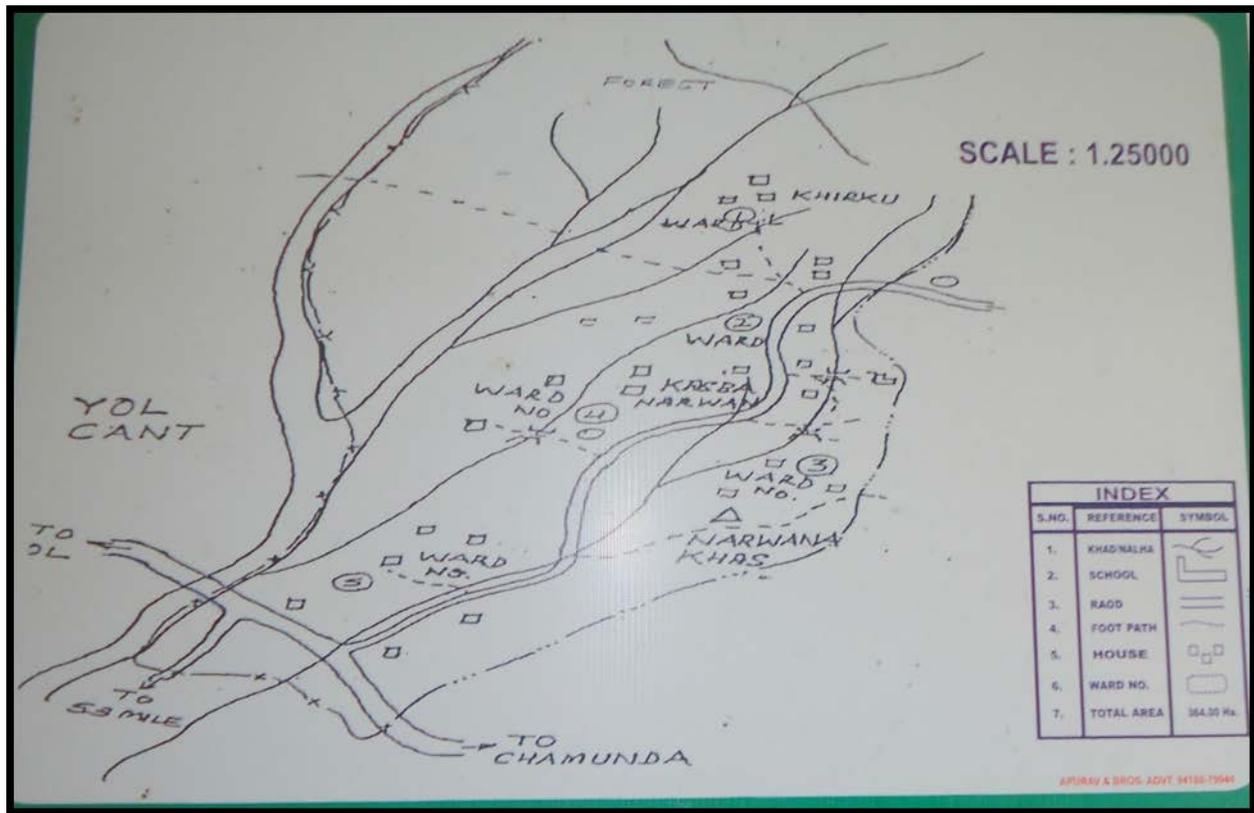


Figure-2 Map of Narwana Village Panchayth



Figure-3 Meeting of BMC Members and Villagers with Dr. M.L. Thakur, State Project Coordinator, UNEP ABS Project, Himachal Pradesh State Biodiversity Board, at Narwana Village Panchayath on 12 February 2014

Table-2 Formulation recorded for various diseases

Disease	No. of formulation
Stomach disorder	08
Cut and wounds	08
Respiratory (cold, cough, bronchitis, asthma, running nose)	07
Tooth decay, tooth ache	05
Dysentery, diarrhea	05
Jundice	04
Women specific (Heavy menstrual discharge, white discharge)	05
Ear problem (ear pain, ear rotting)	03
Joint pain	06

Documentation and Assessment of People's Biodiversity Register was carried out in Narwana Village Panchayath, Kangra District Himachal Pradesh. All healers from different village of Narwana Village Panchayath (Narwana Khas, Narwana Kaswa) were interviewed and nutritionally important food and vegetable crops collected from the 20th January to 24th March 2014.

Table-3 Land use pattern

Type	Total area shown in hectares as shown above under land use	Percentage
Cultivated land	64	31%
Forest land	123	60%
Grazing land	2	1%
Irrigated land	9	5%
Non Irrigated land	6	3%
Total	204	100%

Graph- 1 Land use pattern

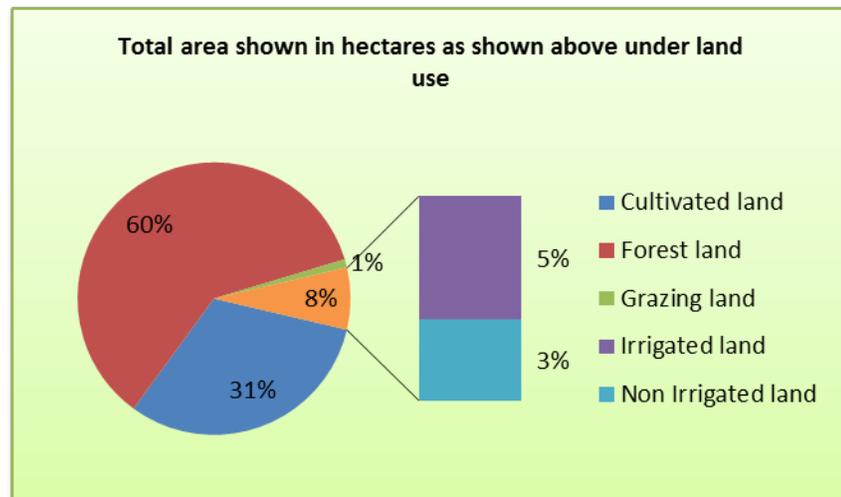
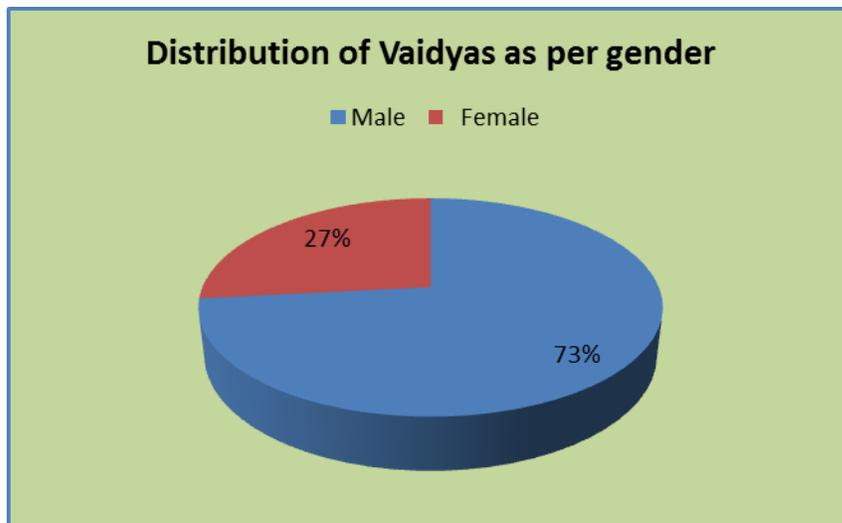


Table-4 Distribution of Vaidyas as per gender

Gender	No of vaidyas	Percentage
Male	11	73%
Female	4	27%
Total	15	100%

The table shows that male vaidyas account for 73%, female vaidyas account for 27%.

Graph- 2 Distribution of Vaidyas as per gender



Age wise distribution of Vaidyas

The Table below shows that while there are maximum of 5 vaidyas in the age group of 40 – 60 years followed by 4 vaidyas in 60-100 years age group and reducing to 1 vaidya only in 20 to 40 years age group. It also shows that there are 7 male vaidyas compared to 2 female vaidyas. It further shows that there are no female vaidyas in the age group of 20 to 40 years. This trend shows rapid erosion of folk healing traditions amongst the younger generation and especially among female is of grave concern.

Table-5 Age wise distribution of Vaidyas

Age group in Years	Male	Female	Total
20-40	1	1	2
40-60	4	2	6
60-100	5	1	6
Total	10	4	14

Graph-3 Age wise distribution of Vaidyas

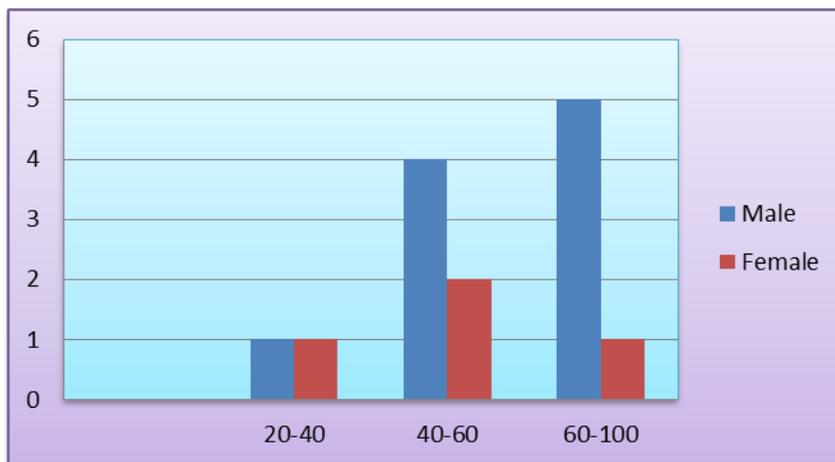


Table-6 List of Medicinal plants of Narwana Village Panchayath used in Primary Health care

Primary Healt

Sl. No.	Local Name	Scientific name	Health Condition
1.	Turmeric	<i>Curcuma longa</i> Linn. (Zingiberaceae)	Skin eruption/Joint pain/Tooth ache
2.	Kainth	<i>Pyrus pashia</i> (L.), Batsch (Rosaceae)	Oral health care
3.	Braa	<i>Rhododendron arboretum</i> Linn. (Ericaceae)	Heat Storke
4.	Banaa	<i>Vitex negundo</i> Linn.	Body swelling
5.	Chittra	<i>Plumbago zeylanica</i> L.	Hair fall, Liver Care, Common Fever
6.	Harad	<i>Terminalia chebula</i>	Cold/ Cough/ Joint pain/ Weight management
7.	Kasamal	<i>Berberis Lycium</i> (Berberidaceae)	Sexual dysfunction /Oral health care/ Eye infection
8.	Jamun	<i>Syzygium cumini</i>	Diabetes
9.	Karela	<i>Momordica charantia</i>	Diabetes
10.	Gandla	<i>Murraya Koenigii</i> (L)Spreng. (Rutaceae)	Health food/ Skin infection
11.	Ajvan	<i>Carum Copticum</i> (L) Benth. & Hook. (Apiaceae)	Sexual dysfunction/ Skin eruption
12.	Kali Basunti	<i>Eupatorium adenophorum</i> Spreng. (Asteraceae)	Cold/ Cough/ Injury
13.	Sans Paud	<i>Asparagus adscendens</i> Roxb.	Injury/ Wound
14.	Phutkanda	<i>Achyranthes Aspera</i> Linn (Amaranthaceae)	Skin eruption /General weakness
15.	Sapdotri	<i>Bergenia cilliata</i> Stermb. (Saxifragaceae)	Sexual dysfunction
16.	Bhang	<i>Cannabis sativa</i> Linn. (Cannabaceae)	Sexual dysfunction
17.	Bish kapru	<i>Stephania glabra</i> (Roxb.) Miers (Menispermaceae)	Outgrowths/ Injury/ wound
18.	Kamla	<i>Mallotus philippiensis</i>	Constipation
19.	Tulsi	<i>Ocimum sanctum</i>	Cold/ Cough/ Cardiac trouble
20.	Behra	<i>Terminalia bellirica</i>	Oral health care/ Tooth ache/Constipation / Weight management
21.	Ambla	<i>Phyllanthus emblica</i>	Weight management

Table-7 List of Threatened medicinal plants of Narwana Village Panchayath Forests which are endangered that require attention for *in-situ* conservation, sustainable harvest practices and cultivation

Plant Type	Local Name	Scientific Name	Variety	Source of Plants/ Seeds	Local status Past	Local status Present	Parts collected
Plant	Sapdotri	<i>Bergenia cilliata</i> Stermb. (Saxifragaceae)	Wild	Forest	Available	Endangered	Root
Plant	Ajwain	<i>Carum copticum</i> (L) Benth. & Hook. (Apiaceae)	NA	Home Garden	Available	Endangered	Leaves, Seed
Plant	Gandla	<i>Murraya koenigii</i> (L)Spreng. (Rutaceae)	Wild	Forest	Available	Endangered	Root, Branch

III. DISCUSSIONS

Documentation was carried out with the selected Healers, Community members, BMC Members, University, NGOs, Teachers from the different locations of Narwana Village Panchayath, Kangra District, Himachal Pradesh. The entire healer interviewees were male and female healer in the age group of 25 to 85 years. With all 15 healers 80 diseases and 115 remedies was documented and 47 species used in the remedies was collected with the help of 15 healer. Altogether 31 plant species are used in various remedies documented and photography was done for all the documented plants used by the 15 healers.

Among the remedies documented stomach disorder, cuts and wounds was the maximum formulation recorded followed by, Respiratory diseases, tooth related, women's specific problem, ear problem, Skin diseases, Joint pain etc., *Ruellia tuberosa*, *Tragia involucrate*, *Aloe barbadensis*, *Nicotiana tabacum*, *Curcuma longa* were most used plants among the documented remedies shows that they are having high medicinal value. The most used 27 medicinal plants in primary health care.

Habit analysis if the 31 species used in the documented remedies shows 3 herbs, 4 shrubs, 17 trees, 3 climbers, 1 fern. Out of 31 species documented all are having Botanical evidence and 25 out 31 species of wild medicinal plants are reported to be traded. These medicinal plants in the wild offers livelihood security to the local communities.

During the documentation it was found in that they have immense knowledge in the field of traditional medicine and herbal preparation. Due to modernization, the traditional system of the herbal use is not very popular with younger generation. In the past, the indigenous communities had a self-regulatory system that was interwoven in such a way so that each individual could receive certain economic benefits from his profession. Some of the traditional vaidyas were marginal farmer and they provided their services free of cost. In return, the villager helped the vaidyas with their agricultural work and also offered some donation in the form of the cereals, pulses and vegetable. They were happy to share their knowledge. With changing life styles and introduction of immediate economic return in terms of cash, the traditional value to the profession of vaidyas has started changing. The younger generation of vaidyas might have visualized fewer opportunities in the profession for livelihoods. This has resulted in sharp decline in the sharp decline in the number of recognized vaidyas.

The study analysis shows that about the 11 species are reported to have Nutritional important traditional varieties of the crops. It was found that about 3 species under the threatened category.

Agriculture and farm based activities constitute the major livelihood activity. The Table shows a maximum area of 204 acres is used for cultivation of food crops followed by oil seeds and vegetables, fruits, flowers. The study analysis shows a list of 09 nutritionally important food and vegetable crops.

It is observed that there are only 9 traditional crops are under cultivation. This indicates rapid erosion of traditional crop varieties. The people of the Narwana Village Panchayath also depend on activities relating to livestock keeping of cows, oxen, goat, sheep and poultry.

For the future of the Narwana Village Panchayath, Local Health Tradition should be regarded and established as a valuable traditional system. The various herbal formulations prepared and used by traditional vaidyas and other information must be documented systemically so as to avoid the gaps in the traditional knowledge and traditional crops.

IV. CONCLUSION

Traditional societies have accumulated a wealth of local knowledge, transmitted from generation to generation. Experience has taught them how the water, trees, and other natural resources should be used and managed to last a long time.

The People's Biodiversity Register would be prepared in relation to some specified human community of a few tens to a few thousands of households, generally falling within the jurisdiction of a single Panchayath and for the area from over which they gather the bulk of biological resources such as fuel wood or bamboos.

People's Biodiversity Register is a projection to fill the gap between knowledge & ignorance and rich & poor. It is certainly a tool of regional as well as national development with the practical involvement of rural people in a participatory mode for the Assess and Benefit Sharing of Biological Resources.

The present study on documentation of Local Health traditions among the selected 15 healers of Narwana Village Panchayath, Kangra District, Himachal Pradesh gives an insight about the richness of traditional knowledge. The study show that various ailments treated by using the plant species. This would be helpful for further research on exploring their medicinal efficacy, value addition and use in curing for various old and new diseases. On the other hand exploring with more healers would give ocean of traditional knowledge which can contribute for primary health care at low cost. Due to modernization, the traditional system of the herbal use is not very popular with the younger generation. In other words the traditional knowledge is eroding. Therefore, there is a need for preserving rich traditional knowledge from the existing healer through Revitalization of local Health Traditions.

The study also indicates that nearly 3% of the documented medicinal plants fall under the threatened category. There is no need for establishment of Home Herbal Garden and organize awareness of Programmes for conservation and sustainable use of the medicinal plants.

Due to modernization the traditional system of the herbal use is not very popular with the younger generation. In the past, the indigenous communities had a self-regulation system that was interwoven in such a way so that each individual could receive certain economic benefits from his profession. Some go the traditional vaidyas were marginal farmer and they provided their services free of cost. In return, the villagers helped the vaidyas with their agricultural work and also offered some donation of cereals, pulse and vegetable.

With changing life style and introduction of immediate economic return in terms of cash, the traditional values related to the profession of Vaidyas started changing. The younger generation of vaidyas might have visualizing fewer opportunities in the profession to become wealthy. This resulted in sharp decline in the number of recognized vaidyas.

Nonetheless the, knowledge of herbal use is so deeply rooted in society that there are still number of women and men in the village who know the healing properties of many medicinal plant species. The loss of traditional knowledge on preparing medicines is due to the decline in number of vaidyas coming forward to adopt this profession. In addition the survey results indicate that the practice of individual healers of identifying plants and preparing various formulations themselves for the use their patient have been decaling rapidly. Today, due to rapid socio- economic changes and urbanization, most of the vaidyas largely depend on product supplied by the pharmaceutical industries.

The analysis of data in this report reveals the documentation of 115 remedies from Kangra District, Himachal Pradesh in which 31 plants species have been documented, out of 31 plant species 25 plants species are use in the primary health care, only 09 traditional crops are under cultivation. This indicates rapid erosion of traditional crop varieties and that require immediate precautionary step for their conservation and to protect them from getting extinct.

In developed countries like United States a majority of people (55%) combine alternative treatments with conventional medicine. It is important to note that 13% try them because they think that conventional medicine is too expensive (*Stein 2004). They Ayurvedic medicines and the herbal product are cheaper and more available to the poor. In developing countries, where the majority of the people cannot afford the high cost of modern medicines, traditional herbal therapy is the only and most vital option. This aspect traditional herbal healing can be made a highly saleable concept in both developed and developing countries.

The present study of the medicinal plants of Narwana Village Panchayath Kangra District, Himachal Pradesh and various ailments that can be treated by these plant species would be helpful for the further research on exploring their medical efficacy, value addition, and use in curing for various old new diseases.

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Impact of Emotional Intelligence, Nature of Course and Gender on Problem Focused Coping Style among College Students

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Abstract- The aim of the present investigation is to assess the impact of emotional intelligence, nature of course and gender on problem focused coping style among college students. Sample of the present study consists of 560 professional and non-professional college students, both male and female in Rayalaseema region of Andhra Pradesh State. To measure emotional intelligence and Coping styles, "Emotional intelligence scale" developed by Nutankumar Thingujam and Usha Ram (1999); Coping styles questionnaire developed by Dr. B.S. Kumar Reddy (1999) were administered to the subjects. Results revealed that students with high emotional intelligence; students perusing non professional courses and female students frequently use problem focused coping style to overcome stress.

Index Terms- Emotional intelligence, Coping styles, Professionals and Non-Professionals.

I. INTRODUCTION

Emotional intelligence is defined as the ability to perceive emotion, integrate emotion to facilitate thoughts, understand emotions, and to regulate emotions to promote personal growth.

Emotional intelligence is the ability to monitor our own and other's feeling and emotions, to discriminate among them, and to use this to guide our thinking and actions (*Falco Salovey and Mayer 1990*). Emotional intelligence is "an array of non-cognitive capabilities, competencies and skills that influence one's ability to succeed in coping with environmental demands and pressures", (*Baron, 1997*). Emotional Intelligence refers to the capacity for recognizing our own feelings and those of others, for motivating ourselves, and for managing well in ourselves and our relationships (*Goleman D.1998*). Emotional intelligence as the mental liability we are born with which gives us our emotional. Sensitivity and our potential for emotional learning, management skill which can help us maximize our long term happiness and survival (*Hien, S., 2004*).

Coping is thus expending conscious effort to solve personal and interpersonal problems, and seeking to master, minimize or tolerate stress or conflict Psychological coping mechanisms are commonly termed ways of coping or coping skills. Unconscious or non-conscious strategies are generally excluded. The term coping generally refers to adaptive or constructive ways of coping, i.e., the strategies reduce stress levels. However, some ways of coping can be considered maladaptive, i.e., stress levels increase. Maladaptive coping can thus be described, in effect, as

non-coping. Furthermore, the term coping generally refers to reactive coping, i.e., the coping response follows the stressor. This contrasts with proactive coping, in which a coping response aims to head off a future stressor.

Problem-focused strategies try to deal with the cause of their problem. They do this by finding out information on the problem and learning new skills to manage the problem. Problem-focused coping is aimed at changing or eliminating the source of the stress. The three problem-focused coping strategies identified by Folkman and Lazarus (1988) are taking control, information seeking, and evaluating the pros and cons.

Ptacek, Smith and *Dodge*, (1994); Supe (1998) ; Taylor (2001); Vanderbijlpark (2004); Folkman and Moskowitz, (2004); Sirin (2007); Skinner and Zimmer-Gembeck, (2007); Mukti Shah and Nutankumar S. Thingujam (2008) Phillip and Carlos (2009); Carolyn Mac Cann et al., (2011); Song and Chae (2014); Onyedibe Maria Chidi et al., (2015) investigated that individuals high in emotional intelligence may adapt well to stressful events and those with low emotional intelligence may adapt poorly, which would include responding with depression, hopelessness and other negative behaviours. However, little empirical research has explored the relationship among emotional intelligence, coping and mental health in adolescents.

II. OBJECTIVE

1. To assess the influence of emotional intelligence, nature of course and gender on Problem focused coping style among college students.

III. HYPOTHESES

1. There would be significant impact of emotional intelligence on problem focused coping style among college students.
2. There would be significant impact of nature of course on problem focused coping style among college students.
3. There would be significant impact of gender on problem focused coping style among college students.

IV. POPULATION AND SAMPLE

The Students studying Professional and Non-Professional courses in Chittoor District of Andhra Pradesh State in India constituted the Population of the Study. Students of Professional courses like Medicine and Engineering from NIMS, Kadapa; S.V.Medical College, and S.V.University College of Engineering, Tirupati and Students of Non-professional courses (B.A., B.Sc.,B.Com) from S.V.Arts College and S.P.W.Degree College, Tirupati were selected using stratified random sampling technique.

The two Psychological tools namely 1.Emotional intelligence developed by Nutankumar Thingujam, and Usha Ram (1999); 2.Coping styles developed and standardized by Kumar Reddy B.S (1999) were administered to 1200 Professional and Non-Professional Students, both Male and Female. Only the high and low Scorers on these Scales were considered and finally 560 constituted the sample of the present

study and a 2X2X2 Factorial Design was adapted to analyze the results.

Variables Studied

Independent Variables: (1). Emotional Intelligence (2). Nature of Course (3).Gender

Dependent Variable: (1). Coping Styles

Tools: (1). Emotional Intelligence Scale: The Emotional Intelligence of the Subjects was assessed by using Emotional Intelligence Scale developed by Nutankumar Thingujam, and Usha Ram (1999). (2). Coping styles (Adjustment Styles) Questionnaire: Coping styles (Adjustment Styles) Questionnaire was developed and standardized by Kumar Reddy B.S (1999).

Statistical Analysis: The obtained data were subjected to statistical analysis such as Means, SDs, and Analysis of Variance (ANOVA).

V. RESULTS AND DISCUSSION

Table-II: Means and SDs of scores on Problem Focused Coping Styles.

Emotional Intelligence		Nature of Course			
		Professionals		Non- Professionals	
		Gender		Gender	
		Male	Female	Male	Female
Low	Mean	41.40	42.58	46.15	44.55
	SD	7.30	6.64	7.54	8.69
High	Mean	43.27	46.80	45.15	47.04
	SD	8.65	7.63	6.13	8.15

Grand Means

Professionals = 43.51
Non-Professionals =45.72

Male =43.98
Female =45.24

Low Emotional Intelligence = 43.67
High Emotional Intelligence = 45.56

A close observation of table-II shows that the female students studying non-professional courses with high emotional intelligence obtained a high score of M=47.04 indicate they frequently use problem focused coping styles compared with other groups. Male students studying professional courses with low emotional intelligence obtained a low score of M=41.40 indicate they use problem focused coping styles less frequently compared to other groups.

In terms of comparisons, non-professional students (M=45.72) frequently use problem focused coping styles than professional students (M=43.51). Female students (M=45.24)

frequently use problem focused coping styles than male students (M=43.98). Students with high emotional intelligence (M=45.56) frequently use problem focused coping styles than the students with low emotional intelligence (M=43.67).

There are differences in mean scores of different groups of students related to problem focused coping styles. However, in order to test whether emotional intelligence, nature of course and gender on problem focused coping style of the students, the data were further subjected to factorial analysis of variance and the results are presented in table-III.

Table-III: Summary of ANOVA for scores on Problem Focused Coping Style.

Source of Variance	Sum of Squares	df	MSS	'F'
Emotional Intelligence (A)	2550.045	1	2550.045	42.63**

Nature of Course (B)	1662.902	1	1662.902	27.80**
Gender (C)	2499.088	1	2499.088	41.78**
(A x B)	2316.645	1	2316.645	38.73**
(A x C)	949.002	1	949.002	15.86**
(B x C)	331.716	1	331.716	5.54*
(A x B x C)	322.545	1	322.545	5.39*
Within	33015.414	552	59.811	-
Corrected total	43647.355	559	-	-

**-Significant at 0.01 level

*-Significant at 0.05 level

Hypothesis-1. There would be significant influence of emotional intelligence on problem focused coping style among college students.

It is evident from table-III that the obtained “F” value of 42.63 is significant at 0.01 level implying that emotional intelligence has significant influence on problem focused coping style among college students. As the ‘F’ value is significant, the hypothesis-1, which stated that emotional intelligence has significant influence on problem focused coping styles among college students is accepted as warranted by the results. Students with high emotional intelligence (M=45.56) frequently use appraisal focused coping style than the students with low emotional intelligence (M=43.67).

The results of the present study corroborate with the findings of Ozge Hacifazlioglu and Melahat Halat (2010) and [Einollah Mollaei](#) et al., (2012) which states that emotional intelligence was positively associate with problem-focused coping style.

Hypothesis-2. There would be significant influence of nature of course on problem focused coping style among college students.

It is evident from table-III that the obtained “F” value of 27.80 is significant at 0.01 level implying that nature of course has significant influence on problem focused coping style among college students. As the ‘F’ value is significant, the hypothesis-2, which stated that nature of course would significantly influence the problem focused coping style among college students, is accepted as warranted by the results. Non-professional students (M=45.72) frequently use problem focused coping style than professional students (M=45.72).

In Indian academic institutions, students pursuing different courses experience academic stress, because of heavy work load, competition, high parental expectations, and practical work, seminars, etc. It is natural that when the intensity of academic stress is more, students generally try to seek directions from others, asking someone to provide a specific kind of help, approaching the problem with suitable skills, negotiate and compromise to resolve the issue. In the same way in the present study it is found that students of non-professional courses use

problem focused coping more frequently to overcome academic stress than professional students.

The most important observation in the present study is non-professional college students experience little academic stress compared to professional college students. It is found that non-professional college students are frequently using all the three coping styles namely appraisal focused, emotional focused and problem focused coping styles equally compared to professional college students. It indicates that it is because of the usage of all three coping styles by non-professional college students lead to experience little stress compared to their counterparts.

Hypothesis-3. There would be significant influence of gender on problem focused coping style among college students.

It is evident from table-III that the obtained “F” value of 41.78 is significant at 0.01 level implying that gender has significant influence on problem focused coping style among college students. As the ‘F’ value is significant, the hypothesis-3, which stated that gender would significantly influence the problem focused coping style among college students is accepted as warranted by the results. Female students (M=45.24) frequently use emotional focused coping style than male students (M=43.98).

VI. CONCLUSIONS

1. Students with high emotional intelligence use problem focused coping style to overcome stress.
2. Non-professional course students frequently use problem focused coping style than professional course students.
3. Female students frequently use problem focused adjustment style only to reduce or eliminate a stressor.
4. There is significant interaction among emotional intelligence, nature of course and gender in causing the effect on problem focused coping style.

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Implementation of Student Safety System Using RFID

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Abstract -Recently, crime against children is increasing at higher rate and it is high time to offer safety system for the children going to school. This paper presents a system to inform parents about the status of their children such as absence. The system checks and detects which child enter the wrong bus and issues an alert to this effect. RFID-based detection unit located inside the bus detects the RFID tags worn by the children. In addition, the system checks the children absence and updates the database. The parents can log into the system website and monitor the details of their children.

Keywords _ RFID (Radio Frequency Identification) , Bus Alert System , Web Server , Database , Students Absence

I. INTRODUCTION

Nowadays, parents are worried about their children because of the high rate of kidnapping. Moreover, parents are having long working hours, so they simply do not have as much time to spend for their children. Moreover, they will be persuaded by kidnapper before they enter the school. So, it is the responsibility for the school to take care of their students and they also know in-time and able to send an alert message to their parents if the students are not at the school at school start time. However, it is not easy to do this manually. The school authorities cannot check their students individually and cannot send an alert message to their students. So, The suitable solution for this problem is by designing a system that will alert the student such as by ringing buzzer or by LED if the student enter the wrong buses. Moreover, an automatic SMS sending system will be needed to send SMS if their children will not arrive school at school starting time.

II. SYSTEM BLOCK DIAGRAM AND COMPONENTS

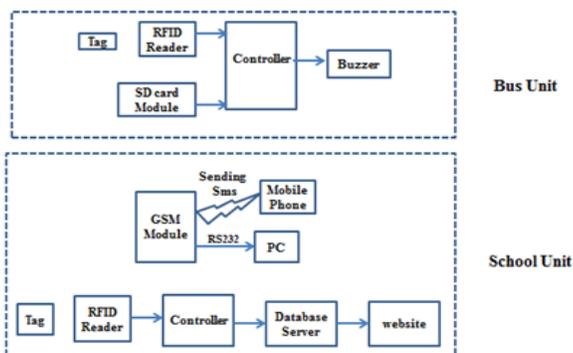


Figure1. Block Diagram of the system

The block diagram of the system is shown in Figure.1. This Block Diagram consists of RFID (radio frequency identification) , Controller (Arduino Mega 2560) , SD card module , Buzzer and GSM Module (SIM900A) and webpage .

A. Bus Unit Description

The bus unit will detect the children when they enter/leave the bus. RFID technology is used to achieve this process. Controller will check if this read ID is matched with the student list stored on SD card. The buzzer will alarm if the ID do not match .

B. School Unit Description

The School Unit consists of a server and GSM module. The server acts as database server and web server. In addition , the server communicates with an SMS gateway to send notification in case a child is detected missing.

Table I. Components used in the system

Components	Specifications
RFID reader	MFRC522 13.56 MHz (high frequency) Reading Range (10cm – 1m)
RFID tag	Passive tag S50IC Card 1kbyte EEPROM
Controller	Arduino Mega 2560 Clock Speed (16MHz) EEPROM (4KB) SRAM (8KB) Flash Memory (256KB)
GSM Module	SIM900A

III. FLOW CHART FOR THE SYSTEM

A. Flow chart of the school Unit

The flow chart of the school unit is shown in Figure.2. In this flow chart we also initialize the I/O ports. Firstly, attendance is stored to the temporary table. To determine the absence list by matching student list with attendance list. This absence list will be uploaded to the website. SMS will be sent to parents whose children are absent without taking leave.

B. Flow Chart of the bus unit

The Flow Diagram of the controller is shown in Figure.3. Firstly we initialize the I/O ports. Next, the controller will read the student list stored on SD card. Then , the reader read the tag ID .Data is sent to SP controlled device in byte form . The controller with checkif read tag ID match with stored ID .

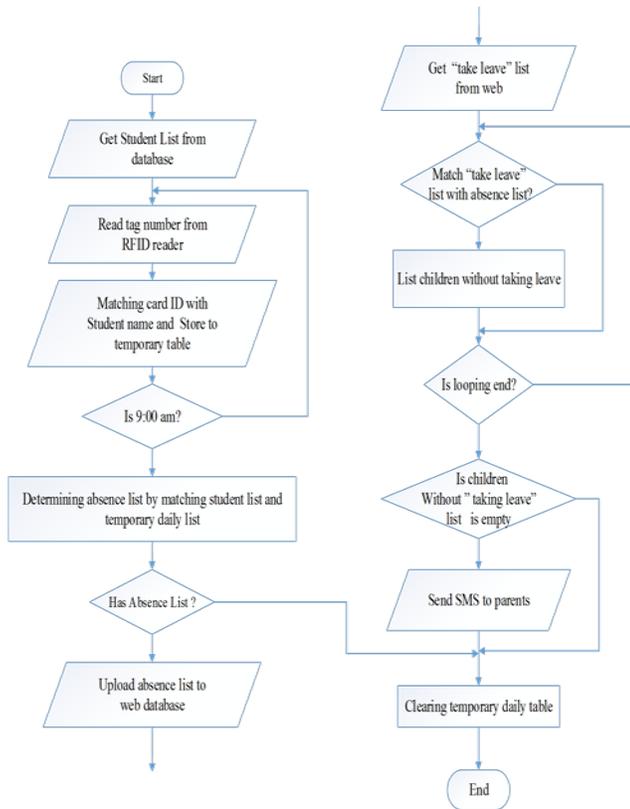


Figure.2. Flow chart of School unit

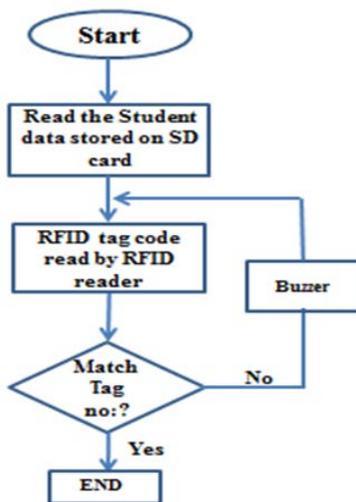


Figure.3. Flow chart of Bus unit

Testing is vital part to confirm the functionality of the system. Firstly, the units were tested individually and they were implemented to check if they were working correctly. Then, they were configured and integrated as required for the system. The unit test was held for all the units in system: RFID reader and tags, GSM modems and school server.

A. Bus Unit

The bus unit consists of RFID reader , Controller , SD card module and Buzzer as shown in figure4. Microcontroller is used to interface the reader and SD card module to check if the RFID tag code read by RFID reader is matched with the tag code stored in the SD card module.RFID based security system is able to identify whether the student enters the right bus or not .

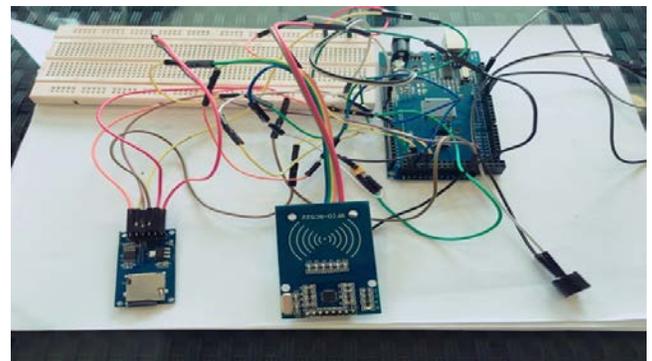


Figure.4. Working Circuit Diagram of Bus Unit

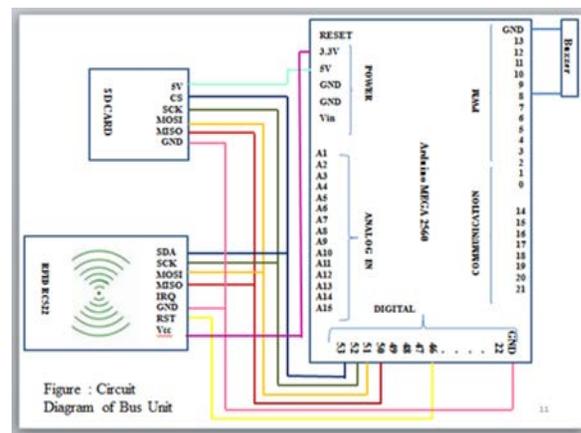


Figure.5. Circuit Diagram of Bus Unit

```

    Initializing SD Card...
    Initialization Done
    Seat.txt:
    44 7C 14 DB
    0A 30 E5 45
    0B 07 32 3B
    3
    Done reading
    44 7C 14 DB
    true
    0B 07 32 3B
    true
    E4 E4 F2 B6
    false
    0A 30 E5 45
    true
    01 0E 13 24
    false
    
```

IV. IMPLEMENTATION AND TESTING

Figure.6. Serial Monitoring of bus unit

Figure 6 shows the accepted card information that read by the reader matches with stored base coded or not. If they are matched it returns true. If not, it return false.

B. School Unit

The school unit consists of RFID reader, Controller and GSM module as shown in Figure.7.

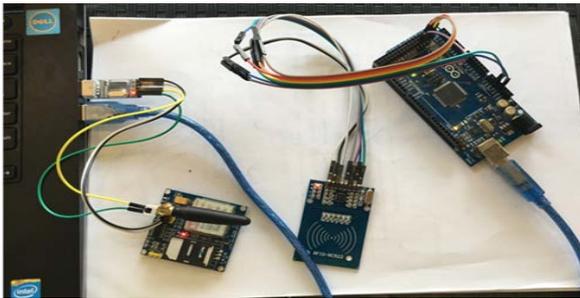


Figure.7. Working Circuit Diagram of SchoolUnit

1) Testing GSM Modem

The GSM module is connected to the PC by using RS232. This modem is a type of modem that accepts SIM card, and operates through a subscription to a mobile operator. It works like a mobile phone for sending and receiving SMS through radio waves. The microcontroller contain the AT commands, written in C, for sending SMS. The code was verified using a terminal program to ensure that microcontroller sent the correct AT commands to GSM modem. It is also responsible for notifying the parents in case of emergencies by sending SMS. The sms notification can be seen on Figure.9.

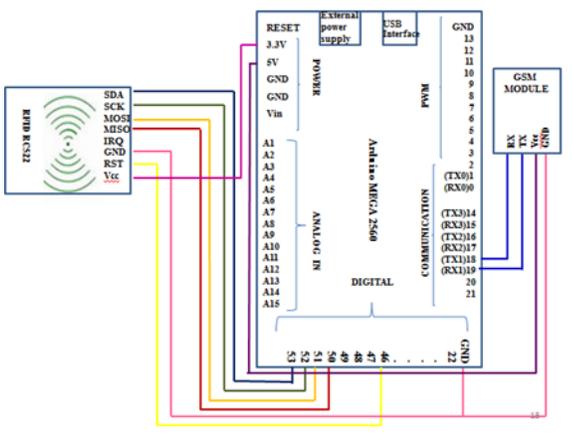


Figure.8. Working Circuit Diagram of SchoolUnit

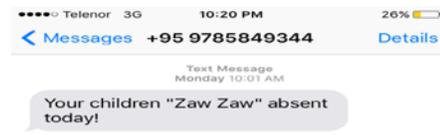


Figure.9. SMS that can be notified to parents

2) Web-based Application

This section presents some tests that had carried out to verify the functionalities of web-based application. The server is implemented in PC. The web pages are categorized different modules, namely the absence list, roll call, services. The pages are developed using Java scripting language and compatible with all major web browsers.



Figure.10. webpage that can be seen on parents phone

The website functionality is provided by accepting request from the user's browser and responds back HTML documents (web pages) and files. Parents can have only access if they log in to website.

Parents can get access to web site via mobile phone. It is shown in Figure11. Only the authorized person can get access to absence list, roll call list and service.

Figure.11 shows that parents can take a leave on website.

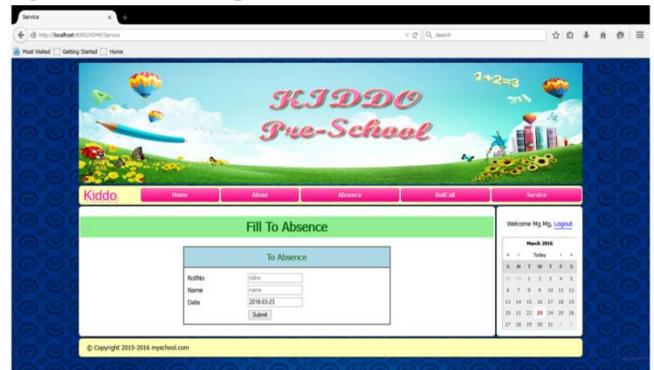


Figure.11. Parents fill absence form to take leave for their parents

V. CONCLUSION

This project implementation primarily focuses on alert if the children enter the wrong bus. RFID-based detection unit located inside the bus detects the RFID tags worn by children. The system checks and detects which child did not arrive the school and issues an alert message to this effect. In addition, the system checks the children absence list and updates the database. The parents can log into system website and monitor the details of their children.

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SMEs Policies and Challenges: A Comparative Analysis of Zimbabwe and South Korea

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Abstract- This comparative study examined the policies and challenges of SMEs operating in Zimbabwe and South Korea. Data were collected using focus group discussions, document analysis, interviews and observations. The sample of the study constitutes of SMEs operating in urban areas of Seoul and Ansan, Harare and Chinhoyi of South Korea and Zimbabwe respectively. The major findings revealed that SMEs in the two countries face similar major challenges what differs is that they operate in different policy environments. This research concludes that South Korea's policies are more supportive to the SMEs sector and hence has led to a miracle economic growth as well as lower mortality rate of SMEs in South Korea while Zimbabwe's policies are less supportive resulting in higher failure rate of SMEs. The study recommends an econometric investigation of the utility of the traditional production model in SMEs in the two economies. The economic model $Q=f(K, L)$ states that growth (Q) is a function of Technology (K) and Labour (L).

Index Terms- SMEs, Policies, Challenges, Economic Development, South Korea, Zimbabwe

I. INTRODUCTION

One longstanding and polarised debate in global development concerns the role played by SMEs in economic development. SMEs across the globe have been hailed for immense employment creation, Gross Domestic Product contribution, export earnings and the general well-being of the populace. Major economic giants such as South Korea, Taiwan, Japan, Malaysia and China are thriving on SMEs. These countries are now regarded as the new worlds. Their industrialisation has been brought about by SMEs contribution. Across the world the focus of every country is on SMEs development. Major support policies are being crafted to spearhead SMEs development. Zimbabwe has also adopted the stance of sprucing up its economy through channelling resources to the development of SMEs. However the current scenario shows that Zimbabwe is facing a plethora of challenges in that pursuit but the challenges seems not to be unique since they show a lot of similarities to those being experienced by South Korea. Therefore this study is based on a comparative analysis of challenges and policies of Zimbabwe and South Korea's SMEs.

1.2 Background of Zimbabwe and South Korea.

1.2.1 Zimbabwe

Zimbabwe is a landlocked country surrounded by Mozambique, South Africa, Botswana, Namibia, Zambia and Malawi. It is endowed with natural resources such as high abundance of sunlight, precipitation and water bodies which gives the country a high potential for agriculture (arable land of about 390 757 km²) and has the Victoria Falls which is one of the seven wonders of the world. It is rich in minerals such as diamonds (about 25% of the world supply), platinum group of metals, gold, tantalite, chrome, iron ore, copper, nickel and others. It is rich with flora and fauna and a home to the big five.

Zimbabwe has a young population of 13.06 million with a life expectancy of 60 years. It is composed of three ethnic groups and languages namely Shona (82%), Ndebele (14%), others (4%). The official language used in Zimbabwe is English although languages such as Shona and Ndebele are widely used in Mashonaland provinces and Matebeland provinces respectively. The major dominating religions in Zimbabwe are Christianity 75%; Indigenous Beliefs: 24%; other: 1%. Currently Zimbabwe is using multicurrency as its official currencies (USD, SA Rand, Botswana pula and Euro. Remarkably Zimbabwe is one country with the highest literacy rate in Africa.

Historically the country was once a British colony and gained independence in 1980, on 18 April. In 2000, the country embarked on land reform which led to many landless Zimbabweans getting access to their native land. The country also proceeded with the Economic Empowerment and Indigenisation policy (51/49%), where foreigners were asked to cede 51 per cent shares of their companies operating in Zimbabwe to locals. Due to the land reform and Economic Empowerment and Indigenisation policy, Zimbabwe was slashed with sanctions by Britain and America. This led to the deterioration of the economic activities in the country.

The economic background of Zimbabwe is characterised by tight liquidity conditions in the financial sector, non-performing loans, large corporates closures, low production levels (capacity utilisation 36% in 2014), power deficit of 1000 MW, (Demand 2200-Supply 1203MW), rising formal unemployment -around 80% and a disproportionate trade balance- trade deficit of about 23% of GDP. The Gross Domestic Product of the country has been increasing at an increasing rate as from 2009 to 2011 and started increasing at a decreasing rate as from 2011 to 2014.

The continuous deterioration of the economy and closure of large corporates made the country to refocus on SMEs as safety nets and for these SMEs to close the gap which was left by large corporates. To that effect the government established a Ministry of Small Medium Enterprises to cater and advocate for SMEs

policies. SMEs are contributing more than 60% on employment, Gross Domestic Product and to the tax base. Though the government of Zimbabwe started its focus on SMEs as from 1980 through enactment of Small Enterprises Development Corporation, SMEs are still facing a mirage of challenges despite numerous policies and supporters of SMEs in Zimbabwe.

1.2.2 South Korea

South Korea is an Asian country. Koreans are primarily from one ethnic family and speak one language, they share distinct physical characteristics and are believed to be descendants of several Mongol tribes that migrated onto the Korean Peninsula from Central Asia. According to South Korea 2011 statistics, South Korea's total population was estimated at 49,779,000. A notable trend in South Korea's demographics is that it is growing older with each passing year. In the 1960s, Korea's population distribution formed a pyramid, with a high birth rate and relatively short life expectancy. However, age-group distribution is now shaped more like a bell because of the low birth rate and extended life expectancy. It is projected that by the year 2020 youths (15 and younger) will make up a decreasing portion of the total population, while senior citizens (65 and older) will account for some 15.7 per cent of the total population. In South Korea about 46,5% of the population have no religion, 29.3% are Christians, 22.8% are Buddhism, 0.4% Islam, 0.3 % Won bhuddism, 0.2% Confucianism, 0.1% Cheondoism and 0.4% others (SBC, 2015).

South Korea seems to share the same experiences with Zimbabwe but however their SMEs policies seem to be better than Zimbabwe. Similarly, South Korea was once a colony of Japan and gained independence in 1945. South Korea embarked on land reform, distributing land from Japanese to Koreans and invested heavily on farmers. South Korea believes in SMEs and has invested aggressively in this sector since their independence and crafted policies to support SMEs. Despite sharing same experiences and same focus, Zimbabwe is lagging behind in SMEs development while South Korea is booming, although SMEs in South Korea seem to face same challenges like those faced by Zimbabwean SMEs. This has premised this research in comparing SMEs challenges and policies faced by these two different countries.

1.3 Objectives

The research study's main aim was to compare the challenges and policies being faced by SMEs in Zimbabwe and South Korea.

1.4 Justification of the study

Both countries have suffered colonial rule, Zimbabwe was colonised by Britain while South Korea was colonised by Japan. They also attained political independence through liberation struggles and they belong to the South-South Cooperation. Both countries seem to be facing similar challenges but operating in different policy environments. However South Korea's SMEs seems to be prospering as compared to Zimbabwe.

1.5 Literature Review

Small Medium Enterprises has been defined and used differently in various contexts. Definitions vary between

industries, countries and even between studies (Davidson, 1989). A small firm in the UK, for example, is not necessarily a small firm in the Zimbabwean business environment. However the different variables that are widely used include the number of employees, the capital base, fixed assets employed, level of turnover, type of business, degree of formalisation and some combination of variables (Davidson, op cit.; Havens and Senneseth, 2001; Premaratne, 2001; Ozcan, 1995). Maseko (2011) confirms that authors do not unanimously agree on one definition of SMEs across all academic disciplines. No single definition can capture all the dimensions of a small and medium enterprise.

In Zimbabwe, legally the Ministry of Small Medium Enterprise Cooperation define a small enterprise as a business that employs not more than 50 employees while operating as a registered entity and a medium enterprise as one employing up to 75 and 100 people. Also SEDCO (2010) does not differentiate between Small and Medium enterprises and further defined it as a firm that has not more than 100 employees with maximum annual sales of up to \$830 000.

Small and medium-sized entities (SMEs) play important roles in economic growth and sustainable development of every nation, (Moore et al., 2008). The growth of SMEs is a critical ingredient in the sustainable development of developing economies (Mudavanhu et al., 2011). According to Storey and Westhead (1994), SMEs are regarded as the seed-bed for the development of large companies and are the life blood of commerce and industry at large. Entrepreneurship the world over today is regarded as a panacea to unemployment, poverty reduction and economic growth (Reserve Bank of Zimbabwe (2009). SMEs have been identified as sources of innovation and business evolution (Wynarczyk et al., 1993).

Globally, Small to medium enterprises are being hailed for their pivotal role in promoting grassroots economic growth and equitable sustainable development (Munyanyiwa, 2009). Literature noted that in the USA and EU countries it is estimated that SMEs contribute 40-60 percent to Gross Domestic Product and 30 to 60 percent in exports. It is also highlighted that Asian Tigers such as India, Indonesia, China, Malaysia, Japan and South Korea also have thriving SME sectors contributing between 70 to 90 percent in employment and an estimated of over 40 percent contribution in their respective GDPs (SBC, 2015). Whilst in African power houses such as South Africa, Egypt, Nigeria and Kenya, the SME sector is estimated to contribute over 70 percent in employment, and 30 to 40 percent contribution to GDP (Munyanyiwa 2009). Empirical evidence according to Mbendi (2003) indicates that SMEs in Zimbabwe contribute less than 5 percent to GDP.

SMEs are confronted by a number of opportunities and challenges. Some of these opportunities and challenges are caused by the SMEs themselves, some are caused by the corporate world while others are caused by government policies and legislation. Of importance in this study are the opportunities and challenges that relate to government policies, legislation and actions. The government, through its policies and legislation acts as both a barrier and a facilitator of the establishment and development of SMEs.

1.6 Research Methodology

In investigating the situation of the SME sectors in South Korea and Zimbabwe, the researchers adopted an embedded mixed research approach. A similar triangulation technique has been used widely in policy studies by the Institute of Policy Analysis and Research (IPAR). Primary data were collected from a purposively selected sample of SMES and scholars drawn from the four urban areas participating in the study. Focus group discussions (FGDs) were conducted from the following urban areas; Ansan, Seoul, Chinhoyi and Harare. Observations were also made to corroborate the data collected through interviews and FGDs. Some of the interviews were conducted using the information and communication technology. In this case social networks like the WhatsApp, Facebook, and twitter were used to collect the data. Secondary data for this study were collected from literature on SMEs in general, SMEs in South Korea and SMEs in Zimbabwe. The researchers took advantage of their tour in South Korea (2015) to undergo training on SME policies sector for sustainable development.

In conducting this study, the researchers observed the 1948 Nuremberg Code which states that respondents have the right to refuse to participate in a research. All the respondents willingly consented to participate in the study; informed consent was sought after the researcher had disclosed his intentions to the

sampled respondents. The researchers observed Patton's (2002) advice that no attempt should be made to deceive the respondents. The respondents were protected from all forms of physical and psychological harm. Where necessary, codes were used in place of names (SK for a respondent in South Korea and ZW for a respondent in Zimbabwe). No individuals with diminishing autonomy were involved in the study.

1.7 Major Findings

The SME sector in South Korea is small in size but big in potential; it employs 88 per cent of the total workforce, accounting for 99 per cent of the total number of companies and they make up 50 per cent of the country's GDP (SBC 2015). This section presents the research findings under the following thematic areas; definition of SMEs, Challenges faced by the SMEs in the two countries, and country specific Policies of dealing with the challenges. The themes emerged from the data sets.

1.7.1 Definition of SMES

The study established that South Korea and Zimbabwe have different definitions of SMES. The table below summaries the definitions by law

Industry	No. of Employees		Capital Base (<i>upper limit</i>)		Annual Sales (<i>upper limit</i>)	
	S. Korea	Zimbabwe	S. Korea	Zimbabwe	S. Korea	Zimbabwe
Manufacturing (12 sectors)	≤300	Up to 75	KRW 8 billion (US\$8 million)	US\$1000 000	US\$100 million	US\$1000000
Manufacturing (6 sectors)	≤300	Up to 75	KRW 8 billion (US\$8 million)	US 1000 000	US150million and US\$80million	US\$1000000
Mining	≤300	<75	KRW 3 billion (US\$3 million)	US\$2000 000	(US\$100 million)	US\$3000 000,
Construction	<300	<300	KRW3 billion (US\$3 million)	US\$2000 000	(US\$100 million)	US\$2 000 000
Transportation	<300	<300	KRW3 billion (US\$3 million)	US\$500000	(US\$80 million)	US\$1000000
Publication, broadcast, services (business support, IT etc	≤300	<75	No threshold	US\$500 000	KRW30billion (US\$80million)	US\$1000 000
Wholesale and retail	≤200	<75	No Threshold	US\$50 000	KRW20billion (US\$100 Million)	US\$1000 000
Financial services	≤200	<75	No threshold	US\$500 000	\$40 million	US\$1 000 000
Agriculture,	≤200	<75	No threshold	US\$500 000	\$100 million	US\$1 000 000
Utilities	≤200	<75	No threshold	US\$500 000	\$100 million	US\$2 000 000
Environmental services, education etc	≤100	<75	No threshold	US\$500 000	KRW10billion (US\$40 million)	US\$1 000 000
Real Estate Services	≤50	<75	No threshold	US\$500 000	KRW5billion (US\$40	US\$1000 000

million)

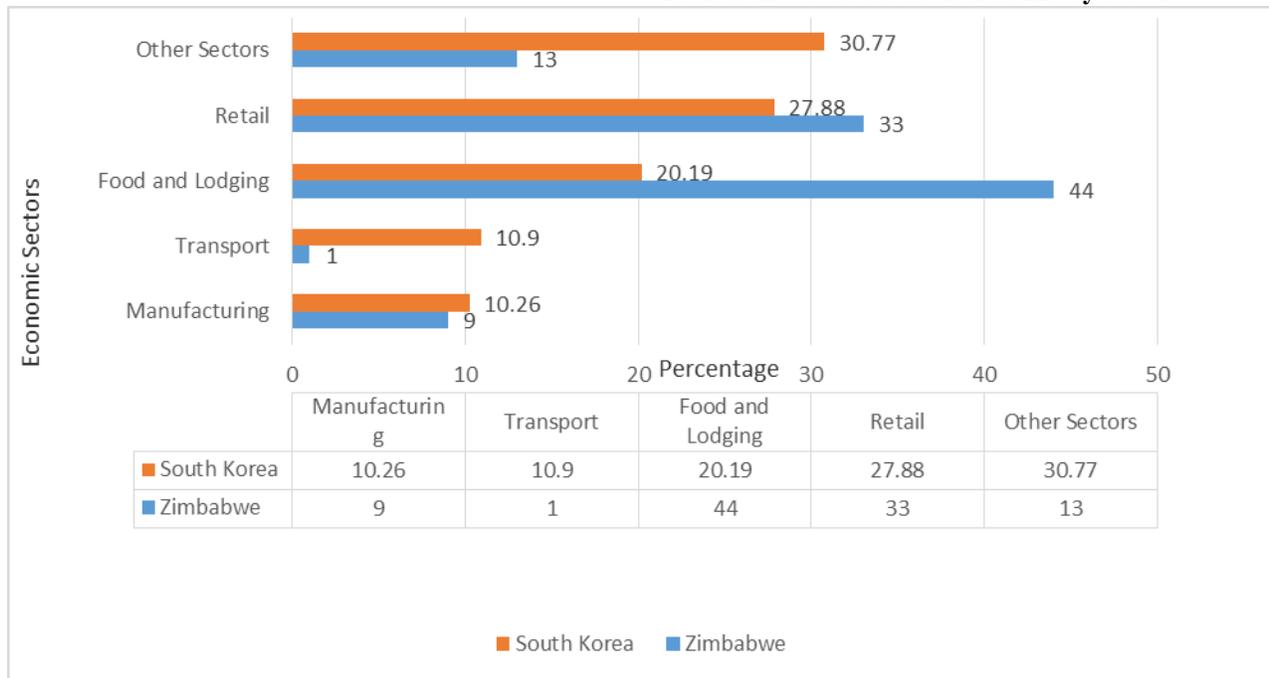
Source: SBC (2015) and Finscorp (2013)

South Korea uses two criteria to define SMEs; namely number of employees or capital and number of employees or sales. This is slightly different from Zimbabwe which consistently uses the three parameters combined to define SMEs. Both countries categorise the SME sector into micro, small and medium depending on the thresholds of the parameters and economic sector.

1.7.2 Contribution of SMEs

In both countries, SMEs are regarded as engines of economic growth. In Zimbabwe the SMEs sector contributes over 60% to the country’s GDP and employs about 5.8 million people (Fin scope Survey of 2012) compared to the SMEs sector in South Korea which contributes over 52 % to the economy’s GDP and employs 12.6 million people. The above statistics indicate that the SME sector in Zimbabwe contributes about 8% more to the country’s GDP than what the South Korean SME sector contributes to their national GDP.

1.8 Distribution of SMEs



Source: Finscorp (2013) and SBC (2015)

1.9 Nature of SMEs

It emerged from the data that compared to the scenario in South Korea and in Zimbabwe that the large enterprise sector is shrinking in terms of numbers and productivity. In this regard Respondent ZW10 noted, the shrinkage is largely a result of the economic sanctions that were imposed on the country by the West at the turn of the 21st century. The sanctions could have affected the vertical and horizontal linkages of the large enterprises that were there prior to the economic sanctions, yet in

The following tables 1 and 2 respectively show the distribution of SMEs in Zimbabwe and South Korea.

1.8.1 Distribution by class

Table 8.1: Distribution of SMEs by class

Class	Zimbabwe (2012)		South Korea (2010)	
	No. of SMEs	%	No. of SMEs	%
Micro	2 660 000	95	2 750 000	88.1
Small	112 000	4	250 000	8
Medium	28 000	1	120 000	3.9
Total	2 800 000	100%	3 120 000	100%

Source: SBC (2015) and Finscorp (2013)

1.8.2 Distribution by Sector

Table 2 shows distribution of SMEs by sector

South Korea both horizontal and vertical integration of firms is increasing especially in the petro-chemical industries. Respondent SK02 argued that the current economic and indigenisation policy by the GoZ is scaring away FDI living the economy in the hands of the struggling SME sector. More than in Zimbabwe, in South Korea more and more SMEs are upgrading to large enterprises.

The fact that fewer SMEs in Zimbabwe are maturing to large enterprises is not unique to Zimbabwe. Caroline’s (2013)

study of SME upgrading revealed that instead of growing, MSEs in most countries run the risk of folding due to challenges which they always face. Unlike in South Korea, SMEs in Zimbabwe face a liquidity crunch which (Mehlomakulu 2014) is a result of low FDI, high import bill, high country risk, illicit capital outflows and low consumer confidence.

1.10. SME Policies in South Korea and Zimbabwe

The SME sector in both South Korea and Zimbabwe operate within government policies. In South Korea, Small and medium business cooperation was formed to assist the SME sector grows. The SBC provides customised support on company’s stage in its growth cycle (start-up growth-leap) to maturity. The policy idea is to promote business start-up and enhance competitiveness of the SME sector. In Zimbabwe, this function is provided by the Ministry of Small to Medium Enterprises through the SEDCO. Both organisations offer loans for facilities and operation in order to promote business start-ups and create new jobs. The money comes in the form of investment and loan hybrid financing; under this scheme, the SBC SMEs are availed cheap loans. Two types of loans are available in South Korea; the income sharing loans¹ and growth sharing loans². The GoS through the SBC also provide growth stage funding; this is called the technology commercialisation Fund. The facility offers loans to introduce production facilities and break into a new market in order to prevent excellent to commercialise development technology. Under this stage, the SBC³ also provides new growth industry funds which offer loans necessary for competitiveness enhancement, such as improved productivity and high value –added products, to high potential SMEs with excellent technology and growth potential in order to create a growth engine and promote collectivization and collaboration of SMEs. Under the leap stage, the South Korean government provides structural adjustment funds. These funds offer loans necessary for the restructuring of less competitive SMEs to recover their competitiveness, and providing loans for facilities and operation to promote re-starting up based on knowhow o successful or failed entrepreneurs. The same government also provides emergency stabilisation funds. The fund offers loans to create a stable business environment for SMEs which are temporarily struggling due to difficulties in production and sales, natural disasters etc. the Government of Zimbabwe does assist SMEs but the process is somewhat different from that of South Korea. For instance, loans provided by the SEDCO are not neatly categorised as is the case in South Korea.

In line with the traditional growth model ($Q=f(K, L)$) the government of Korea through the SBC develops human capital

¹ Income sharing loan: after financing, receive income-related interest (fixed interest + income –related interest) based on the company’s sales performance.

² Growth sharing loan: acquire convertible bonds (CBs) and offer loans at a low interest rate.

³ The Small and Medium Business Corporation provides Korea’s SMEs with a wide range of services, such as policy funds, corporate consulting, technical support, marketing, global cooperation and human resources training in order to enhance their global competitiveness (Chae-Un Lin 2015)

by providing passionate youths with an opportunity to start a business and SMEs with high quality training. Lessons to be learned by the government of Zimbabwe are that there should be a Youth Start-up Academy whose main function is to establish a comprehensive supporting system from technical assistance to training funds and marketing to ensure success of youth star-tups. Under this programme, 70 percent of the total project costs are subsidized (within a maximum of 100 million won- US\$10 million). Besides, the Academy offers space for preparing starting –up, room for product development, common workplace and room for product release. Notably the academy also offers one-on-one coaching services by professionals with vast experience in addressing on-site problems.

The GoZ can also learn from the South Korean Smile stories which operate a private job portal to provide job information on best SMEs which the SBC and college students have found out in person (providing job information in real time through SNS). The goal of South Korea also provides Performance Compensation funds. Under this scheme employers and core manpower of SMEs create a mutual aid fund, which is provided to capable employees who have worked over 5 years as an incentive for long term service.

The study has revealed that the registration process for one to be considered an official SME in Zimbabwe is hectic and the requirements are difficult to meet. This has led to many SMEs operating without the required paper work. Respondents argued that the stiff requirements for legal recognition of SMEs have had a negative impact on their operations as they cannot acquire financial assistance, legal places to operate from as well as running the risk of losing their wares through confiscation by the police.

1.11 Summary of Major SME policies

1.11.1 Summary of Major SME policies of Zimbabwe.

Year	SMEs Policies Crafted
1983	Small Enterprises Development Corporation Act:
2002	Ministry of Small and Medium Enterprises was established to support SMEs
2008	It incorporated cooperative development and was renamed Ministry of Small and Medium Enterprises and Cooperative Development
2002-2007 and 2011-2016	The Ministry put in place a SME Policy and Strategy Framework 2002- 2007, It was revised for 2011-2016 period
2014-2018	Formulating policies to create an enabling environment- SME Act (Chap 24: 12) , Revised Policy and Strategic Framework 2014-2018- Launched on 25 June 2015

1.11.2 Summary of Major SME Policies of South Korea

1945-1960	South Korean SMEs Policies Establishment of the SME Department in the
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Ministry of Commerce and Industry	
1961-1971	Promulgation of the Law of SME Business 1961-1971-Adjustment (1961); Establishment of the SME Bank (1961) - Establishment of the Korea Federation of Small and Medium Business (1962) - The Export Promotion Act (1962) - The SME Framework Act (1966) - Establishment of export industrial complex (Seoul and Incheon, 1966)
1972-1981	-The Law of Credit Guarantee Fund (1974) -The Law of the Promotion of SME Systematisation (1975) -The Law of SME Promotion (1978); Establishment of Small Business Corporation (1978)
1982-1992	The Law Promotion of Procurement from SMEs (Collective Negotiated Contract System, etc.1981); Implementing the “SME-Only” Business Policy (1982) - The Law of the Support for SME Start-ups (1986) - The Law of Technology Credit Guarantee Fund (1989); The Law of the Promotion of SMEs and the Procurement from SME Products (1989)
1993-1997	Abolition of “SME Only” Policies; Re-structuring and reforming SMEs (Concentrating on technology development, automation of production lines, promotion of start-ups) - Expanding Obligatory Loans to SME to 45%; Regional SME development - Establishment a SME control tower, the Small and Medium Business Administration (1996)
1998-2008	The Law of Special Measures for the Promotion of Venture Businesses(1997), Amendment on the Small Business Act (1997), The Law of Women Owned Businesses (1999)
2008-Present	The increasing magnitude of bi-lateral and regional free trade regimes - Increasing regulations derived from the augmented awareness on environmental protection -threats and opportunities (e.g. the rise of the green economy, green technology, the “silver” economy) - Generation changes occurring in Korean enterprises

1.12 Accessing finance from financial institutions

In both countries financial assistance to the SME sector is divided into indirect funding and direct funding. Bank loans are the largest supplier of funding to the sector. In South Korea, bank loans amounted to US\$443.5 billion in 2010 and the figure shot up to US\$471.6. Indirect funding comes in the form of bank loans, credit guarantee. According to Respondent ZW9, SMEs are perceived to have a high risk profile by financial institutions. This results in players within the sector being charged higher interest rates compared to larger firms, thus unnecessarily increasing operating costs and reducing the competitiveness of SMEs. The exorbitant cost of capital could be one of the reasons why some SMEs fail to repay the loans, causing them to lose

assets they would have provided as collateral security. In addition, the high rates also make SMEs hesitant to take the risk of borrowing from SEDCO fearing to lose assets due to failure to repay the debt. Under such a circumstance, the growth of SMEs becomes hindered. In Zimbabwe 67.4 per cent compared to 5.2 percent of the SMES in South Korea did not receive external finance despite having applied for it. The above finding is corroborated by a statement by the Reserve Bank of Zimbabwe, which states that as at May 2012, total loans that were extended to SMEs by the various institutions amounted to \$164, 4 million (about 5%) of total loans of \$2,8 billion. The respondents claim that Banks’ insistence on collateral, lengthy and tedious loan processing, stringent documentation requirements, complicated procedures in applying for loans, including from government schemes, and high interest rates undermine SMEs potential to survive. The futures of SMEs depend on what government policies do for the entrepreneurs.

Unlike in South Korea, SMEs in Zimbabwe are suffering liquidity challenges. Respondent SK5 explains the link between liquidity and SME growth as; ‘In depressed economic and financial set up, the interest rates on bank loans is too high, the amortization period for the loans is too short, and the amount of the loans given to the borrowers is too small.’ Finance is needed for SME growth (Muchabaiwa 2011; Basil 2005) without it there is premature death of SMEs.

In both countries, Multinational Corporations (MNCs) conduct business with SMEs. However unlike in South Korea, the migration of large companies out of Zimbabwe is a challenge to the growth of SMEs in the country. Fortunately, the GoZ is re-examining its indigenization policy to attract FDI of MNCs because of their pivotal role in the economy and for SMEs to grow and survive. Respondent SK7 noted that if MNCs pull out, many SMEs may close shop and others would find it difficult to access technology/spare parts or components. Similar studies by Tendler and Amorim (1996) and Aremu (2004) have confirmed that scarcity of technology and skilled workers hampers SME growth in most developing countries. This confirms the significance of the Q=f (K, L) growth model in explaining what should be done to improve SME viability in both countries. SMEs are aware of the need to become more resilient and competitive in the face of economic changes.

1.13 Managerial Experience

It emerged from the study that financial management is one of the main reasons for challenges being faced by SMEs. In both countries SMEs performance is closely linked to entrepreneurial skills of the proprietor. Proprietors with business related qualifications tended to survive by 30% more than non-qualified proprietors. This finding confirms the traditional production model Q= f (K, L) economic production model. According to this model an increase in quality of L (human capital) stimulates an increase growth of an SME (Q). In line with this model, South Korea has put in place SME training centers like the SBC. The role of the Centre is to train SME in all issues that are related to business. The centers provide working space and monitor SMEs from start up to upgrade. This is one facility that is lacking in Zimbabwe. Respondent ZW6 notes, ‘SME failure is high in Zimbabwe because of poor training and monitoring of the sector by Government.’ The GoZ should support the SMEs by creating

a well conducive environment and infrastructure for the SMEs to operate without hindrances. Lack of well-groomed managers in some SMEs has resulted in inadequate market research, over-concentration on one or two markets for finished products, lack of succession plan, lack of proper book keeping, lack of proper records or lack of any records at all, inability to separate business and family or personal finances, lack of business strategy, inability to distinguish between revenue and profit, inability to procure the right plant and machinery, and inability to engage or employ the right caliber staff.

1.14 Infrastructure

Infrastructure is an important factor in SMEs growth. More than in South Korea, most of the infrastructure being used by many SMEs in Zimbabwe is either dilapidated or is inadequate to accommodate the assigned SMEs. At Mupedzanhamo market in the high density suburb of Mbare there is no adequate toilet infrastructure for the vendors and their customers. At Glen View complex, SMEs produce further but have no proper storage space; the raw materials, unfinished products and finished furniture are exposed to harsh weather conditions such as heat and rain.

Unlike in South Korea, in Zimbabwe SMEs especially those in the agricultural sector face severe challenges of drought due to climate change and environmental risks. The impacts of climate change include droughts. The decreased availability of water may also affect hydro-power production in the energy sector, and higher numbers of people are exposed to vector- and water-borne diseases. Respondent SK1 notes that SMEs in Zimbabwe, more than those in South Korea rely heavily on inefficiently provided state infrastructures such as electricity and water and cannot afford the cost of developing any alternatives.

KODIT in South Korea and SEDCO in Zimbabwe are government owned SME funding partners. In cases of default by SMEs, these organisations have the power to attach properties that would have been had surrendered as collateral security. Since SEDCO is under a Ministry, one can therefore argue that the Government is directly or indirectly sanctioning the activities by SEDCO. Directly, it is sanctioning this behavior by not protecting the SMEs who would have defaulted repaying their loans. Indirectly, the Government is sanctioning this conduct by SEDCO by not adequately funding its activities, thus allowing it to leave on solely on its revolving finances. It is important to note that as much as some of the SMEs default in the payment of their loans due to mismanagement, a significant portion default due to a non-conducive economic environment in which these small to medium enterprises exist. Struggling SMEs use labour intensive farming methods, output is low in terms of quantity and quality- and their products are less competitive on the open market.

1.15 Environmental challenges

Both South Korea and Zimbabwe have enforceable environmental laws, however contribution to industrial pollution by SMEs in both countries is high. This is because SMEs prefer low-cost solutions which are not always the best for the environment. This is not unique to the two developing countries; in Europe SMEs contribute 64 per cent to industrial pollution and

up to 24% of SMEs actively engage in actions to reduce their environmental impact (Euro-barometer Survey 2012).

Respondent ZW10 reflects that South Korea has a greater capacity to deal with environmental issues; *South Korea is technologically more advanced and it has a higher GDP per capita of about \$2 000 compared to Zimbabwe which is not only technologically less advanced but experiencing a low GDP per capita of about \$411*. The above idea seems to indicate that there is a direct relationship between economic growth and ability to deal with environmental issues; a country with a higher economic growth rate has a greater potential to enforce environmental laws. Respondent ZW3 explains the situation in Zimbabwe as;

Our SMEs largely lack intricate knowledge on effects of pollutants to the environment, more emphasises on income than environmental wellness, inadequate environment management systems and high informality of the sector make SMES in the country contribute more to industrial pollution, low capitalisation of the sector and low investment in waste management techniques or technology compound the situation in the country. GoZ does not have enough manpower and resources to monitor adherence to environmental impact assessments by SMEs and the country have an average of 3 environment inspectors per district.

1.16 Conclusion

SMEs in both countries contribute significantly to employment creation and to the economic development agenda of their countries. Governments in both countries recognize the need to support SMEs and so have and continue to review their policies in a bid to improve the operational environment of the sector. SMEs in both countries have similar major challenges; the generic challenges relate to; accessing business finance, skills and technology shortage, inadequacy or improper infrastructure, lack of managerial skills and environmental challenges. In all these areas; South Korea fares better than Zimbabwe.

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Optimal Linear Control of an Energy Harvesting System

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Abstract- This paper presents an optimal linear control of an energy harvesting system. Energy harvesting system models are typically non linear and therefore utilize a non linear controller. In this work, an investigation on the performance of a linear controller for a nonlinear harvester model is shown. The aim is to maximize the energy produced by implementing an optimal linear control algorithm. A mathematical model of the harvester is given. All simulations were conducted in matlab and simulink. Results obtained show that a current of 0.48mA and a voltage of 4.2Volts is harnessed. This study demonstrates that for local applications where transients and sensitivity to plant parameters is not a strong requirement, a linear controller can be utilized.

Index Terms- Linear, Control, Energy, Harvester

I. INTRODUCTION

For most applications, the universal goal is power density [3]. In these instances, optimal control of the harvester is essential. Control of energy harvesting systems is an active research area and there have been myriads of recent developments in many forms and applications. One novel research was conducted by Jeff T Scruggs et al in [4]. Their report was focused on maximizing the energy harvested from a vibratory energy harvesting system using actively controlled electronics. A stationary stochastic disturbance model was studied. Their discussion was purely systematic and showed that with the use of LMI (Linear Matrix Inequality) techniques, maximum power can be harnessed from active stochastic energy harvesting systems using feedback controllers based on the requirements of the closed-loop. This work presents a linear controller designed to maximize the energy produced from a continuously rotating energy harvesting system. The objective is to investigate the performance of a linear controller for a nonlinear harvester model.

II. PROBLEM STATEMENT

Nonlinear systems such as the harvester model presented in this paper can display a chaotic and unpredictable behavior contrasting with linear systems. However, nonlinear systems act very much linear around operating points (equilibria are operating points). Despite the fact that linearizations only give local approximations, they are remarkably useful when they work [5]. If a system can be linearized, then a linear controller can be designed. Not all nonlinear systems can be linearized. A typical example is the unicycle whose nonlinearity is so severe that it cannot be approximated around operating points. The

nonlinear model of the harvester presented in this work can be linearized. Hence, a linear controller can be designed.

III. CONTROLLER DESIGN METHODOLOGY

3.1 Harvester Model

The conceptual model of the harvester is presented in [2]. It consists of a direct current generator with the stator attached to the rotating source. An offset mass is coupled to the rotor of the generator at some distance away from the rotational axis. In the experimental set up, a direct current (dc) motor served as the host. In reality, the host could be a wheels or a vehicle, bicycle or any other rotational structure. When the host rotates, a rotational torque is exerted on the suspended mass. This causes the suspended mass to deflect by an angle, θ . When the mass deflects, gravitational torque acts on it that counteracts the torque exerted on it due to the rotating host. It is the difference between the two torques that causes power to be produced.

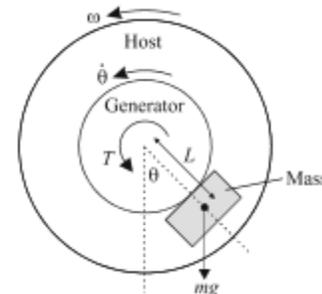


Figure 1: Rotational energy harvester [2]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \\ \dot{x}_4 \end{bmatrix} = \begin{bmatrix} x_2 \\ \frac{-mgL \sin x_1}{J} + \frac{k_E k_T (w_s - x_2)}{J(R_a + (1-\delta)^2 R_L)} \\ \frac{-(1-\delta)x_4}{L} + \frac{k_E (w_s - x_2)(1-\delta)^2 R_L}{L(R_a + (1-\delta)^2 R_L)} \\ \frac{(1-\delta)x_3}{C} - \frac{x_4}{R_L C} \end{bmatrix} \quad (1)$$

Proof of the mathematical model of the harvester is presented in [1].

k_E is the motor torque constant, L represents inductor, C is capacitor, R_L is the load. m represents the mass of the offset body. k_T = torque constant of the motor. The moment of inertia

of the semi-circular mass is J . w_s is the source rotating speed. δ is the duty cycle of the system.

$$\Rightarrow \delta = 1 - \sqrt{\left(\frac{kEkT(ws)}{RLmgl} - \frac{Ra}{RL}\right)} \quad (6)$$

3.2 State Variables

$\vartheta = x_1$
 w_r (rotor speed) = x_2
 I_L (inductor current) = x_3
 V_c (capacitor voltage) = x_4 .

3.3 Conditions of Optimality

$$\text{The current drawn, } I = \frac{mgl \sin \vartheta}{k_T} = \frac{kE(ws - w_r)}{(RL + (1 - \delta)^2 RL)} \quad (2)$$

It is easy to see that maximum current is drawn when $w_r = 0$
 $\Rightarrow I(\max) = \frac{kE(ws)}{(RL + (1 - \delta)^2 RL)} \quad (3)$

$$\text{Also, when } \vartheta = 90^\circ, I(\max) = \frac{mgl}{k_T} \quad (4)$$

$w_r = 0$ and $\vartheta = 90^\circ$ forms the two conditions of optimality and will be utilized in the controller design.

3.4 Constant Controller Design

This controller ensures that $x_1 = \frac{\pi}{2}$ and $x_2 = 0$. Where x_1 and x_2 represents the angular position and angular velocity of the offset mass respectively. From equation (1), it can be observed that the only term that can be controlled and varied is the duty cycle, δ . This term will be used as the constant controller. If $x_1 \rightarrow \frac{\pi}{2}$ and $x_2 \rightarrow 0 \Rightarrow (x_1, x_2) = (0, 0)$.

Equating x_1 and x_2 in equation (1) to 0, and substituting $x_1 = \frac{\pi}{2}$ and $x_2 = 0$.

$$\frac{-mgl \sin x_1}{J} + \frac{kEkT(ws - x_2)}{J(Ra + (1 - \delta)^2 RL)} = 0 \quad (5)$$

Substituting $x_1 = \frac{\pi}{2}$ and $x_2 = 0$, $\frac{mgl}{J} = \frac{kEkT(ws)}{J(Ra + (1 - \delta)^2 RL)}$

$$(1 - \delta)^2 = \frac{kEkT(ws)}{RLmgl} - \frac{Ra}{RL}$$

Since δ represents the duty cycle, it is expected that $(t) \in [0, 1]$ for all $t \geq 0$

$$\therefore \delta = 1 - \sqrt{(kEkT(ws) RLmgl - Ra RL)} \quad (7)$$

Equation (7) is the constant controller. Since it is required for $(t) \in [0, 1]$ for all $t \geq 0$,

$$\Rightarrow 1 \geq (ws) RLmgl - Ra RL \geq 0 \text{ for all } t \geq 0$$

3.5 Linear Controller Design by Pole Placement

From standard controller design techniques, to design a linear controller for the harvester, the nonlinear model is linearized. Nonlinear systems act linear around operating points. Consider the harvester model in equation (1). Matlab script was used to perform the linearization and compute a state feedback controller. Since $\text{rank}(\text{ctrb}(A, B)) = 4$, the system is controllable. Therefore, a suitable control law can be designed. Poles of the closed loop system are chosen to have strictly negative real parts with a good balance between response speed and amount of control. Poles of the resulting closed loop system were placed at $2 * \text{Re}(\lambda(A))$.

The script returns a controller, $K = [0.0000 \quad -0.7248 \quad 0.0680 \quad 0.0554]$.

Linear control law is given as

$$u = K_1 x_1 + K_2 x_2 + K_3 x_3 + K_4 x_4 \quad (8)$$

Where $K_1 = 0$, $K_2 = -0.7248$, $K_3 = 0.0680$ and $K_4 = 0.0554$

3.6 Proposed Linear Control Implementation

The controller is implemented in both state and output feedback modes. In state feedback, the states of the harvester are assumed known and available for feedback. For output feedback, the controller is fed with estimates of the states. The schematic diagrams for each are shown below.

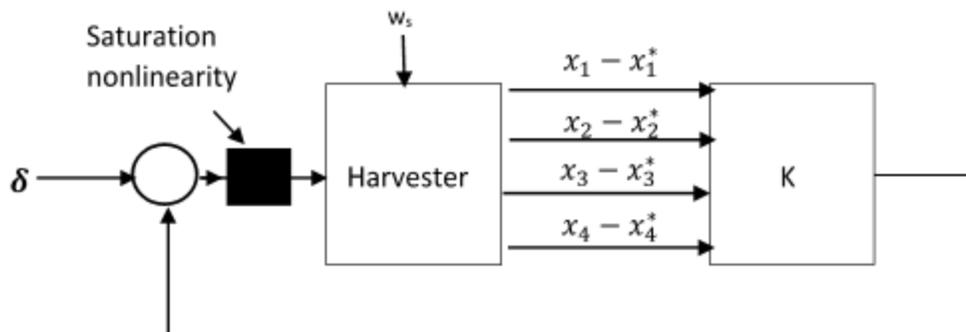


Figure 2: Implementation of State feedback

The saturation nonlinearity was incorporated to ensure that the control $\delta^*(t) = \delta - K(x_i - x_i^*) \in [0, 1]$ for all $t \geq 0$. $i = 1, 2, 3, 4$. Where x_i^* represents the equilibrium states. The equilibria are gotten by equating $\dot{x}_i = 0$ from (35) $i = 1, 2, 3, 4$. When this is done, the following is obtained:

$$\begin{aligned} x_1 &= \frac{\pi}{2} \\ x_2 &= 0 \\ x_3 &= \frac{x_4}{RL(1 - \delta)} \\ x_4 &= \frac{kE(ws - x_2)RL(1 - \delta)}{Ra + (1 - \delta)^2 RL} \end{aligned}$$

The logical implication of the control law $\delta^*(t) = \delta - K(x_i - x^*_i)$ is that when the states of the harvester, x_i , becomes equal to the

equilibrium, x^*_i , then $\delta^*(t) = \delta$ which assures global asymptotic stability.

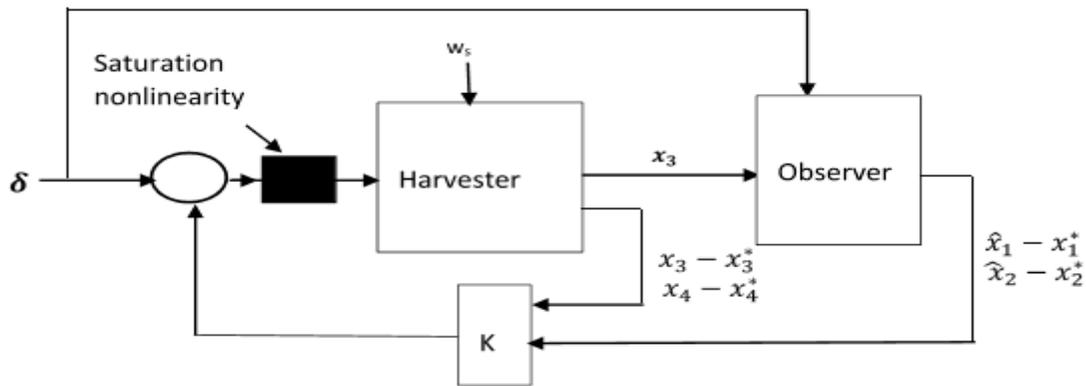


Figure 3: Implementation of output feedback

IV. RESULTS AND DISCUSSION

Figures 4 - 7 examines the plots from the nonlinear model of the harvester described by equation (1). These plots were obtained with a duty cycle of 0.7 and source rotation speed of 75 rad/sec. They show instability. The oscillation in the angular position and angular velocity causes oscillations in the current and voltage. Figures 6 and 7 in particular show that very little power ($P = I_L \cdot V_c$) is produced in the absence of a controller.

Figures 12 and 13 represent the performance of the linear controller together with the constant controller. An angle of 90 degree was maintained with an angular velocity of 0 rad/sec. This satisfies the conditions of optimality. As observed in figures 9 and 10, the controller eliminates all the oscillations in the inductor current and capacitor voltage. It also shows that a voltage of 4.2V was produced with a current of 0.48mA. Hence, maximum power is harnessed. It is important to note that the numerical values of the harnessed current and voltage depends on the numerical values of harvester model parameters.

4.1 Nonlinear Model Simulations

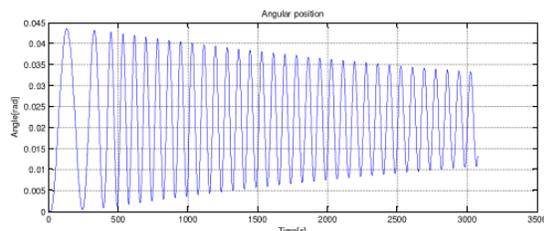


Figure 4: Variation of the angular position ($\theta = x_1$) with time

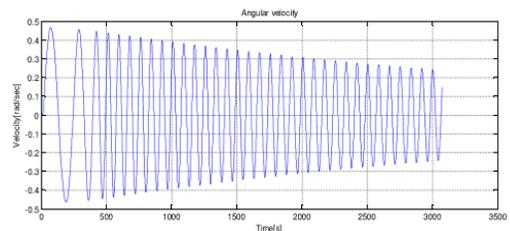


Figure 5: Variation of the angular velocity ($\omega_r = x_2$) with time

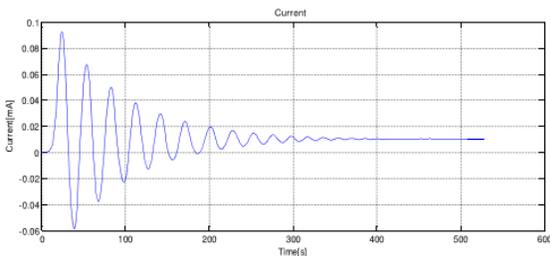


Figure 6: Variation of current ($I_L = x_3$) with time

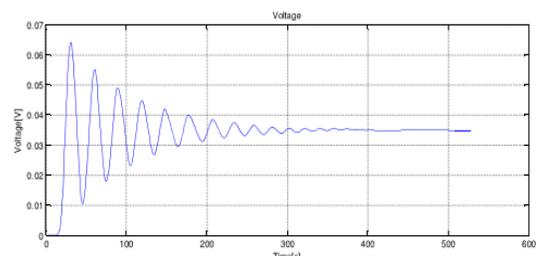


Figure 7: Variation of voltage ($V_c = x_4$) with time

4.2 Constant Controller Simulations

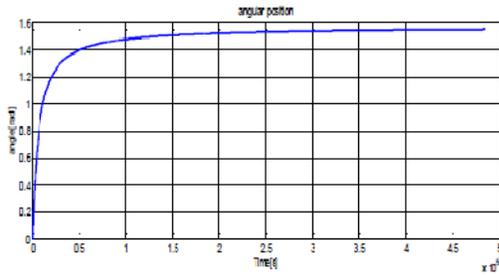


Figure 8: Angle of offset mass maintained at 90 degree

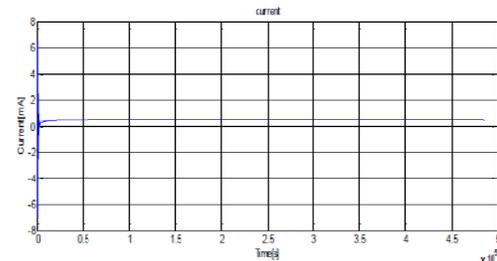


Figure 9: Variation of inductor current with time

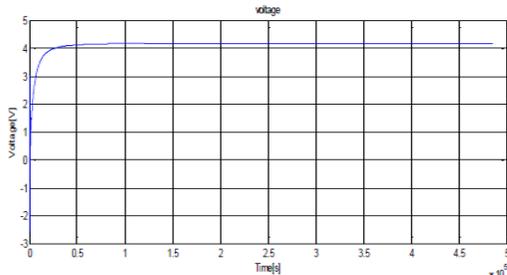


Figure 10: Variation of output voltage with time

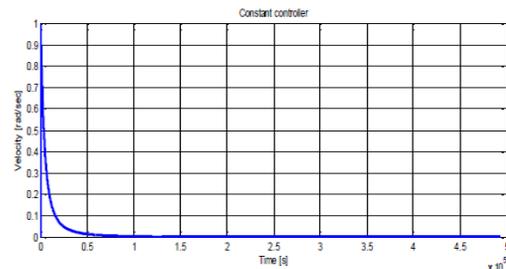


Figure 11: Velocity of offset mass maintained at 0

4.3 Linear Controller Simulations

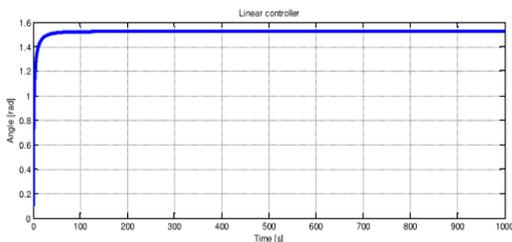


Figure 12: Angle of offset mass maintained at $\pi/2$

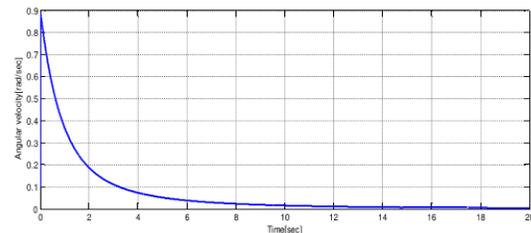


Figure 13: Angular velocity of offset mass maintained at 0 rad/sec.

V. CONCLUSION

In conclusion, a linear feedback controller was designed. This controller worked well with the nonlinear model as shown in the matlab plots. However, a nonlinear controller is better. Nonlinear controllers provide better tracking and regulation of the state, reduction of transients and finally reduction of the sensitivity to plant parameters. For local applications where transients and sensitivity to plant parameters is not a strong requirement, a linear controller can be utilized.

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Characterization and Classification of Soils of Aba-Midan Sub Watershed in Bambasi Wereda, West Ethiopia

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Abstract- The research work was conducted on Aba-midan sub water shed, which is located in the Bambasi District of Assosa Zone in the Benishagul Gumuz Regional State to characterize and to classify the soils along toposequence. Three pedons along toposequence were studied. Aba-midan sub watershed is located between 09°49' 98.9'' and 09°49'89.3'' N latitude and between 34°42' 31.8'' and 34°42'50.3''E longitude, with altitude ranging from 1443 to 1491 m.a.s.l. The soils were generally dark reddish brown to dark red colour and shallow to moderate soil depth. Almost very friable consistency, with bulk density ranges (1.14 to 1.49 gm/cm³), prismatic to sub angular blocky structure, low total porosity indicated that the soil has poor physical condition for plant growth. a definite trend of clay increase down the profile and along the slope in all of the soil pedons. The soils pH along the profiles were slightly (pH: 5.2) to moderately acidic (pH: 6.4). All the micro and macro nutrients, cations and CEC have irregular trends in all the pedons along depth .While Organic carbon content of the soils decrease with soil depth. The available P and TN of the soils of the study area was qualifying for the low range. The surface horizons of all the pedon in the study area qualify for mollic epepedon. The middle and lower pedons had distinct clay increment in the B horizons, which met all the requirements of natic horizon. While the upper sub surface pedons with cambic horizons. Based on the morphological and chemical data obtained from the opened pedons, the soil of the study area was classified under Mollic Nitisol The deterioration in some chemical properties of lower slope as compared to other slopes were supposed to be due to continuous cultivation for longer period of time and that removed the soil organic matter and other plant nutrients. This study results concluded that increasing extent of continuous and intensive cultivation with minimum conservation practices and erosion due to slope effect can further deteriorate soil properties. The control of such damaging effects would require proper soil conservation strategies such as proper land leveling, afforestation, crop rotation, fallowing, terracing and inclusion of restorative crops in cropping systems on these lands.

Index Terms- Soil physico-chemical properties, pedons, Topography, Aba-midan sub water shed

I. INTRODUCTION

Agricultural development is crucial to the survival of mankind in as much as the provision of food, shelter and

clothing is closely associated with it. Food, in particular is necessary for growth, energy production for good health and normal development of the population. All living things depend on their environment for survival to remain alive, thrive and reproduce their kinds. As it is known, nearly all green plants depend on soils which provide a conducive environment and supply all the essential materials that they need for their growth. Since animals, in turn, depend on plants, it becomes obvious that all agricultural activities directly or indirectly depend on the soil. It is from the soil that plants obtain their nutrients and water. It also contains air needed for respiration of the roots (Akinrinde, 2004).

Like other, countries in Ethiopia, agriculture is the predominant economic activity. Due to this, there is an increasing demand for information on soils as a means to produce food (Fasina *et al.*, 2007). In addition as a result of agricultural development and increasing demand for experimental data, much work should be carried out on soil characterization. This provides the basic information necessary to create functional soil classification schemes, and assess soil fertility in order to unravel some unique soil problems in an ecosystem (Lekwa *et al.*, 2004).

Characterization of soils is fundamental to all soil studies, as it is an important tool for soil classification, which is done based on soil properties. It also provides information for understanding of the physical, chemical, mineralogical and microbiological properties of the soils (Ogunkunle, 2005). In addition it can help to determine the types of vegetation and land use best suited to a location (Globe, 2005). Soil classification, on the other hand, helps to organize our knowledge, facilitates the transferring of experience and technology from one place to another and helps to compare soil properties. A soil characterization study therefore is a major building block for understanding the soil, classifying it and getting the best understanding of the environment (Esu, 2005).

Soils are being degraded worldwide through processes of erosion, overgrazing, salinization, compaction, organic matter depletion, and nutrient imbalance. The current activities which focus on ensuring sustainable ecosystems must be the protection and enhancement of soil quality. The concept of soil resource management for sustaining the productivity of plant systems was needed to ensure the reality of sustainable agriculture and environmental protection. Characterizing soil type can serve as an indicator of the soil's capacity to produce safe and nutritious food, enhance human and animal health, and overcome degradation processes (Schoenholtza *et al.*, 2000).Therefore, the

overall purpose of this new emphasis on soil characterization is to develop a more sensitive and dynamic way to document a soil's condition, how it responds to cultivation and its resilience to stresses imposed by cultural practices.

Information of soil and related properties obtained from the soil survey and soil classification can help in better delineation of soil and land suitability for irrigation and efficient irrigation water management. So, depending on the suitability of the mapped agro-ecological units for a set of crops, optimum cropping patterns have to be suggested taking into consideration the present cropping systems and the socioeconomic conditions of the farming community (Sehgal *et al.*, 1989).

In Benishangul-Gumuz Region like Bambasi Wereda, there is a problem of lack of information on soil characterization and soil fertility status. Particularly in the study area the dominant soil type is not known. Consequently the agricultural experts do not know the available and deficient nutrients in the soil to supply the required amount of inorganic or organic fertilizers to the cultivated crop. This condition creates a conducive environment for the expansion of unwise land use practices and allocating lands without considering its capability and suitability classes for each and every crop that are grown in the Wereda. For that the soil becomes exposed for maximum degradation and loss of fertility potential. Due to this the farmers in the study area prefer to use extensive system of farmland expansion in cost of destructing the available natural forests and its ecosystem to maximize their crop yields rather than searching a solution for the degraded land. Therefore, the purpose of this study will be to characterize and classify soils of Bambasi sub watershed to generate baseline information, which was important for formulating the management alternatives for different soil types identified.

The research would help to know the major soil type and the fertility level of the soil in the Aba-Midan sub watershed of Bambasi Wereda; based on these it was become simple to infer and identify the crop type which was highly productive on the land. The outcome of the study was fill the knowledge gap on the soil minerals available in the soil and the minerals which are deficient and require application. Based on the research result it is possible to classify the total area of lands in the watershed into

their suitability classes for the appropriate agricultural practices possible to do on the land. The result of the study can be a baseline data for the developmental projects that will be done in the Wereda; mainly in agricultural sector. Finally, this soil research also paves a way for further related research in the Bambasi Wereda specifically in Beneshangul-Gumuz Region generally. Therefore; the research was initiates with the following objectives:

- To characterize the physico-chemical properties of soils of the study area and
- To classify the soils according to USDA and World Reference Base Legend

II.

III. MATERIALS AND METHODS

3.1. Description of the Study Area

Bambasi Wereda is located in Assosa Zone of Benishangul-Gumuz National Regional State. The Wereda administrative town is known as Bambasi. It is 640kms away from the capital city of the country Addis Ababa and also 46 kms away from the regional and zonal administrative town Assosa to the eastern direction. Bambasi Wereda is bordered in the Northern direction by Oda Bildigilu Wereda of Benishangul Gumuz Region, in the Southern direction by Begi Wereda of Oromia Region and Mao-Komo Special Wereda of Benishangul Gumuz Region, in the Eastern direction by Menesibu Wereda of Oromia Region, in the Western direction by Assosa Wereda of Benishangul Gumuz Region (Bambasi Wereda Administration Office, 2014).

The Wereda is physiographically characterized by Lowland and Midland. The altitude range is lying between 1350-1470m above sea level. The Wereda has diversified land forms such as Plateaus, Hills, Plains and Valleys. It has 38 rural peasant associations and 2 urban dwellers associations which are totally 40 kebeles. The total area of the Wereda is 221,014 hectare (Bambasi Wereda Administration Office, 2014).

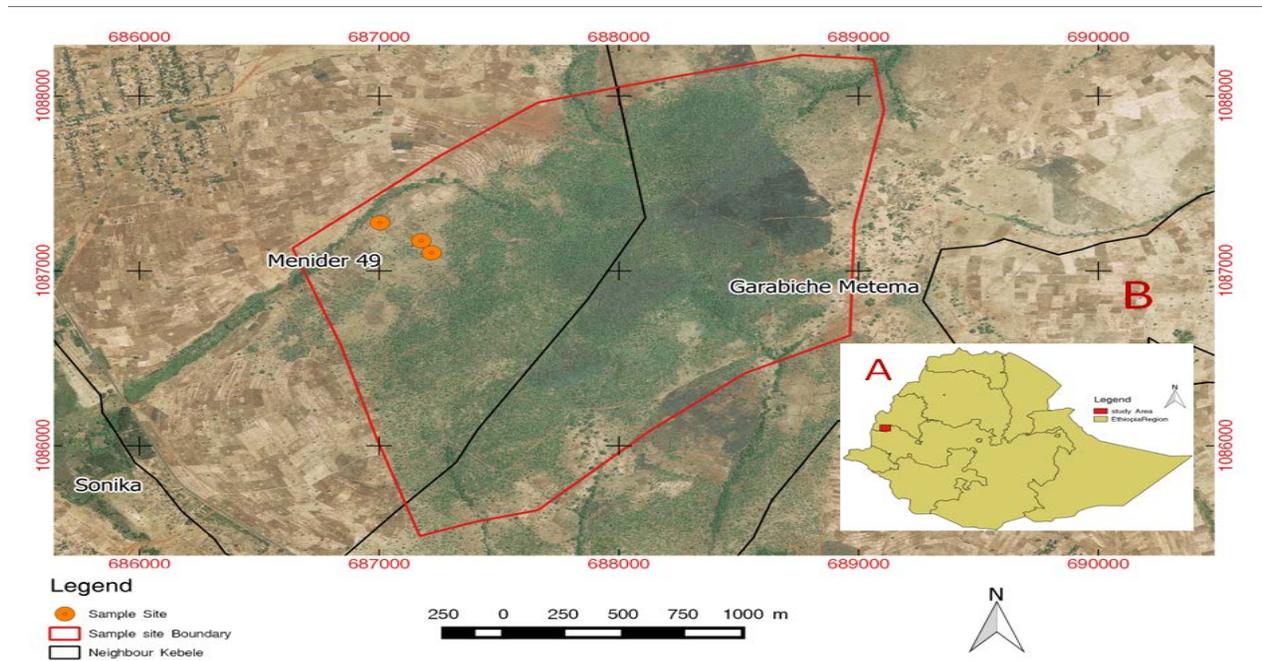


Figure 1: Map of the study area

3.1.2. Climate

The agro-ecological zone of the Wereda is categorized as 15% *Weynadega* 5% *Dega* and 80% *Kolla*. The annual Rainfall ranges between 900mm-1500mm and the average temperature is 28°C. The study area has a mono-modal rainfall distribution pattern. The rainy season, extends from May to October and the dry season extends from November to April. During the rainy season most of the crops in the Wereda are cultivated by using the moisture which is obtained from the rainfall. The rest of the crops are produced in the dry season by using the moisture which is obtained from wetlands found at the side of streams, rivers bank and irrigation water (Bambasi Wereda Agricultural Development Office, 2014).

3.1.3. The socio-economic conditions and population

Even though there is no equal share of land among the farming community of the Wereda, the average land holding size of a single rural household is 15 hectares of land. The livelihood of the people of the study area is mainly depend on crop production and livestock production. The crops mainly produced are maize, sorghum, finger millet, teff, haricot bean, noug, sesame etc. The domestic animals mainly being reared are cattle, sheep, goat, mule, donkey and poultry. The total human population of the Wereda is 62,693 out of this 31,539 are males and 31,154 are females. The urban dwellers of the wereda are 20% of the total population and the rural dwellers are 80% of the total human population in the Wereda (Bambasi Wereda Administration Office, 2014).

3.1.4. Soil type and geology

There are many soil types in the wereda. Most of them are conducive for agricultural production such as crop cultivation, livestock rearing and forest tree production. Because of high availability of rainfall and undulating nature of the land forms;

the soil resources in the wereda are exposed for leaching which in turn exacerbate soil acidity problem. Even though the soil resources of Bambasi Wereda were depleted by inappropriate land use practices and geological factors; it has high capacity and possibility for restoration and rehabilitation. The rock types mainly found in the wereda are basalt, granite, limestone and the like (EARO, 1998).

3.1.5. The land use types

The land use types of the Wereda are dominated by private farm lands. It covers 65% of the total land out of which is 85,747 hectares of land are covered by annual crops and 2373 hectares are covered by perennial crops such as coffee and fruits. Grazing lands in the Wereda cover 18,021 hectares that is 10%, forest land covers 12,488 hectares which is 20% of the total area of the Wereda of which 3743 hectares are intact forest and 8745 hectares are scattered or riverine forests. The wetlands in the Wereda cover 720 hectares and the lands covered by the domestic purposes such as homesteads, roads, public institutions are 350 hectares. The degraded land which is left without any use in the Wereda cover 350 hectares and the future cultivable land or virgin land including savanna grass lands covers 82,270 hectares (Bambasi Wereda Rural Land Administration and Environmental Protection office, 2014).

3.2. Type and Sources of Data

The primary data was obtained by collecting soil samples. Soil profile or Pedons was excavated from the representative fields in the Aba-Midan sub watershed on which the research was carried out for the soil type characterization and for the soil fertility level analysis. Moreover the secondary data was collected from literatures (scientific reports, proceedings and statistical abstracts), Bambasi Wereda Agriculture Development Office, Bambasi Wereda Rural Land Administration and

Environmental protection office. The development agents and the peasant association manager assigned in the PAs where the sub watershed is found and provide the basic information concerning the micro catchment.

3.3. Method of Data Collection

3.3.1. Sampling techniques for soil profile characterization

A semi-detailed soil survey was carried out in Aba-Mijan sub watershed of Bambasi Wereda. Field observations and analysis relating to morphological properties of the soils, topography by using clinometers, soil color with Munsell standard color chart, soil consistency analysis in three moisture level i.e. under wet, moist and dry condition was carried out to establish the soil boundaries. The sampling site was separated into three groups based on their topographic position or slope gradient difference upper slope, middle slope and bottom slope. Three soil profile pit with 1m width, 2m length and 1.5m depth was excavated in each identified soil sampling sites. The soil samples were taken from surface and subsurface horizons in each sampling site and a total of 12 soil samples were collected for laboratory analysis. The soil samples were collected from the four corners of the pit and they were mixed thoroughly in a plastic bag to form a composite soil sample. The soil profiles were characterized according to FAO (2006) Soil Taxonomy Guideline. The collection of bulked samples was made from each horizon for bulk density analysis in laboratory.

3.4. Method of Data Analysis

3.4.1. Analysis of Soil Physical and Chemical Properties

The soil physical and chemical properties will be analyzed at National Soil research Laboratory. Soil particle size distribution (texture) was analyzed by the Bouyoucos hydrometer method following the procedure described by Bouyoucos (1962). Soil bulk density was determined on undisturbed soil samples using the core method and particle density of soil was determined by using the pycnometer method (Blake, 1965). Total soil porosity was calculated from the values of bulk density (ρ_b) and particle density (ρ_s) using the following relationship:

$$\text{Total porosity (\%)} = \left(1 - \frac{\rho_b}{\rho_s} \right) \times 100$$

Soil pH was measured potentiometrically using a pH meter with combined glass electrode in 1: 2.5 soils: The soil electrical conductivity (EC) was measured in 1:1 (weight ratio) dry soil to distilled water mixtures (Ryan *et al.*, 2001). The Walkley and Black (1934) wet digestion method was used to determine soil organic carbon content and percent soil OM was obtained by multiplying percent soil organic carbon by a factor of 1.724. Similarly total N was analyzed using the Kjeldahl digestion, distillation and titration method as described by Black (1965) by oxidizing the OM in concentrated sulfuric acid solution (0.1N H₂SO₄). Determination of available P was carried out by the Olsen method using sodium bicarbonate as extracting solution (Olsen *et al.*, 1954).

Cation exchange capacity (CEC) and exchangeable bases (Ca, Mg, K and Na) were determined after extracting the soil samples by ammonium acetate (1N NH₄OAc) at pH 7.0. Exchangeable Ca and Mg in the extracts were measured by using atomic absorption spectrophotometer, while Na and K were read using flame photometer (Rowell, 1994). Cation exchange capacity was thereafter estimated titrimetrically by distillation of ammonium that will be displaced by sodium from NaCl solution (Chapman, 1965). Percentage base saturation (PBS) was calculated by dividing the sum of the charge equivalents of the base-forming cations (Ca, Mg, Na and K) by the CEC of the soil and multiplying by 100. Exchangeable acidity was determined by saturating the soil samples with potassium chloride solution and titrated with sodium hydroxide as described by Mclean (1965). Available micronutrients (Fe, Cu, Zn and Mn) were extracted by DTPA as described by Sahlemedhin and Taye (2000) and all these micronutrients were measured by atomic absorption spectrophotometer.

IV. RESULT AND DISCUSSION

4.1. Morphological and Physicochemical Properties of the Soils

4.1.1. Morphological properties of the soils

The depth of the investigated soils ranged from moderately shallow to deep with irregular A, B and C horizons (Table 4.1). Among the topographic positions, the upper pedons were relatively moderately shallow in depth. Generally the thickness of the soils increases down topographic positions. Soils on all the three topographic positions showed considerable similarity in the presence and sequence of master horizons where every pedon has B master horizon showing illuviation of silicate clays under A master horizon, affected by cultivation, pasturing and other kind of disturbance.

The upper slope pedon soils were very dusky red (10YR 2.5/2,) at the surface and changed to dark red (10YR 3/6) and dark grayish brown (10 YR 4/2); at the subsurface under moist condition with dark grayish brown (10YR 4/2) at surface to strong brown (7.5 YR 5/6) in the subsurface horizons under dry condition. The structure of the soils were generally moderate, medium sub angular blocky in the surface and change to weak, fine prismatic in the subsurface. An impermeable layer is reached on the upper slope at a depth of less than 90 cm. The dry, moist & wet soil consistence of the upper pedons range slight hard to very hard, firm to very firm and sticky to non sticky on surface and sub surface pedons respectively.

In the middle slope of the pedons soil color was very dark brown (7.5YR 2.5/3) at moist and reddish brown (2.5YR5/3) at dry condition while dominated almost by dark reddish brown (2.5 YR 3/3) at both condition on sub surface. The reddish colour indicates oxidation of Fe at both surface and sub surface soils. Similar finding was reported by Foth (1990) who stated that reddish color is due to the presence of iron compounds in various states of oxidation.

Structurally the soils were strong very course sub angular blocky at surface and moderate very course prismatic at sub surface. the dry soil consistence is almost hard on A, AB and slight hard on Bt1 and Bt2 horizons while the moist and wet soil

consistence dominated by friable and sticky along the profile respectively. The structure of the soil of the lower slope position pedon was dominated by weak medium prismatic on sub surface and moderate large blocky on surface while their color almost dark reddish brown (2.5YR 3/3) under dry condition along the profile.

The variations in soil color observed within and among the pedons might be reflections of differences in chemical and

mineralogical composition, topographic positions, soil organic matter, texture, parent materials and moisture regimes. Similar finding was reported by Dengiz et al, (2012) who stated the variation in soil color could be related to OM, water logging, CaCO₃ accumulation and redox reaction in the soil.

Table 4.1: Morphological properties of the soils of Aba-midan sub water shed

Horizon	Depth (cm)	Colour		Structure	Consistency			Other features
		Dry	moist		Grade, size type	Dry	Moist	
Upper slope (pedon 1)								
A	0-20	10YR 4/2	10YR 2.5/2	MO, ME SB	SIH	Fm	St	Holes or channels i.e. housing for termites
B	20-60	7.5YR 5/6	10YR 3/6	WE, F, Pr,	H	VFm	Sl St	Holes or channels i.e. housing for termites
C	60-90+	10YR 6/6	10YR 4/2	WE, F, Pr	VH	VFm	Non St	Large fragments /stones/
Middle slope (pedon 2)								
A	0-15	2.5YR 5/3	7.5YR 2.5/3	ST, VC, SB	H	Fr	St	Crack along the whole horizon
AB	15-38	2.5YR 4/4	2.5 YR 3/3	MO, VC, Pr	H	Fr	St	
Bt1	38-80	2.5 YR 4/6	2.5YR 3/6	WE, VC, Pr	SIH	Fr	St	
Bt2	80-130+	2.5YR 3/6	2.5 YR 2.5/4	WE, VC, SB	SIH	VFr	St	
Lower slope (pedon 3)								
Ap	0-15	2.5YR 3/3	5YR 3/1	MO, L, B	H	Fr	Sl St	
AB	15-35	2.5YR 3/4	7.5YR 3/2	WE, ME, Pr	H	V Fr	Sl St	
Bw	35-80	2.5YR 3/4	7.5YR 3/4	WE, ME, Pr	SIH	V Fr	St	
B	80-135+	2.5YR 4/4	7.5YR 3/4	WE, ME, Pr	SIH	V Fr	St	

Notes: MO=moderate, ME=medium, SB=sub angular blocky, F= Fine, Pr= prismatic, ST= strong, VC=Very course, VL= very large, SIH=Slight hard, H=Hard, VH= very hard, S=soft, Fm= firm, VFm= very firm, Fr= friable, VFr =very friable, St= sticky, Sl slight, SlSt = slight sticky, Pl=plasticity

4.1.2. Physical properties of the soils

Data in (Table 4.2) show a definite trend of clay increase down the profile and along the slope in all the soil pedons. The clay texture of the lower topography was heavy and could be associated with large accumulation due to the lateral movement of finer fractions from higher elevation as a result of erosion or clay translocation within the pedon.

In pedon 1 the clay increase down the profile ranges from 2 to 4%, which is not significant to characterize it as an argillic horizon having 15% increase in clay movement within 2.5 cm according to Soil Survey Staff (2003). In contrast, for pedons 2 and 3 the increase in clay ranges from 12 to 20 % and 14 to 16%, respectively. The texture of soil is sandy clay in pedon 1, and clay in pedon 2 and 3 respectively. Generally looking the data regarding particle size distribution, it was observed that the clay content showed an increasing trend as slope gradient lowers while sand content showed a decreasing trend down the slope

gradient. Higher physiographic position and more leaching of fine particles at the lower physiographic positions

The bulk density of the soils was in the range of 1.14 gm/cm³ in the Ap horizon of the lower pedon to 1.49 gm cm⁻³ in the C horizon of the upper pedon (Table 4.2). In all pedons the lowest bulk densities were found at the surface horizons, which have relatively higher OM content. Bulk densities values of the soils increased with soil depth in all pedons.

In all the topographic position an appreciable increase in particle density with depth of soil horizons. Brady (1987) reported that particle density values increase with soil depth. Similar results were also reported by Idoga *et al* (2006) in soils of Samaru area, Nigeria.

Porosity values of pedon 1 soil ranges from 43 to 50%, 46.83 to 49.60%, in pedon 2 and 53.43 to 55.81% in pedon 3. According to Brady and Weil (2002) ideal total pore space values, which are acceptable for crop production, are around 50%. Except C horizon in pedon 1 the other pedons soils have

almost an acceptable range of total porosity values for crop production.

(Table 4.2) Selected physical characteristics of soils of Aba-midan sub water shed

Horizon	Depth (cm)	Particle size			Textural class	BD	PD	TP (V %)
		Sand	Silt	Clay				
		%			gm /cm ³			
Upper slope(pedon 1)								
A	0-20	47	12	41	SC	1.17	2.35	50.21
B	20-60	45	12	43	SC	1.22	2.58	52.71
C	60-90+	45	10	45	SC	1.49	2.62	43.12
Middle slope(pedon 2)								
A	0-15	33	18	49	C	1.18	2.30	48.69
AB	15-35	31	8	61	C	1.22	2.33	47.63
Bt1	35-80	21	10	69	C	1.26	2.37	46.83
Bt2	80-130+	21	10	69	C	1.28	2.54	49.60
Lower slope (pedon 3)								
Ap	0-15	33	10	57	C	1.14	2.58	55.81
AB	13-35	17	10	73	C	1.22	2.62	53.43
Bw	35-80	21	8	71	C	1.23	2.65	53.58
B	80-135+	23	8	71	C	1.23	2.67	53.93

Note: SC=Sand clay, C= Clay, BD= Bulk density, PD= Particle density, TP=Total porosity

4.1.3. Chemical characteristics

4.1. 3.1. Soil pH and electrical conductivity

The pH-H₂O values of soils varied from 5.2 to 6.4 (Table 4.3). The lowest (5.2) value was observed in the C (60 to 90 cm) horizon of upper slope position pedon, whereas the highest (6.4) was found at the middle slope position. According to Tekalign (1991) the pH range of the soils is slightly to moderately acidic, which is preferred range for most crops. The pH H₂O values had shown a general tendency to increase with soil depth at the lower and middle slope positions compared to the upper slope position pedons. This could be attributed to down ward translocation of basic cation and leaching.

All pedons irrespective of topographic positions showed very low electrical conductivity (EC) which varied from 0.008 to 0.032dS/m. According to Havlin et al. (1999) this range is categorized as very low and implies that the soils are not salt affected.

4.1.3.2. Organic matter, Total nitrogen and available Phosphorus

Soil organic matter (SOM) content is one of the most important attribute of an arable land. Irrespective of landforms, SOM decreased with depth in all the pedons. Its concentration varied from 2.69 to 0.8%; 2.59 to 0.96%; 1.67 to 0.88% in pedons 1, 2 and 3, respectively (Table 4.3). Generally the lower slope(pedon 3) have relatively low SOM contents than the pedons 1 and 2 this may due to the continuous cultivation, burning of farm lands and removal of crop harvest.

The total nitrogen (TN) content of the soils ranged from 0.08 in the subsurface horizon of the lower pedon to 0.17% in the surface horizon of the upper pedon. According to London (1991), TN content of soils are categorized less than 0.1 very low, 0.1-0.2 as low, 0.2 - 0.5 as medium, 0.5-1 high and > 1 as high. Accordingly, the TN content of the soils is almost categorized under low category. This reveals that nitrogen is found the limiting plant nutrients in the study area due to low level of soil organic matter content and the limited use of nitrogen containing inputs like commercial fertilizer, plant residues and animal manure.

In general, OC and TN content decrease from the upper to the lower slope in all surface soil position. Intensive and continuous cultivation aggravated OC oxidation, resulted in reduction of total N as compared to virgin land. The results are in accordance with the findings of Wakene and Heluf (2003) and Tuma (2007) who reported that intensive and continuous cultivation forced oxidation of OC and thus resulted in reduction of TN.

The available phosphorus content of the soils ranged from 0.02(ppm) in the A horizon of the lower pedon to 1.02 (ppm) soil in the A horizon of the middle pedon (Table 4.3). According Olsen *et al.* (1954) (appendix table 3) rating for available phosphorus content of the study area is low. Phosphorus fixation tends to be more pronounced and ease of phosphorus release tends to be lowest in those soils with higher clay content (Brady and Weil, 2002).

(Table 4.3) Selected chemical characteristics of soils of Aba-midan sub water shed

Horizon	Depth (cm)	pH (1:2.5)	EC(dS/m)	OC			Avai P(ppm)	Ex.Acid Ex.H Ex Al		
				OM TN (%)				meq/100g		
Upper slope(pedon 1)										
A	0-20	5.9	0.013	1.56	2.69	0.17	0.58	0.75	0.35	0.4
B	20-60	5.6	0.009	0.47	0.81	0.14	0.59	2.34	0.46	1.88
C	60-90+	5.2	0.032	0.46	0.80	0.11	0.43	2.17	0.73	1.44
Middle slope(pedon 2)										
A	0-15	6.0	0.014	1.5	2.59	0.15	1.02	0.3	0.16	0.14
AB	15-35	5.9	0.029	0.48	0.89	0.14	0.3	0.95	0.44	0.51
Bt1	35-80	6.4	0.008	0.48	0.88	0.10	0.96	0.39	0.23	0.16
Bt2	80-130+	6.3	0.009	0.49	0.86	0.09	0.86	0.36	0.3	0.06
Lower slope(pedon 3)										
Ap	0-15	5.7	0.023	0.97	1.67	0.14	0.02	1.32	0.63	0.69
AB	13-35	6.1	0.010	0.54	0.93	0.11	0.08	0.79	0.27	0.52
Bw	35-80	6.1	0.017	0.53	0.92	0.10	0.52	0.21	0.07	0.14
B	80-135+	6.2	0.020	0.51	0.88	0.08	0.53	0.1	0.08	0.02

4.1.3.3. Exchangeable bases, cation exchange capacity and percentage base saturation

The extent of exchangeable bases followed unsystematic pattern of distribution along the toposequence and along depths. The cation exchange capacity (CEC) of the soils ranged from 12.1 to 20.5 cmol (+) kg⁻¹ of soil (Table 4.4) and the values were generally higher in surface than in subsurface horizons except for the upper pedon, which had relatively higher CEC values in the sub surface horizons. Furthermore, the upper and middle pedons have relatively higher CEC than the lower slope pedons. Hazelton and Murphy, (2007), CEC values are rated < 6 as very low, 6 - 12 as low; 12 - 25 as medium, 25 - 40 as high and > 40 as very high. Accordingly the CEC of the soils in the study areas ranged from medium to high. In general, there was a decrease in CEC with depth, except in the middle pedon, which could be due to the strong association between organic carbon and CEC. According to Brady and Weil (2002), CEC depends on the nature and amount of colloidal particles.

The exchange complex of the soil was dominated by Ca followed by Mg, K and Na (Table 4.4). According to Havlin et al. (1999), the prevalence of Ca followed by Mg, K, and Na in the exchange site of soils is favorable for crop production. According Hazelton and Murphy, (2007) rating the exchangeable bases were low to moderate for Ca and K, moderate to high for Mg and very low to low for Na for all the pedons.

The exchangeable Na content of the soils is low and the exchangeable sodium percentage (ESP) of the soils was also less than 15%. This indicates that there is no sodicity problem in these soils. According to Brady and Weil (2002), ESP of 15% is considered as critical for most crops. The base saturation percentage of the soil was greater than 50 in all surfaces except in the upper pedons of B horizon.

(Table 4.4). Exchangeable cation CEC, Sum of bases, PBS and ESP of Aba-midan sub water shed

Horizon	Depth (cm)	Exchgeable cation (Cmolc(+)/kg of soil					Sum of Bases	ESP (%)	
		Ca ⁺²	Mg ⁺²	K ⁺	Na ⁺	CEC			
Upper slope									
A	0-20	6.01	4.00	0.19	0.09	16.5	10.29	62.36	0.5
B	20-60	4.20	1.60	0.18	0.09	19.9	6.07	30.50	0.4
C	60-90+	4.60	2.61	0.49	0.17	15.1	7.87	52.11	1.12
Middle slope									
A	0-15	9.40	5.80	0.27	0.09	20.5	15.56	75.90	0.43
AB	15-35	7.80	3.41	0.20	0.09	18.5	11.5	62.16	0.48
Bt1	35-80	6.60	6.40	0.19	0.13	16.5	13.32	80.72	0.78
Bt2	80-130+	6.04	5.60	0.12	0.09	19.5	11.85	60.76	0.46
Lower slope									
Ap	0-15	7.01	3.63	0.28	0.13	17.7	11.05	62.42	0.43
AB	15-35	7.80	3.01	0.17	0.11	18.5	11.09	59.94	0.59
Bw	35-80	6.09	4.08	0.14	0.09	12.1	10.4	85.95	0.74
B	80-135+	6.08	4.02	0.17	0.19	14.5	1046	72.13	0.13

4.1.3.4. Micronutrients

The available micronutrient content (Fe, Mn, Zn, and Cu) in all pedons have irregular trends along soil depth and slope (Table 4.5). Very high concentration of available Fe and Mn were found in all the pedons as compare with Zn and Cu. The micro nutrient content of soils is influenced by several factors among which soil organic matter content, soil reaction and clay content are the major ones (Fisseha, 1992).

The amounts of Fe, Mn, Zn, and Cu in all the pedons ranged from 109.91mg/kg (in the B horizon of the lower pedon) to 149.78mg/kg in the AB horizon of the middle pedon, 106.8mg/kg (in Bt1 horizon of the middle pedon) to 133.4mg/kg

(in the Bt2 horizon of middle pedon), 0.6ppm (in B horizon of the lower slope pedon) to 4.86ppm (in B horizon of the middle slope pedon) and 2.41mg/kg (in B horizon of the middle pedon) to 3.53mg/kg (in the B horizon of the upper pedon), respectively.

According to critical values of available micronutrients set by Havlin et al. (1999) the amounts of Fe, Zn, Mn and Cu in all the pedons have above sufficient and it might be affect particularly for sensitive crops. This is in agreement with various works which stated that particularly Fe and Mn contents usually at an adequate level in Ethiopian soils (Abayneh, 2005; Alemayehu, 2007).

(Table 4.5.) Available micronutrient of Aba-midan sub water shed

Horizon	Depth (cm)	Micro nutrients (mg/kg)			
		Cu	Zn	Mn	Fe
Upper slope					
A	0-20	3.28	2.90	124.18	145.91
B	20-60	3.53	2.07	131.18	110.88
C	60-90+	2.96	4.54	126.23	142.9
Middle slope					
A	0-15	2.92	3.19	131.31	130.42
AB	15-35	2.65	4.86	125.0	149.78
Bt1	35-80	2.41	2.91	106.80	121.5
Bt2	80-130+	3.17	2.29	133.4	128.07
Lower slope					
Ap	0-15	3.34	1.09	122.19	112.73
AB	15-35	2.86	1.23	125.83	111.57
Bw	35-80	2.73	1.73	123.67	129.48
B	80-135+	3.22	0.60	128.73	109.91

Classification According to USDA and WRB

The surface horizons of all the pedon in the study area qualify for mollic epepedon. In the subsurface horizons, all pedons had thick B horizons. The middle and lower pedons had distinct clay increment in the B horizons, which met all the requirements of Natic horizon. Although few to many distinct clay coatings exist in the upper slope pedons, due to slight clay increment in the profiles they did not meet the clay increase requirement of argillic horizon. Rather they showed evidence of color alteration in their B-horizons, and as a result they are recognized to have a cambic horizon.

The soil classification was done according to the procedure of World Reference Base for Soil Resources (WRB, 2006). Based on the morphological and chemical data obtained from the opened pedons, the soil of the study area was classified under Mollic Nitisol

V. CONCLUSIONS AND RECOMMENDATION

The results of this study are evidences of significant changes in the quality attributes of the soils in the study area following the removal or destruction of vegetative cover and frequent tillage that lead to soil erosion and thereby declining soil fertility. The direct causes of land degradation, including decline

in the use of fallow, limited recycling of dung and crop residues to the soil, limited application of external sources of plant nutrients, deforestation, and overgrazing, are apparent and generally agreed. Underlying these direct causes include population pressure, poverty, high cost and limited access to agricultural inputs and credit, fragmented land holdings and insecure land tenure, and farmers' lack of information about alternative appropriate technologies. The process of prolonged use of lands for crop production with no or only little inputs has exacerbated soil quality decline leading to soil degradation, which may ultimately lead to complete loss of land values.

Topography had influence on the characteristics of the soils in the studied site. Hence, much of the soil properties varied along the toposequence. The soils are dark reddish brown to dark red colour and shallow to moderate soil depth .a definite trend of clay increase down the profile and along the slope in all the soil pedons. Almost very friable consistency, with bulk density ranges (1.14 to 1.49 gm/cm³), prismatic to sub angular blocky structure, low total porosity indicated that the soils have poor physical condition for plant growth. The soils pH were slightly (pH: 5.2) to moderately acidic (pH: 6.4). All the micro and macro nutrients, cations and CEC have irregular trends in all the pedons along depth .While Organic carbon content of the soils decrease with soil depth. The available P and TN of the soils of the study area were categorized under the low category.

Available Fe, Zn, Mn and Cu contents of the soils were more than the requirement for crop production and may leads to toxicity especially for sensitive crops. Macro morphological observations have shown that clay translocation and accumulation has taken place in the soils. In the middle and lower pedons, there was a marked increase in clay content with depth and common to many distinct clay coatings were observed.

The surface horizons of all the pedon in the study area qualify for mollic epepedon. The middle and lower pedons had distinct clay increment in the B horizons, which met all the requirements of a natic horizon. While the upper sub surface pedons with cambic horizons.

In the study area a general decline trend in soil OM and TN contents in the middle and lower slope were observed. This may due to the continuous cultivation, burning farm lands, clearing of forests and grasslands for annual crop production invariably resulted in a loss of soil organic matter because of the removal of large quantities of biomass during land clearing, a reduction in the quantity and quality of organic inputs added to the soil. Furthermore as OM is the main supplier of soil N, S and P in low input farming systems, a continuous decline in the soil OM content of the soils is likely to affect the soil productivity and sustainability.

The sub water shed area was being degraded particularly on the lower slope, therefore; it will highly require intensive and grate conservation agriculture, develop proper soil fertility improvement strategies such as, use of organic and inorganic input such as crop rotation, conservation tillage, fallowing, terracing and inclusion of restorative crops in cropping systems on these lands and thereby utilizing optimum rate suitable types of fertilizers.

The sub water shed area was totally subjected to overgrazing and communal wood land, therefore; it requires intensive management regarding range land utilization and conserving biodiversity.

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The Impact of Small Scale Irrigation on Household Income in Bambasi Woreda, Benishangul-Gumuz Region, Ethiopia

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Abstract- Small scale irrigation is one of the most useful irrigation systems designed to increase production and productivity and reduces risk related with rainfall variability and increasing income of rural farm households indeed. In fact, planners, researchers, development practitioners, and donors emphasized the importance of small scale irrigation in their policy recommendations and actual measures. So, the main objective of this paper is to investigate the impact of small scale irrigation on the income of rural households in Bambasi Woreda. This paper used a cross-sectional household level survey data and multistage sampling was employed to select the four kebeles from Bambasi woreda and the information obtained from a total sample of 363 randomly selected households of these total sample households 117 households are treated group whereas, 246 households are control group. Secondary data were also collected from different sources. As part of the study, the data collected were analyzed through propensity score matching. Besides, the estimates of the propensity score matching of the probit model exhibits that gender, the linear and non-linear age, education, plot size, social position participation, extension service, access to credit and total livestock unit are the statistically significant variables which significantly affects the income of small scale irrigation. And the region of common support is found between 0.0017 and 0.999. Furthermore, the nearest neighbor, radius, kernel and stratification matching methods of the outcome variable income shows a statistically significant result with bootstrapped standard errors and the Average treatment effect for treated of the radius, kernel and nearest neighbor matching is 2166.83 birr where as the ATT of the stratification matching is 1917.55 birr per as compared to the control groups. Thus, the result of ATT shows a significant income difference. And the ratio of the average income per family size of the household head per year is 1870.71 birr.

Index Terms- Small Scale irrigation income, Probit, Propensity Score Matching, ATT, Bambasi woreda.

I. INTRODUCTION

By large agriculture contributes substantially to the economic growth of many low-income countries like Ethiopia with the potential of irrigation. So, it is often the leading sector of the economy as source of income, employment and foreign exchange. Moreover, more than half of the less developed countries population gets their food from own-production. And

agricultural output also is used as an input for industries so it can stimulate the growth of industrialization. Similarly, increasing the agricultural productivity thus contributes to income growth (UNDP, 2007).

Sub-Saharan African (SSA) countries, especially Ethiopia, is predominantly an agrarian country with the vast majority of its population directly or indirectly engaged in agriculture where around 95% of the country's agricultural output is produced by small holder farmers (MoARD, 2010). Thus, it is the backbone of Ethiopian economy; it contributes about 50 % of the GDP, 85% of the employment, 90% of the export earnings and 70% of the supply of industrial raw materials (World Bank, 2010).

Even though, the country is endowed with three main resources namely land, water and labor for agricultural production, the sector in the country is mostly small- scale, rainfall dependent, traditional and subsistence farming with limited access to technology and institutional support services. Thus, the ability of the nation to address food and nutritional insecurity, poverty, and to stimulate and sustain national economic growth and development is extremely dependent on the performance of agriculture. Nonetheless, achieving higher and sustained agricultural productivity growth remains one of the greatest challenges facing the nation (Spielman et al., 2010). Basically, rainfall is erratic and unevenly distributed between seasons and agro ecological regions lead to poor yields, low productivity, food insecurity and poverty within the farming population, accordingly it emphasizing the need for irrigation in the country.

Small-scale irrigation is irrigation that usually practiced on small plots where small farmers have the majority controlling influence, using a level of technologies which they can operate and maintain effectively. Hence, Small-scale irrigation is, therefore, farmer-managed that is farmers involved in the design process and, in specific, with decisions about boundaries, the layout of the canals, and the position of outlets and bridges. As a result, the preference for small-scale schemes is based on the perceived easy adaptability of the systems to local environmental and socioeconomic conditions (Vaishnav, 1994).

Consequently at this time, the government is trying to transform from traditional and manual, rain-fed, supply driven and production oriented agriculture to technology intensive and mechanized, irrigated, market oriented agriculture, through full packages of value addition and postharvest technologies. Indeed, the objective of the growth and transformation encompasses i) achieving a sustainable increase in agricultural productivity and production; ii) accelerating agricultural commercialization and

agro-industrial development; iii) reducing degradation and improving productivity of natural resources; and iv) achieving universal food security and protecting vulnerable households from natural disasters (MoARD, 2010).

On aggregate the agriculture sector remains our Achilles heel and source of vulnerability for various shocks as a result of the high dependency on the seasonal rainfall. However, we remain convinced that agricultural based development remains the only source of hope for Ethiopia (Devereux et al., 2005)

Therefore, due to the visible merit of irrigation currently the government is giving a high emphasis on the expansion of small scale irrigation as a best viable option for achieving food security for the sake of improving yields in both rain-fed and irrigated agriculture and cropping intensity especially in irrigated areas security (IWMI, 2005).

Since, irrigation contributes to the overall livelihood improvement through increased income, food security, employment opportunity, social needs fulfillment and poverty reduction. It Increase agricultural production through diversification and intensification of crops grown, increased household income because of on/off/non-farm employment, source of animal feed, improving human health due to balanced diet and easy access and utilization for medication, soil and ecology degradation prevention and asset ownership are contributions of irrigation (Asayehegn, 2012).

Coincided with the irrigation investments leads to production and supply shifts, indirect linkages operate through regional and national level and have a strong positive effect on the national economy. Therefore, as the study conducted from Gambia proposed that irrigation provided smallholder farmers the chance for increasing income that was reflected on increased expenditure, investment in productive and household assets, saving and trade (Webb, 1991).

At large agricultural production in Ethiopia is primarily rainfed in which it mainly depends on erratic and often insufficient rainfall. Consequently, there are frequent failures of agricultural production. And irrigation has the potential to stabilize the agricultural production and minimize the negative impacts of the variability and insufficient rainfall. Thus, irrigation development also can help offset some of the negative effects of the rapid population growth (2.6 percent per year in Ethiopia; CSA 2007). Which in turn has a negative effect of the population growth on agricultural activities expands into marginal land, which leads to forest, land and water degradation that affects the food security and poverty status.

So, as per the knowledge of the researchers Benishangul-Gumuz Regional State have a potential of irrigation development but the actual coverage of irrigation on the region is at its infancy. However, some areas of the region especially Bambasi Woreda is highly irrigated land. Therefore, the purpose of this paper is to investigate the impact of small scale irrigation on the households' income.

II. RELATED LITERATURE REVIEW

Historically the practice of irrigation accounted for many years especially in Far East it accounted for 5000 years and in Egypt for around 4000 years (Peter, 1997). As FAO (1997) indicated that, 30-40 percent of the world food production comes

from an estimated 260 million hectare of irrigated land or one-sixth of the world's farmlands. Thus, irrigated farms produce higher yield for most cereal crops and vegetables.

As Asayehegn et al., (2012) indicated that irrigation intensifies input especially labor throughout the year. And it motivates to self employment and decreases leisure time of active labors. This proposes off-farm income inspires to withdraw active labor force from irrigation activities and placing to off farm income driving activities reduces irrigation participation of farm households. Furthermore, farm households that have access to market information are able to compare, the net income from rain-fed and irrigation farming. Similarly, it assists purchasing of the right input at the right time from the right enterprise and supplying of the products to the right customer with a reasonable intermediary cost. Nevertheless, the gender difference of household heads in irrigation participation indicated female-headed households face shortage of labor and market information, made them rent/share out their land. In addition, networking of rural farm households with their customers through information sources such as mobile and telephone service is a determinant factor.

The Impact of Irrigation on Household Livelihoods

As various scholars like Burrow (1987) confirmed that, small holder irrigated agriculture had proven to be a viable and attractive alternative for poor farmers especially in developing countries. In addition, he asserted that returns from intensive irrigated agriculture even on tiny plots could greatly exceed returns from rain fed cereal production. As a result, in many developing countries such as Ethiopia, small scale irrigation schemes were counted on to increase production, reduce unpredictable rainfall and provide food security and employment to poor farmers. Hence, the same sentiments were echoed by Gor Cornist (1999) when he asserted that some of the small scale irrigation projects have been discovered primarily for income generating like the peri-urban areas in Benishangul-Gumuz and Vegetable growing in Bambasi woreda. Overall, irrigation farming is the source of income for the disadvantaged rural people that are mostly women, widows, and orphans. Similarly, some empirical results shows that irrigation farming enables the growing of green vegetables, wheat, tomatoes, cotton, maize and even sugar-cane among others.

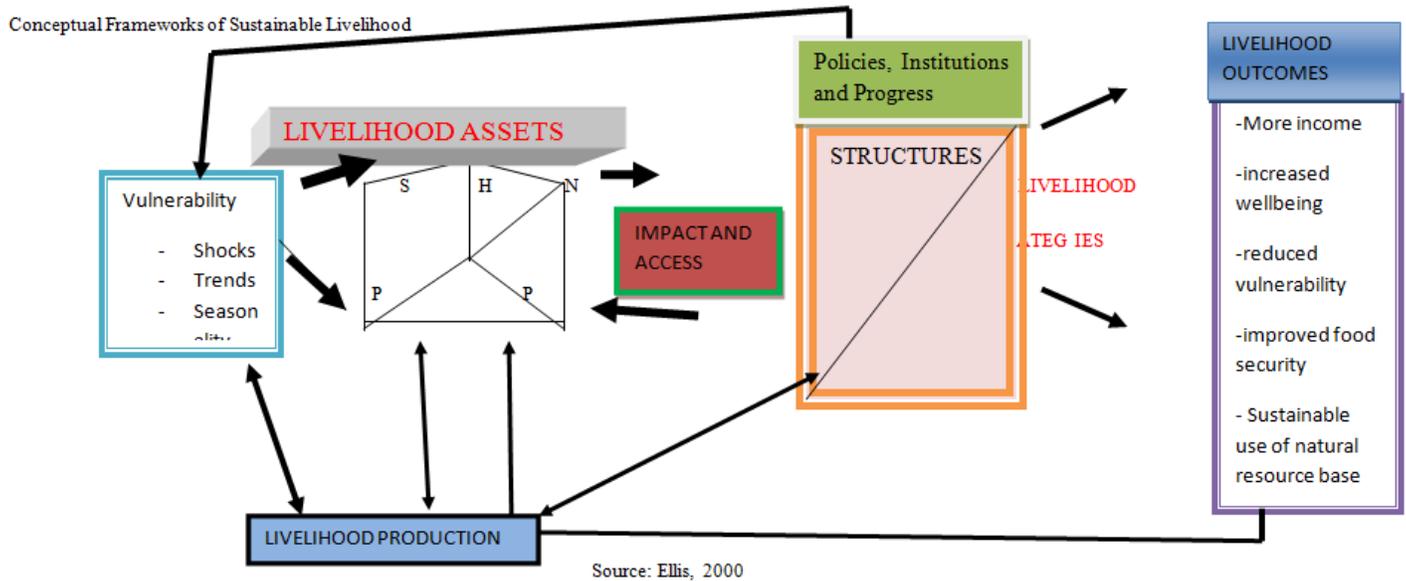
In similar fashion, World Bank (2008) reported that more than 70% of the poor people in the world live in areas relying mostly on agricultural activities and sometimes mining and finishing for survival. Besides, as Makumbe (1996) proposed that, about half of the family heads in the informal sectors are employed as peasant farmers. And also population is ever increasing thus land set aside for irrigation farming has been excessively subdivided rendering most units sub-economic irrigation schemes. This author also postulates that, land is deteriorating very rapidly in Benishangul-Gumuz especially Bambasi woreda and in most cases farmers do not have access to or buying power to purchase certified seeds and fertilizers.

And irrigation farming contributes significantly for household especially in terms of income in rural areas. Due to most of the rural household are unemployed, most families' income levels are relatively low and possibly not enough to acquire their basic commodities and services. Therefore, the household in Bambasi Woreda confessed that their project

enables members to earn an income which enables them to meet some of their basic needs, (Makumbe, 1996). Since, the cash earned from the sale of food is used to cover household needs like cooking oil, paraffin and others. And it also enables members to meet their educational needs of their children such as exercise books and tuition fees and clothing fees as well as forage of animals. Thus, the data from previous time periods also revealed that irrigation farming has long term economic contribution on rural livelihoods.

Based on the study of Kundlande et al., (1994), food production from irrigated farms is a major source of wealth creation to the extent that it is the basis for economic growth in a number of localities. And the income generated provide funds for

purchase of irrigation development to make up an important and growing proportion of the products used before by processing firms. Generally, irrigation agriculture is an essential component of any strategy to increase global food supply. As a result, the benefits of irrigation have resulted in lower food prices, higher employment and a more rapid agricultural and economic development. With regard to this, the spread of irrigation has been a key factor behind the rear tripling of global grain production since the 1950s. Furthermore, small scale irrigation schemes play an important role in augmenting government policy of reducing rural to urban migration.



III. METHODOLOGY OF THE STUDY

3.1 Source of Data collection

For this study both primary and secondary data sources have been employed to collect the qualitative as well as the quantitative data type. In using the primary data the conventional household survey was the key method employed to collect the quantitative information via a well designed structured scheduled questionnaire and interview which was prepared for the study. Information pertaining to households' demographic, socio-economic characteristics and institutional situations were obtained directly through the interview and sample household heads were the unit of analysis. Whereas, Focus group discussion, key informant interview and direct personal observation were also used to collect the qualitative primary data. Indeed, to enrich the primary data the secondary data source was also collected from the published and unpublished documents of the Weredas administration office and agricultural Bureau of Benishangul-Gumuz Region.

3.2 Sampling techniques and sample size

A multistage sampling technique was used to determine the sampling of households. First, Bambasi woreda is selected purposively because of the extensive practice of agriculture

especially irrigation and it is the place where various agricultural crops irrigated. And Bambasi woreda consists of 11,286 households and 38 kebeles. Furthermore, three kebeles was also selected using purposive sampling technique based on their irrigation access and utilization and the households of the three kebeles was also selected using simple random sampling technique in order to give an equal chance of the households' participation to be selected and to minimize the sampling error too. Finally, the selection of the households was based on probability proportional sampling. Furthermore, to determine the sample size of this study Yamane's (1967) formula was utilized as:

$$n = \frac{N}{1 + N(e)^2}$$

Where, n is the required sample size; N is the total number of Bambasi woreda households; e is the level of precision at 95% degree of confidence. Specifically, in the four selected rural Kebeles, the total number of the households are 4030 (that is, Dabus =1800, Keshmando = 1250, Mender 46 = 980). Thus, the actual sample size determined is

$$n = \frac{4030}{1 + 4030(0.05)^2} = 363$$

The then, to determine each kebeles sample size using probability proportional sampling technique, is computed as follows

Table 3.1: Proportional Sample Size Determination

Kebeles	Household <i>n₀</i>	How to compute	Sample size
Dabus	1800	1800*363/4030	≈ 162
keshmando	1250	1250*383/4030	≈ 113
Mender 46	980	980*363/4030	≈ 88
Total	4,030	1800*363/4030 + 1250*383/4030 + 980*363/4030	363

Source: own computation, 2015

3.3 Methods of data Analysis

After the necessary data was collected from the farm household small scale irrigation users to analyze the data both descriptive statistics and econometrics model has been employed. And after the data has been collected, edited, coded and labeled the descriptive statistics was employed to summarize the demographic and socioeconomic behavior of household characteristics using mean, standard deviation, and table and pie charts.

3.3.1 Econometric Model Specification

3.3.1.1 Theoretical Model Specification

3.3.1.1.1 Random Utility Model

The theoretical bench mark of participating in small scale irrigation is on the basis of utility derived. Therefore, rural households with higher utility derived from practicing of irrigation would prefer to engage in small scale irrigation.

$$U_i = X_i\beta + \epsilon_i$$

Where, U_i shows the utility derived from participation in small scale irrigation, X_i represents all the explanatory variables which affects the probability of participation in small scale irrigation, ϵ_i reveals the disturbance term which is unobservable for the researcher but observable for the farm household with zero mean and constant variance (δ^2).

3.3.1.2 Empirical Model Specification

This paper consists of two models for the participation equation and the outcome equation. Therefore, the participation equation was regressed using probit model since the dependent variable is a discrete variable that is if the household participates ($Y_i = 1$, otherwise =0). This model is preferable than OLS because the estimation using OLS results with biased parameter estimates in case of the binary response dependent variable. Rather, the probit model is used to estimate the result of participation due to its effectiveness in determining the unobservable dependent variables given the explanatory variables. But, the Logit model is also recommended for such study due to their indifference in model selection. However, the researchers' chosen the probit model in order to show the normal distribution behaviour of the data too in the model.

I. Participation equation using: Probit Model

$$z_i^* = \sum_{k=1}^k \gamma_k w_{ki} + u_i$$

Where, Z_i^* reveals the participation decision which has dichotomous realization on un observed Z_i ($Z_i = 1$, if participate

in irrigation, otherwise = 0), γ_k = unknown parameters of the k variables w_{ki} explanatory variables determining the probability of participation in irrigation utilization and u_i is the disturbance term with zero mean and constant variance.

3.3.1.2.1 Propensity Score Matching Model Specification

The PSM is applied based on two assumptions: first the Conditional Independence Assumption (CIA) that is the key assumption made in PSM is that selection into a program can be captured with observable data that are available to the evaluator. ($Y_0, Y_1 \perp T \mid X$, where Y_0 shows the outcome of the control groups, Y_1 shows the outcome of the treated group, T shows the participation into the program, and X shows the set of pre-treatment explanatory variables. Thus, based on Rosenbaum and Rubin (1983) using their assertion that 'treatment assignment is strongly ignorable', displayed that, for non-randomized observations, outcome and treatment are conditionally independent given the propensity score, $P(x)$, ($Y_0, Y_1 \perp T \mid P(x)$). That is a balancing condition needs to be satisfied for propensity score matching. $T \perp X \mid P(x)$.

Secondly, the common support or overlap condition: $0 < P(T=1 \mid X_i) < 1$. According to Heckman et al., (1999) suggestion this assumption ensures that the treatment observations have comparison observations "nearby" in the propensity score distribution.

Thus, in order to estimate the real impact of the irrigation participation on households' income propensity score matching is employed since OLS could not control the selection bias of the treatment and this model had this merit.

Denoting participation in micro irrigation adoption by T_i , (where $T_i = 1$ indicates treated, and $T_i = 0$ indicates non treated), Average Treated on the Treated (ATT) for the population can be computed as:

$$ATT = E(Y_{1i} - Y_{0i} \mid T_i = 1)$$

This is similar with;

$$ATT = [E(Y_{1i} \mid T_i = 1) - E(Y_{0i} \mid T_i = 1)]$$

Thus, the sample equivalence is given by:

$$ATT = \frac{1}{n} \sum_{i=1}^n (Y_{1i} - Y_{0i} \mid T_i = 1)$$

This is the same as;

$$ATT = \frac{1}{n} \sum_{i=1}^n [(Y_{1i} \mid T_i = 1) - (Y_{0i} \mid T_i = 1)]$$

Where; $(Y_{0i} | T_i = 1)$ indicates the amount of income from micro irrigation intervention. $(Y_{0i} | T_i = 0)$ indicates what would have been the amount of income without participation in micro irrigation.

For the consistency and robustness of the results, the study has applied four methods of matching. These are Nearest Neighbor matching, Radius Matching, Kernel Matching, and the Stratification or Interval Matching.

IV. RESULTS AND DISCUSSION

1.1 Descriptive Statistics

Irrigation Income earning Distribution of the Study Area

As the Figure below depicts that, the income earning of Dabus kebele is 42 percent from engagement of small scale irrigation. And Keshmando also obtain for around 40.97 percent of income from small scale irrigation. Indeed, the sample kebeles are highly engaged in small scale irrigation and earn higher amount of income from their practice of irrigation.

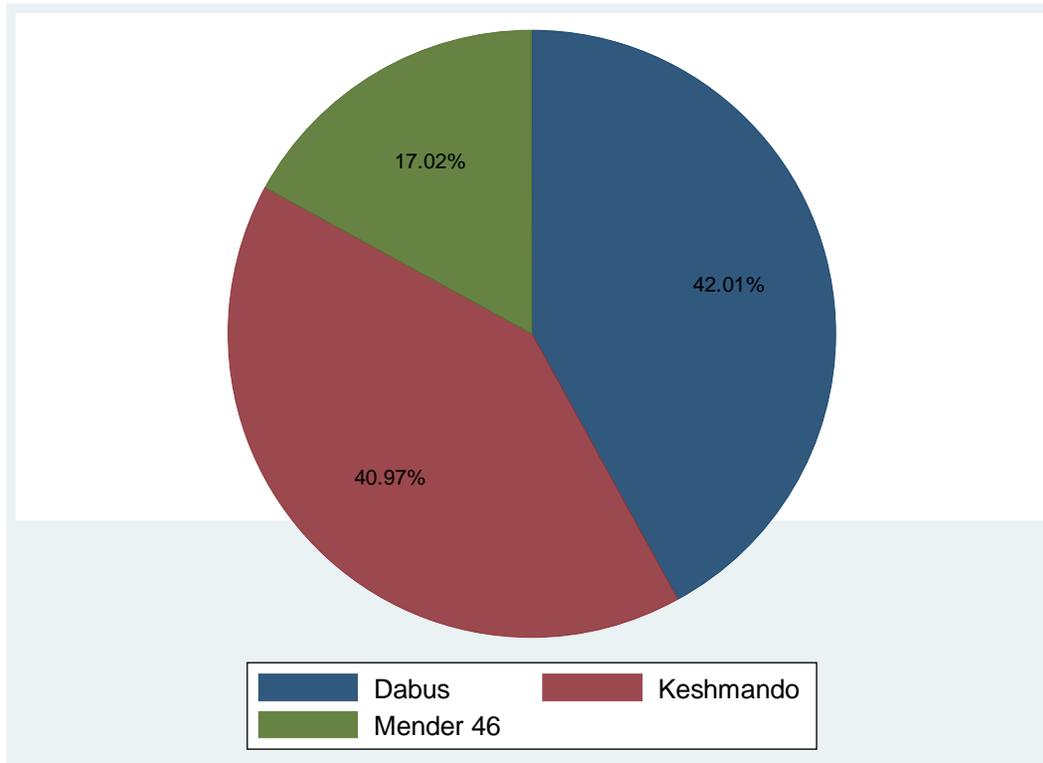


Fig 4.1: Income generating of kebeles from small scale irrigation

Econometrics Model results

As one can see from the Table below, sex of the household head, the linear and the non-linear age, education, plot size, total livestock unit, extension service and access to credit are statistically significant and economically meaning full results, that affects the probability of small scale irrigation participation. With regard to the sex of the household head male headed households are 46.46 percent less likely to participate in small scale irrigation participation. The probable reason is that, male headed households prefer to shift from irrigation participation to other income generating activities like trade and daily labourer as well as governmental employees as compared to female headed households. Similarly, the linear age of the household is positively correlated with the probability of participation in irrigation. Therefore, age of the household head exhibits a hill shaped relationship with the probability of participation in

irrigation. This result is consistent with the theory of the life cycle hypothesis. Since irrigation requires high energy and effort. Besides, the increase in one years of schooling increases the probability of participation in small scale irrigation by 19.71 percent of marginal effect, other variables remain constant at their mean value. Because, education enables the farm households to engage in small scale irrigation due to the benefit they derive from irrigation participation too.

On the other hand, access to extension service is the surprising result in which it negatively correlates with the probability participation in small scale irrigation. The probable reason is that, households with more extension service are less likely to participate in irrigation rather they shift to diversified agricultural crops during the rainy season because of the sufficient extension service by agricultural experts.

Table 4.1: Marginal Effect Estimation of the probit maximum Likelihood of Parameters

variable	dy/dx	Std. Err.	z	P> z	[95% C.I.]	X
hhsex1*	-.4645779	.11025	-4.21	0.000	-.680668 -.248488	.81
age1	.0823115	.03881	2.12	0.034	.006249 .158374	46.8633
age_sq	-.0007318	.00039	-1.90	0.058	-.001489 .000025	2287.87
educ_hh	.197103	.04036	4.88	0.000	.117999 .276207	1.08333
family~e	-.0535991	.03658	-1.47	0.143	-.125291 .018093	5.37333
labora~l	-.0216898	.04465	-0.49	0.627	-.109208 .065828	2.10333
plotsize	1.188168	.2241	5.30	0.000	.748943 1.62739	.569167
offfarm~n*	.0693748	.08733	0.79	0.427	-.101787 .240536	.726667
TLU	.0236817	.01029	2.30	0.021	.003515 .043848	6.3573
mktdis~e	.0080283	.00682	1.18	0.239	-.005342 .021399	10.3117
extens~e*	-.2384913	.08124	-2.94	0.003	-.397722 -.07926	.52
access~t*	.1199435	.06477	1.85	0.064	-.006996 .246883	.523333
social~t*	-.1720782	.08345	-2.06	0.039	-.335631 -.008526	.69

Source: Own Survey, 2015

4.1 Impact Evaluation

As one can see from the below Table, all the results of the matching estimation techniques are statistically significant at 1 percent probability level of significance. Hence, the ATT result reveals that households practicing small scale irrigation are significantly different in their welfare based on income indicator. Furthermore, the ATT estimation result of the Nearest Neighbour, Kernel and Radius matching type of the treated group

shows a 2,166.83 Birr difference with their counterfactual whereas, the ATT Stratification matching algorithm of the treated reveals 1917.55 Birr difference with the control group. Therefore, the empirical investigation of the impact evaluation of the main objective is proved due to the overall significance of the matching algorithms and the alternative hypothesis decision is accepted.

Table 4.2: Average Treatment Effect of the treated (ATT) estimation result of the impact of Irrigation on Households Income: with Bootstrapped standard errors

Matching Algorithms Type	Treated	Control	ATT	Std. Err.	t-value
Nearest Neighbour	117	246	2166.83	156.00	13.86***
Kernel	117	246	2166.83	149.01	14.54***
Stratification	85	212	1917.55	196.29	9.77***
Radius	117	246	2166.83	153.37	14.13***

Source: Own Survey, 2015

Note: *** statistically significant at 1 percent probability of significance.

As the result of the below indicates that, the average income difference of the treated with the control group shows a 1870.71 Birr difference with a standard deviation of 1736.86 birr. This average difference of income is the ratio of the actual irrigation income to the family size of the household head.

Table 4.3: The Actual Average Income Difference

Variable	Obs	Mean	Std. Dev
Irrigation_income	117	1870.707	1736.86

Source: own Survey, 2015

V. CONCLUSION

The study was based on a cross-sectional household survey data collected using primary and secondary data sources. And samples of 363 households were randomly selected after long process of using multistage sampling technique.

As the empirical result of the probit model of the propensity score matching indicates that sex of the household head, the linear and the non-linear age, education, plot size, total

livestock unit, extension service and access to credit are statistically significant and economically meaning full variables, that affects the probability of small scale irrigation participation. Indeed, male headed households with higher extension service shift from irrigation participation to other income generating activities like trade and daily labourer as well as governmental employees as compared to female headed households.

And age of the household head exhibits a hill shaped relationship with the probability of participation in small scale irrigation. And also education enables the farm households to engage in small scale irrigation due to the benefit they derive from irrigation participation too.

Besides, as the four matching estimators revealed that all are statistically significant at 1 percent probability level of significance and the impact is confirmed between the treated and control group. Furthermore, the ATT estimation result of the Nearest Neighbour, Kernel and Radius matching type of the treated group shows a 2,166.83 Birr difference with their counterfactual whereas, the ATT Stratification matching

algorithm of the treated reveals 1917.55 Birr difference with the control group.

Finally, the average income difference of the treated with the control group shows a 1870.71 Birr difference with a standard deviation of 1736.86 birr. This result shows the ratio of the average income per family size of the household head per year.

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Research Capabilities of Public Secondary and Elementary School Teachers in the Division of Antipolo City

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Abstract- The study aimed to determine the factors affecting the research capabilities of public secondary and elementary school teachers in the Division of Antipolo City. The study made use of the descriptive method.

The public secondary and elementary school teachers are moderately capable in writing a research proposal and publishable research paper or article.

There is no other profile which affects the research capabilities of public secondary school teachers in writing a research proposal and publishable research paper or article except their position in the school. The research capabilities of public elementary school teachers with respect to writing a research proposal and a publishable research paper or article are affected by sex, civil status and research seminars/trainings attended and not age, position and by highest educational attainment.

Index Terms- public elementary school teachers, research capabilities

I. INTRODUCTION

Research is a very important tool in national and global progress. Its value cannot be underestimated for it is directed towards the preservation and improvement of quality of life (Calderon and Gonzales, 1993). Moreover, the purpose of research is to serve man and the goal of research is good live. Hence, due to research man becomes progressive because man is utilizing the products of research.

Research serves as a solution to societal problems that are apparent from community level up to different government and non-government agencies. Thus, most government and non-government agencies are developing research agenda in order to find solutions to prevailing problems observed in the society.

The Department of Education as an agency of the government should take part in addressing problems particularly the teaching-learning process. In other words, the teachers should conduct research relative to the solutions of the problems in their classrooms which will in turn improve the educational system of the country. Although there is no specific mandate coming from the higher authorities of the Department of Education requiring teachers to conduct research, conduct of research should be promoted by the middle level educational managers in order make realistic decisions. To corroborate this concept, the DepEd issued DO No. 65, s. 2003 which institutionalizes the research-based decision and policy making in the department. This order stipulates that policies in the department should be based on research.

Hypothetically, some teachers are not skillful in conducting research particularly classroom based or action research. Thus, how can these teachers help address the problems encountered in classrooms if they are not skillful in conducting research? This situation should not be neglected and should be given attention not only by the Department of Education but also other institutions who are affected by their outputs, the high school graduates.

The University of Rizal System with a mission to “nurture and produce upright and competent graduates and empowered community ,through relevant and sustainable higher professional and technical instruction, research, extension and production services” should take part in helping the DepEd teachers as a member of the larger community. In view of the need to concretize this mission, the research proponents conducted this study on “Research Capabilities of Public Secondary and Elementary School Teachers in the Division of Antipolo City”.

II. OBJECTIVES

The study aimed to develop an extension training on research for public elementary and secondary school teachers in the Division of Antipolo City during the Schools Year 2015-2016 and 2016-2017.

Specifically, it sought answer the following questions:

1. What is the level of research capabilities of public secondary and elementary school teachers in terms of the following:
 - 1.1. writing a research proposal; and
 - 1.2. writing a publishable research paper?
2. Is there a significant difference in the level of research capabilities of public secondary and elementary school teachers when grouped according to profile?

III. RESEARCH METHODOLOGY

The made use of the descriptive evaluative method of research utilizing survey form to assess the research capabilities of faculty members in public secondary and elementary schools in the Division of Antipolo City, Philippines.

The respondents of the study were the one hundred sixty (160) public secondary and 160 elementary school teachers in the different public schools in the Division of Antipolo City. The number of respondents was pre-determined by the researchers and was selected using multi-stage random sampling.

The study made use of the Questionnaire Checklist devised to answer the specific problems of the study. It was subjected to

validation by Ten (10) experts and the suggestions were checklist, mean was used. considered in the finalization of the checklist. To score the

IV. RESULTS

Table 1. Level of Research Capabilities of Public Secondary School Teacher Research Capability of Public Secondary and Elementary School Teachers In Writing a Research Proposal

Aspects	Secondary		Elementary	
	Mean	Verbal Interpretation	Mean	Verbal Interpretation
1. Writing Rationale	3.62	Moderately Capable	3.77	Moderately Capable
2. Writing Significance of the Study	3.75	Moderately Capable	3.75	Moderately Capable
3. Writing Definition of Terms	3.90	Moderately Capable	3.86	Moderately Capable
4. Writing Expected Output of the Study	3.71	Moderately Capable	3.67	Moderately Capable
5. Writing the Review of Related Literature	3.63	Moderately Capable	3.71	Moderately Capable
6. Writing the Research Methodology	3.69	Moderately Capable	3.70	Moderately Capable
7. Writing the Research Framework	3.67	Moderately Capable	3.71	Moderately Capable
8. Applying APA Format	3.32	Less Capable	3.42	Moderately Capable
Overall	3.66	Moderately Capable	3.70	Moderately Capable

Table 2. Research Capabilities of Public Secondary and Elementary School Teachers in Writing A Publishable Research Paper or Journal Article

Aspects	Secondary		Elementary	
	Mean	Verbal Interpretation	Mean	Verbal Interpretation
1. Writing abstract	3.46	Moderately Capable	3.48	Moderately Capable
2. Writing an Introduction	3.66	Moderately Capable	3.56	Moderately Capable
3. Writing the Objectives	3.71	Moderately Capable	3.61	Moderately Capable
4. Writing Research Methodology	3.56	Moderately Capable	3.50	Moderately Capable
5. Writing Results and Discussions	3.62	Moderately Capable	3.57	Moderately Capable
6. Writing Conclusions	3.65	Moderately Capable	3.55	Moderately Capable
7. Writing Recommendations	3.65	Moderately Capable	3.63	Moderately Capable
Overall	3.62	Moderately Capable	3.56	Moderately Capable

Table 3. Analysis of Variance Table on Research Capabilities of Public Secondary and Elementary School Teachers with Respect to Writing a Research Proposal In Terms of their Profile

Profile	Secondary			Elementary		
	F-Value	p-value	Ho	F-Value	p-value	Ho
Age	1.519	0.200	FR	0.54	0.700	FR
Sex	2.450	0.123	FR	9.583	0.002	R
Civil Status	.276	0.603	FR	6.605	0.002	R
Position	2.812	0.043	R	2.113	0.101	FR
Highest Educational Attainment	0.085	0.924	FR	1.053	0.354	FR
Research Seminars/Trainings Attended	1.095	0.383	FR	3.472	0.003	R

Legend: FR-Fail to reject, R-Reject

Table 4. Analysis of Variance Table on Research Capabilities of Public Secondary and Elementary School Teachers with Respect Writing a Publishable Research Paper or Article In Terms of their Profile

Profile	Secondary			Elementary		
	F-Value	p-value	Ho	F-Value	p-value	Ho
Age	0.746	0.570	FR	0.490	0.740	FR
Sex	0.970	0.332	FR	5.641	0.020	R
Civil Status	0.001	0.983	FR	3.991	0.020	R
Position	1.430	0.243	FR	1.317	0.271	FR
Highest Educational Attainment	0.631	0.534	FR	2.379	0.094	FR
Research Seminars/Trainings Attended	1.570	0.134	FR	3.820	0.002	R

V. DISCUSSIONS

As presented in Table 1, the research capabilities of public secondary and elementary school teachers in writing definition of terms has the highest mean rating of 3.90 and 3.86 respectively both with verbal interpretation of moderately capable. While, applying American Psychological Association (APA) format has the lowest mean rating of 3.32 verbally interpreted as less capable and 3.42 verbally interpreted as moderately capable respectively. The data indicates that the public secondary and elementary school teachers are moderately capable of writing the different parts of a research proposal. However, they are less capable of applying the American Psychological Association format. The results of the interviews with the teachers revealed that they are hard up in applying American Psychological Associations format in texts and bibliographical citations. This implies that the teachers shall be provided with trainings in applying American Psychological Association format in writing not only in research proposal, but also in writing a publishable research paper or article.

As shown in Table 2, the research capabilities of public secondary schools teachers in terms of writing objectives of research has the highest mean rating of 3.71 and the public elementary school teachers has the highest mean rating of 3.46 in writing abstract. Both the highest and lowest mean ratings have verbal interpretation as moderately capable. The research capabilities of public elementary school teachers in writing recommendations has the highest mean rating of 3.63 and writing abstract has the lowest mean rating of 3.48. Both the highest mean and lowest mean ratings and other mean ratings have verbal interpretations of moderately capable. The results emphasizes that both the public secondary and elementary school teachers are moderately capable in writing the different parts a publishable research paper or article.

As manifested in Table 3, the probability value on research capabilities of public secondary school in writing a research proposal when grouped according to position is lesser than 0.05 level of significance which is enough to reject the null hypothesis. On the other hand, the probability values on research capabilities of the public secondary school teachers when grouped according to age, sex, civil status, highest educational attainment, and seminars/trainings attended are greater than greater than 0.05 level of significance which are not sufficient to reject the null hypothesis. The result explains that the capabilities of public secondary school teachers in writing the

different parts of a research proposal is affected by their position and not with their age, sex, civil status, highest educational attainment and research seminars/trainings attended. In relation to the research capabilities of public elementary school teachers in writing a research proposal, the table revealed significant difference in terms of sex, civil status and research seminars/trainings attended as indicated of the lower probability values compared to 0.05 level of significance. On the other hand, there is no sufficient evidence to show that there significant difference in the research capabilities of teachers when grouped according to age, position, and highest educational attainment. The finding illustrates that the research capabilities of public elementary school teachers are affected by sex, civil status and research seminars/trainings attended and not certain by age, position and highest educational attainment.

As presented in Table 4, there is no sufficient evidence to reject the null hypothesis that there is no significant difference on the research capabilities of public secondary school teachers in writing the different parts of a publishable research paper or article when grouped according to age, sex, civil status, position, highest educational attainment and research seminars/trainings attended as indicated by the higher probability values compared to 0.05 level of significance. On the other hand, the probability values on the research capabilities of public elementary school teachers in writing a publishable research paper when grouped according to sex, civil status and research seminars/trainings attended are low compared to 0.05 level of significance which is enough to reject the null hypothesis. On the other hand, the probability values in terms of age, position, and highest educational attainment are higher compared to the 0.05 level of significance which are not sufficient to reject the null hypothesis. The result emphasizes that the research capabilities of public elementary school teachers are affected by sex, civil status and research seminars/trainings attended and not by age, position, and highest educational attainment.

VI. CONCLUSIONS

The public secondary and elementary school teachers have average level of research capabilities in writing different parts of a research proposal and publishable research paper or article and low level in applying American Psychological Associations format.

The research capabilities of public secondary school teachers in writing a research proposal is affected by their

position and not affected by age, sex, civil status, highest educational attainment and research seminars/trainings attended. The research capabilities of public elementary school teachers with respect to writing a research proposal and a publishable research paper or article are affected by sex, civil status and research seminars/trainings attended and not age, position and by highest educational attainment.

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Phytochemical screening and Thin layer chromatographic identification of Terpenoids from the root extract of *Achyranthes aspera* L.- An Indian Ethanomedicine

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Abstract: Medicinal plants are big source of information for wide variety of chemical constituents which could be developed as drug with precise selectivity. *Achyranthes aspera* Linn is one of the important medicinal plants having many therapeutic uses. The present study deals with preliminary phytochemical screening and TLC investigation of *Achyranthes aspera* Linn. In qualitative analysis, the phytochemical compounds such as steroids, triterpenoids, sugars, alkaloids, phenolic compounds, flavonoids were screened in root methanolic extract by using standard methods. Phytochemical screening of plant revealed the presence of alkaloids, flavonoids steroids reducing sugar, glycosides and Terpenoids. The present study revealed that *Achyranthes aspera* roots are important source of many therapeutically and pharmacologically active constituents.

Keywords: *Achyranthes aspera*, Terpenoids ,Phytochemical analysis, Flavonoids,Triterpenoids ,Therapeutically

I.INTRODUCTION

Ethanomedicinal study deal with the study of traditional medicine .since ancient times mankind has been using herbal plants, organic materials from the sea, rivers etc .for its betterment. Recently much attention has directed towards extracts and biologically active isolated from popular plant species .In the present era of drug development and discovery of newer drug molecules ,many plant products are evaluated on the basis of their bioactive constituents .The curative properties of medicinal plants are mainly due to presence of various complex chemical substances of different compositions which occur as secondary metabolites.(Karthikeyan et.al.,2009)The therapeutic properties of medicinal plants are mainly due to the existence of an assortment of complexchemical substances of diverse compositions which occur as secondary metabolites.The most significant of theses bioactive constituents are alkaloids ,glycosides ,flavanoids ,tannin are terpenoids.various parts of the plants like roots ,leaves ,bark ,exudates etc are used as per medicinal propertites(Perumalet.al.,2007).They are the reservoirs of potentially useful chemical compounds which could serve as newer leads and clues for modern drug design(Akinjogunia et.al,2010).*Achyranthes aspera* Linn belongs to the family Amaranthaceae.It is an annual stiff erect herb and found commonly as a weed throughout india and is one of the important medicinal plants having many therapeutic use as Odontalgic

,Rheumatism, Bronchitis ,skin disease and rabies(Girach et.al1992)Leaf extract were reported to posses thyroids stimulatingandanti-peroxidativeproperties(Tahilianiet.al2000).The aqueous and methyl alcohol extracts of plant also decreased blood glucose levels in normal and alloxan diabetic rabbits(Akhtar et.al1991) .The main aim of the present investigation was to study the phytochemical constituents and identification of two pharmaceutically valuable terpenoids from methanolic extract of roots of *Achyranthes aspera*.

I. MATERIAL AND METHOD

1.Collection and identification of plant material

The specimen was collected from University Botanical Garden,Departmentof Botany, University of Rajasthan, Jaipur.The roots of the plant(*Achyranthes aspera*)were washed thoroughly 2-3 times with running tap water and then with sterile distilled water .air dried at room temperature .After complete drying roots were powdered well using a mixer. Powdered samples were extracted through soxhlet extraction with methanol. The crude extract were collected in amber coloured sample bottles and stored .All chemical and reagents used including the solvents were of analytical grade.

Phytochemical Analysis

Phytochemical analysis was carried out in the methenolic extract of the roots of *Achyranthes aspera* using standard procedures to identify constituents as described by Harbone(1984),Trease and Evans (1979) and Sofowara (1993).

Test for alkaloids

Methanolic extract was warmed with 2% H₂SO₄ for two minutes .it is filtered and few drops of reagents were added and indicated the presence of alkaloids .

a)Dragendroff's test

To 5 ml of extract few drops of Dragendroff's reagent was added for the formation of orange coloured precipitate. A orange precipitation indicates the positive.

b)Mayer's test

To 5 ml of extract few drops of Mayer's reagent was added for the formation of creamy-white coloured precipitate .This precipitation indicates positive .

c)Wagner's test

To 5 ml of extract few drops of Wagner's reagent was added for the formation of Reddish brown coloured precipitate .this reddish brown coloured precipitation indicate positive .

d)Hager's test

To 3 ml of extract few drops of Hager's reagent (Picric Acid (1%)- was added for the formation of prominent yellow colored precipitate .this yellow colored precipitation positive.

Test for Flavonoids

A small quantity of extracts is heated with 10ml of ethyl acetate in boiling water for 3 minutes .The mixture is filtered differently and the filtrates are used for the following test

a)Ammonium Test

The filtrate was shaken with 1 ml of dilute ammonia solution (1%).The layers were allowed to separate .A yellow coloration was observed at ammonium layer. This Indicates the presence of flavonoids .

b)Aluminium Chloride Test

The filtrates were shaken with 1 ml of 1% aluminum chloride solution and observed for light yellow color .it indicated the presence of Flavonoids and diluted NaOH and HCL was added .A yellow solution that turns colorless indicates positive.

Test for Terpenoids

a)Salkowski Test

The extract was mixed with 2ml of chloroform and concentrate H₂SO₄ (3ml) is carefully added to form a layer.A reddish brown coloration of the interface is formed to show positive result of presence of terpenoids .

Test for Tannins

A small quantity of extract is boiled with 5 ml of 45% solution ethanol for 5 minutes .each of the mixture is cooled and filtered.filtrates were used to the following test .

a)Lead Sub Acetate Test

1ml of the different filtrate was added with three drops of lead sub acetate solution. A cream gelatinous precipitation indicates positive test for Tannins.

b)Ferric Chloride Test

1ml each of filtrate is diluted with distilled water and added with two drops of ferric chloride. A transient greenish to black color indicates the presence of Tannins.

Test for sterols

a)Liebermann-Burchard test

To a small amount of the extract few drops of chloroform, acetic anhydride and H₂SO₄ was added along the sides of the test tube to observe the formation of dark red or pink colour.

Test for proteins

a)Ninhydrin test

To the test solution added 1 ml of 0.2 % ninhydrin solution, violet color indicate the presence of protein in sample

b)Biuret test

To 3 mL of the extract few drops of 10% sodium chloride and 1% copper sulphate was added for the formation of violet or purple color. On addition of alkali, it becomes dark violet.

c) Xanthoprotein test

To 3 mL of the extract few drops of HNO₃ reagent was added for the formation of intensely yellow colour.

Test for carbohydrates

a)Molisch's test

To a small amount of the extract few drops of Molisch's reagent was added followed by the addition of conc. H₂SO₄ along the

sides of the test tube. The mixture was then allowed to stand for 2 min and then diluted with 5 mL of distilled water. Formation of red or dull violet colour at the inter phase of two layers indicates the presence of carbohydrates.

b)Fehling's test

The extract was treated with 5 ml of Fehling's solution (A and B) and kept in boiling water bath. The formation of yellow or red color precipitate indicates the presence of reducing sugar

Test for Glycosides

5ml of diluted sulphuric acid was added in extracts in a test tube and boiled for fifteen minutes in a water bath. It was then cooled and neutralized with 20% potassium hydroxides solution. A mixture of 10ml of equal parts of Fehling's solution A and B were added and boiled for five minutes. A more dense red precipitate indicates the presence of glycosides

a)Baljet's Test

To 5 mL of the extract few drops of sodium picrate was added to observe yellow to orange colour.

b)Keller-Killiani test

To 5 mL of the extract few drops of ferric chloride solution was added and mixed, then sulphuric acid containing ferric chloride solution was added, it forms two layer showed reddish brown while upper layer turns bluish green indicates the presence of glycosides

Test for saponins

a)Foam test

To a small amount of the extract few drops of distilled water was added and shaken vigorously until persistent foam was observed.

TLC identification of two terpenoids from methanolic root extract:

Phytochemical identification of terpenoids from extract by thin layer chromatography was performed as per the method .Briefly ,the extract were drawn into capillary tubes and applied as spots on a stationary phase (silica gel coated plate)about 1 cm from the base. The plates was then dipped into a suitable solvent system (mobile phase) and placed in a well covered tank.

Chromatographic tank was saturated with mobile phase at room temperature for 5 min prior to development. After that the plates were removed dried and processed for the identification of separated compounds(as colored spots) and the R_f values were calculated using the formula .

$R_f \text{ value} = (\text{Distance moved by the compound}) / (\text{Distance moved by the solvent front})$

III.RESULT AND DISCUSSION

Extraction of Plant Material

The roots of the plant(*Achyranthes aspera*)were washed thoroughly 2-3 times with running tap water and then with sterile distilled water .air dried at room temperature .After complete drying roots were powdered well using a mixer. Powdered samples were extracted through soxhlet extraction with methanol. The crude extract were collected in amber coloured sample bottles and stored .All chemical and reagents used including the solvents were of analytical grade.



Figure 1: Achyranthes aspera L. Roots

Phytochemical Analysis

Powdered roots of *Achyranthes aspera* were subjected to various qualitative tests for the identification of phytochemical constituents includes tests for alkaloids (Dragendroff’s test, Mayer’s test, Hager’s test, Wagner’s test), saponins, glycosides (Baljet’s test, Kellar-Killianitest), carbohydrates (Molisch’s test, Fehling’s test), proteins (Biuret test, Xanthoprotein test), tests for tannins, flavonoids, steroids (Liebermann-burchard test), phenols, terpenoids were performed using specific reagents and results are tabulated in Table 1.

Table no -1 preliminary phytochemical screening of methanolic extract of roots of achyranthes aspera linn.

Sl. No	Test for	Reagents	Reaction	Inference
1	Alkaloids:	Dragendroff’s Reagent Mayer’s reagent Wagner’s reagent Hager’s reagent (Picric Acid (1%)- Dilute ammonia solution (1%).	Orange precipitation Creamy-white precipitation Reddish brown precipitation yellow coloured precipitate	+++
2	Flavanoids	Dilute ammonia solution (1%).	Yellow coloration was observed at ammonium layer	++
3	Carbohydrates:	Molisch Reagent Copper sulphate+ potassium sodium tartarate +NaOH	Formation of red or dull violet colour at + the inter phase Formation of yellow or red color precipitate	+
4	Terpenoids	2ml of chloroform and concentrate H2SO4 (3ml) (Lieberman Test)	Reddish brown coloration of the interface	+++
5	Steroids	Few drops of chloroform, acetic anhydride and H2SO4(salkowski Test)	Dark red or pink colour	+
6	Glycosides	Few drops of sodium picrate Few drops of ferric chloride solution	Observe yellow to orange colour Reddish brown while upper layer turns bluish green	+
7	Proteins and amino acids	0.2 % ninhydrin solution Few drops of HNO3 reagent	violet color Formation of intensely yellow colour	-
8	Saponin	distilled water	persistent foam	-
9	Tannins	drops of ferric chloride lead sub acetate solution	Transient greenish to black color A cream gelatinous precipitation	-

* - absent, + trace, ++ present, +++ abundant

Table 2: Results of TLC of methanolic extract of achyranthes aspera linn.-:

Stationary Phase: Silica gel. 60-120 mesh size (Merk).

Sample	Solvent system(7.8:2.2:0.75 ml)	No. of spot	Rf Values
Root extract	Toluene:Methanol:Formic acid	7	0.19,0.20,0.45,0.5,0.58,0.66,0.83
Standard1(Oleanolic acid)	Toluene:Methanol:Formic acid	1	0.19
Standard2(Ursolic acid)	Toluene:Methanol:Formic acid	1	0.20

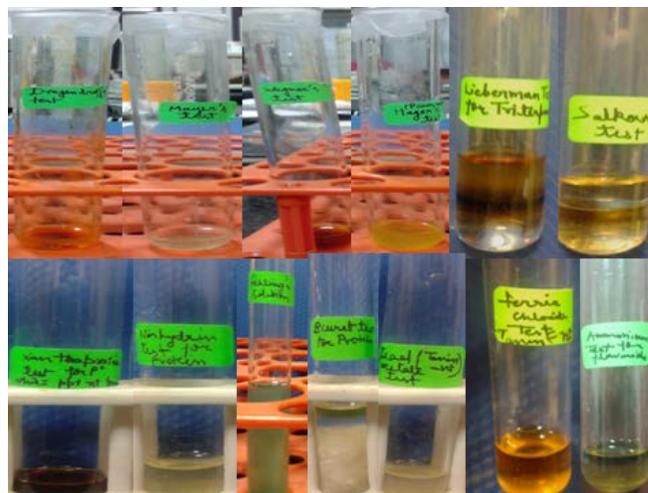
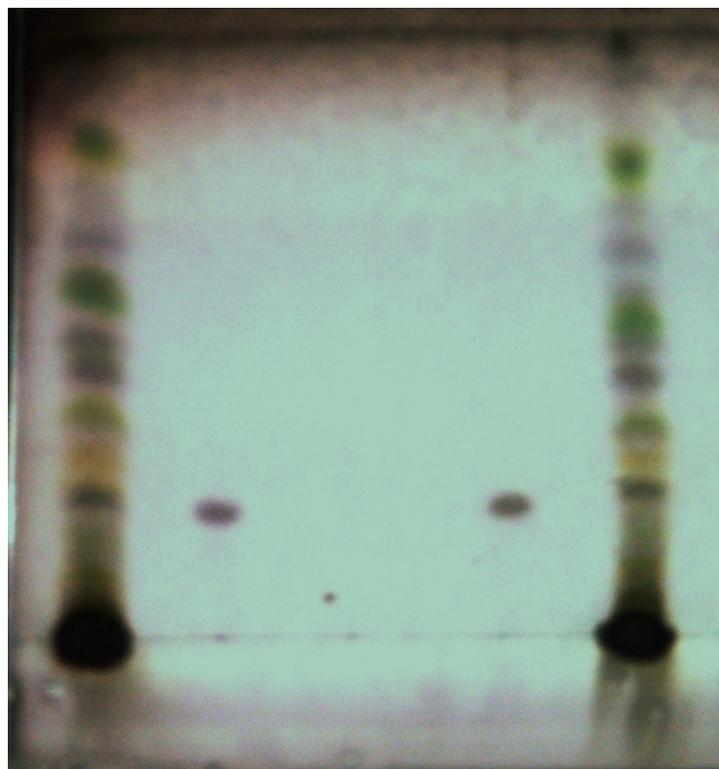


Fig 2 Phytochemical screening of methanolic extract of roots of achyranthes aspera linn.

Figure 3: TLC identification of terpenoids from methanolic root extract of achyranthes aspera after derivatization.

Root extract	O.A	U.A	Root Extract
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IV. CONCLUSION

The selected Ethanomedicinal plant is source of secondary metabolites i.e. alkaloids, Flavanoids, terpenoids, steroids, glycosides and reducing sugars. Medicinal plants play a vital role in preventing various diseases. The antidiuretic, anti-inflammatory, antianalgesic, anticancer, anti-viral, anti-malarial, anti-bacterial and anti-fungal activities of the medicinal plants are due to the presence of the above mentioned secondary metabolites. Medicinal plants are used for discovering and screening of the phytochemical constituents which are very helpful for the manufacturing of new drugs. This phytochemical screening study established a significant scope to develop a broad spectrum use of roots of *Achyranthes aspera* in herbal medicine and as a base for the development of novel potent drugs and phytomedicine.

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Development of MRI Brain Image Segmentation-technique with Pixel Connectivity

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Abstract-Recently, Magnetic Resonance Imaging (MRI) of Brain is used widely in the clinical applications for the detection of abnormalities such as tumor. Accurate segmentation of the affected regions in the brain MRI image plays a vital role in the quantitative image analysis to detect the location of tumor in the brain. However, many segmentation algorithms suffer from limited accuracy, due to the presence of noise and intensity inhomogeneity in the brain MR images. This paper proposes a novel Textural Pixel Connectivity (TPC) based segmentation technique to predict the location of brain tumor. The Probabilistic Neural Network (PNN) classifier is used to classify the normal and abnormal images. If the image is classified as abnormal, then TPC segmentation process is applied for clustering out the background and tumor spot in the binary segmented output. Then, the growing pattern of tumor is analyzed and represented as a binary image output. The proposed technique achieves superior performance in terms of sensitivity, specificity, accuracy, error rate, correct rate, inconclusive rate, Positive Predicted Values (PPV), Negative Predicted Values (NPV), classified rate, prevalence, positive likelihood and negative likelihood, when compared to the traditional Adaboost and Enhanced Adaboost techniques.

Index Terms- Affine Transform, Brain Tumor detection, Canny-based Edge Detection, Fractional Fourier Transform (FRFT), Gaussian Mixture Model (GMM), Enhanced Gray Level Co-occurrence Matrix (GLCM), Magnetic Resonance Imaging (MRI) Brain Image, Probabilistic Neural Network (PNN) classifier, Textural Pixel Connectivity (TPC) based segmentation.

I. INTRODUCTION

Image segmentation [1], [2] has gained more popularity and attracted more attention in medical field. This helps in the effective and early diagnosis and detection of brain tumor. For the early detection of brain tumors, various imaging techniques such as Positron Emission Tomography (PET), Magnetic Resonance Imaging (MRI), and Computed Tomography (CT) are used. Among them, Magnetic Resonance Imaging (MRI) is high-quality medical imaging technique that enables reliable and rapid detection of brain tumor. This is due to less harmful radiation, high contrast of soft tissues and high spatial resolution. MRI provides rich information about the anatomical structure to enable quantitative clinical examination. Highly accurate segmentation is required for the quantification of

tumor in the MRI brain image. The size, shape and location of the brain tumors can vary for each individual. In addition to the tumor heterogeneity, the edges of the tumor may be complex and visually vague to detect. Some tumors may deform the surrounding structures in the brain. Additionally, presence of artifacts and noise in the brain tumor images increase the difficulty in tumor detection. Thus, designing an efficient and automatic image segmentation approach is necessary to provide a better tumor detection performance. Figure 1 shows the brain MRI images containing tumor and non-tumor brain image.

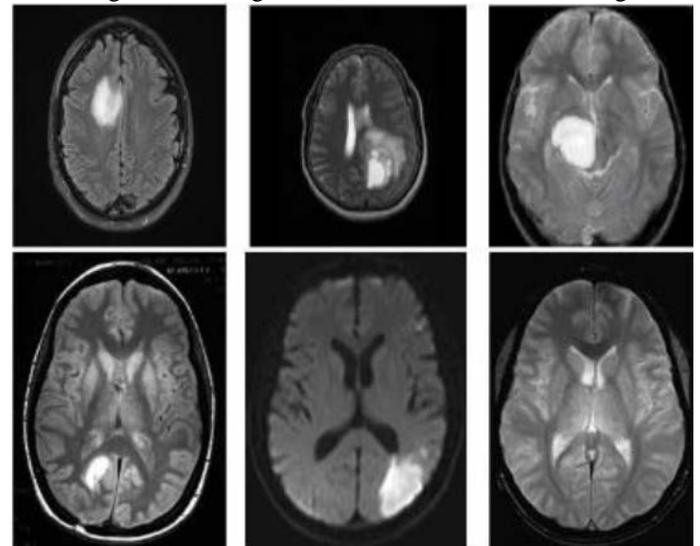


Figure 1 Brain MRI images containing tumor and Non-tumor brain image

Numerous approaches have been proposed during the last two decades for brain image segmentation. Existing image segmentation approaches are thresholding [3], region-based [4] and edge-based segmentation [4]. However, these approaches do not produce adequate and accurate segmentation results, due to the presence of noise and inhomogeneous intensities in the image. Occurrence of inhomogeneous intensities in the brain MRI images may cause due to the bias field and heavy noise. The presence of noise and artifacts in the brain images increases the difficulty in the segmentation of tumor. Due to the variation in the size, shape, location and heterogeneity of the brain tumors, detection of the edges of the tumors is highly complex and visually vague. Some tumors cause deformation of the surrounding structures in the brain, due to the mass effect or edema. Heterogeneity of tissue causes the potential rise in the

uncertainty of the segmentation task. Moreover, the presences of redundant and noisy features increase the computational complexity and degrade the performance of segmentation process. Accordingly, selection of relevant and informative features from redundant measurements is really crucial to improve the segmentation accuracy. Hence, this paper proposes a novel TPC based brain MRI image segmentation technique for the effective detection of location of brain tumor. Adaptive median filtering is performed as a pre-processing technique to remove the noise such as impulse noise from the brain MRI image. Canny-based Edge Detection is used for detecting edge of skull from MRI brain image. Extraction of the pixel components is performed to verify the presence of unwanted pixels. The Morphological operation is applied to eliminate the skull from the input MRI image. Then, the Gaussian Mixture Model (GMM)-based intensity equalization method enhances the contrast of the image. Feature extraction is done by using the enhanced Gray level Co-occurrence Matrix (GLCM) method. The PNN classifier performs classification of normal and abnormal images. The affine transform combined with Fractional Fourier Transform (FRFT) is applied to extract the texture of tumor intensity level from the given input image. If the input image is classified as an abnormal image, then segmentation is done by using TPC segmentation process. Then, the growing pattern of tumor is analyzed and represented as a binary image output. By performing the segmentation after the classification of the abnormal image, the proposed technique enables efficient reduction in the overall time required for the brain MRI image analysis. Finally, the performance of the PNN classifier is evaluated by comparing it with traditional Adaboost and enhanced Adaboost. The proposed technique achieves superior performance in terms of sensitivity, specificity, accuracy, error rate, correct rate, inconclusive rate, PPV, NPV, classified rate, prevalence, positive likelihood and negative likelihood. The remaining of the paper is systematized as follows: Section II describes the existing MRI brain image segmentation techniques. Section III explains about the proposed TPC segmentation technique including adaptive median filter, enhanced GLCM based feature extraction process, PNN classification method and segmentation process. The performance evaluation results of the proposed technique are illustrated in the section IV. Section V discusses about the conclusion and future implementation of the proposed work.

II. MRI BRAIN IMAGE SEGMENTATION TECHNIQUES

This section explains about the conventional image segmentation approaches applied for the segmentation of MRI brain images. Automatic segmentation of brain tissues from the MRI image plays an important role in the healthcare application and research fields. Robust segmentation of brain tissues is enabled by identifying the characteristic information among the multiple features extracted on the super pixels. There are some difficulties in the clustering process due to the heterogeneity of tissues and redundancy of the MRI features. To overcome these challenges, Kong et al [5] introduced a robust discriminative segmentation method based on the information theoretic learning approach. The informative feature was selected simultaneously and uncertainties of super voxel assignment

were reduced. Hence, effective discriminative segmentation of the brain tissue was achieved. Ji et al [6] proposed a novel Adaptive Scale Fuzzy Local Gaussian Mixture Model (AS-FLGMM) algorithm for the accurate and robust segmentation of the brain MR image. The proposed approach was implemented in both real-time and simulated clinical MR images and compared with the existing segmentation approaches. The proposed algorithm produced robust segmentation results by successfully mitigating the problems caused by low contrast, noise and bias field in the MR brain image. Dong and Peng [1] introduced a novel variation based approach for efficient segmentation of brain image by using simultaneous bias correction. To reduce the influence of noise and obtain a smooth segmentation, the nonlocal spatial regularization was used for the maintenance of fine structures in brain images. Huang et al [7] introduced a novel automatic tumor segmentation method to overcome the issues of high variations in the appearance of tumor and unclear tumor boundaries. The data distribution of different classes was considered in the Local Independent Projection-based Classification (LIPC) method by learning a soft-max regression model. Manikandan et al [2] presented a Real Coded Genetic Algorithm (RGA) with Simulated Binary Crossover based multilevel thresholding for the high-quality segmentation of T2 weighted MRI brain images. Due to the efficient global searching ability, the RGA with simulated binary crossover achieves higher entropy and lower standard deviation for all the images. Van Opbroek et al [8] used the transfer learning technique was used for the image segmentation process. The proposed transfer learning technique has achieved better segmentation performance than the common super vised learning approaches, while reducing the classification errors up to 60%. Ribbens et al [9] presented a data-driven probabilistic framework for the segmentation of heterogeneous set of brain MR images and image clustering. The segmentation accuracy was improved due to the combined segmentation and atlas construction. Caldairou et al [10] proposed an extended FCM based method for the unsupervised segmentation of the brain images. Occurrence of noise and intensity inhomogeneity in the image was handled efficiently by using the non-local (NL) framework. Wang et al [11] introduced a novel patch-driven level set method for the neonatal brain MR image segmentation by using sparse representation techniques. The accuracy of the proposed method for white and gray matter was increased. Ji et al [12] presented a modified possibilities FCM clustering algorithm for the fuzzy segmentation of MR images with intensity inhomogeneities and noise. The local contextual information was used to mitigate the noise and resolve the classification issues. Gao et al [13] introduced a novel algorithm for automatic lesion segmentation from multichannel MR images. Then, a nonlocal means technique was introduced to achieve spatially regularized segmentation, to overcome the influence of noise. Hancer et al [14] proposed a novel image segmentation method based on artificial bee colony algorithm (ABC) to extract brain tumors from MRI brain images. The proposed methodology was compared and analyzed on 9 MRI images obtained by using various techniques based on K-means, FCM and GA. Ji et al [15] proposed a Fuzzy Local Gaussian Mixture model (FLGMM) algorithm for the automated segmentation of brain MR image. The image segmentation accuracy of the

proposed algorithm was improved. Lu et al [16] presented an automatic segmentation, non-rigid registration and detection of tumor in the cervical MR data by using a unified Bayesian framework. Reddy et al [17] presented a novel brain tumor segmentation approach for effectively manipulating the texture information from multi-parametric MRI. The classifier was used to generate the confidence surface to obtain the likelihood of each pixel for the detection of tumor region. Koley and Majumder [18] introduced a Cohesion based Self-Merging algorithm for the segmentation of brain MRI image, to detect the exact location of brain tumor by using partitional K-means clustering algorithm. The computational complexity and computation time of the proposed approach were reduced and the exact location of tumor was obtained. Selvakumar et al [19] used a computer aided method for the segmentation and detection of brain tumor. Finally, approximate reasoning was used for evaluating the shape and position of tumor. Subbanna et al [20] presented an entirely automatic hierarchical probabilistic framework for the segmentation of brain tumors from the multispectral brain MRI image. Ji et al [21] proposed a generalized rough FCM (GRFCM) algorithm was proposed for brain MR image segmentation. The robustness of the proposed algorithm with respect to the noise and bias field was observed from the experimental results and more accurate and reliable segmentation was achieved. Rajendran and Dhanasekaran [22] combined fuzzy clustering with the deformable model for segmenting the tumor region on MRI images. Paul et al [23] proposed an automated scheme for the segmentation of brain MRI image, by using FCM algorithm. The presence of degenerative disease was identified by detecting the reduction in the gray matter in the brain image. The major drawback of the FCM algorithm was the high computational time required for convergence. So, the cluster center and membership value updating criterion were modified to improve the computational rate of the FCM algorithm. Shasidhar et al [24] used the modified FCM algorithm to detect the brain tumor. The segmentation efficiency and convergence rate of the modified FCM algorithm were improved. Mukhopadhyay and Maulik [25] introduced a novel multiobjective genetic fuzzy clustering scheme for the segmentation of multispectral MR image of human brain. Wang et al [26] proposed a novel patch-driven level set method for the segmentation of neonatal brain images with the help of the sparse representation techniques. Benaichouche et al [27] used an improved FCM clustering algorithm for the segmentation of brain image. The Mahalanobis distance was used to reduce the influence of the geometrical shape of the different classes. Then, the clustering errors were corrected and the misclassified pixels were reallocated for refining the segmentation results. The presence of noise will vary the pixel intensity. This affects the segmentation of the brain image and detection of the exact location of the tumor. Occurrence of inhomogeneous intensities in the brain MRI images may cause due to the bias field and heavy noise. Since, the existing image segmentation algorithms typically depend on the homogeneity of image intensities, it fail to provide accurate segmentation results. Hence, this paper proposes a novel TPC based segmentation technique for the effective segmentation of brain MR image and exact detection of the location of brain tumor.

III. NOVEL TPC BASED MRI BRAIN IMAGE SEGMENTATION TECHNIQUE

This section explains about the proposed TPC based MRI brain image segmentation technique. The pre-processing involves adaptive median filtering, image normalization and image enhancement. An adaptive median filter performs filtering of the brain MRI image, to remove the impulse noise such as salt and pepper noise from the image. Edge detection using Canny is used for detecting edge of skull from MRI brain image. The morphological operation is applied to eliminate the skull from the input MRI image. The EGLCM is applied for the extraction of testing features to form a feature vector. Classification of the normal and abnormal images is performed by using a PNN classifier. The affine transform combined with FRFT is applied to extract the texture of tumor intensity level from the given input image. If the input image is classified as an abnormal image, then segmentation is done by using TPC segmentation process. Then, the growing pattern of tumor is analyzed and represented as a binary image output. Figure 2 shows the overall flow diagram of the proposed TPC based brain MRI image segmentation technique. The proposed approach involves the following steps Preprocessing Enhanced GLCM based feature extraction PNN classification Affine-transform based image registration TPC based image segmentation A. Pre-processing The pre-processing operation is performed to remove the noise contained in the image and enhance the visual appearance of the image. The three stages of the pre-processing operation are Adaptive Median Filtering Image normalization Image enhancement. 1) Adaptive Median Filtering The adaptive median filter [28] performs spatial processing technique to determine whether the pixels in the image are affected by the impulse noise such as salt and pepper noise.

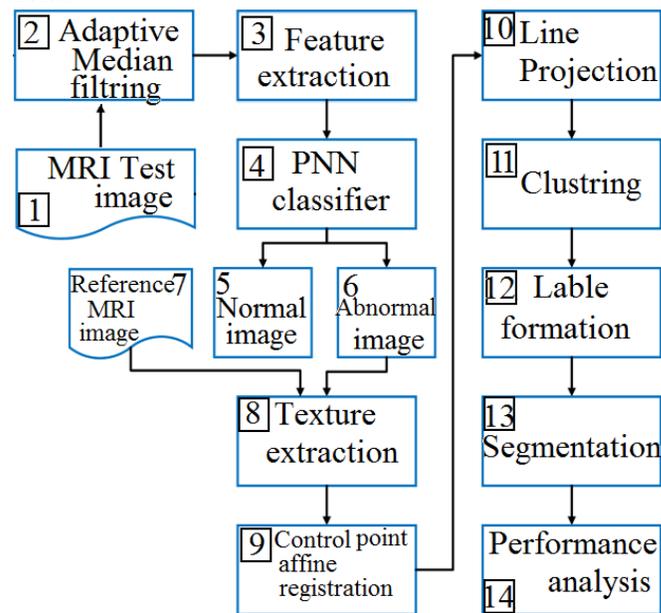


Figure 2 Overall flow diagram of the proposed TPC based brain MRI image segmentation technique

It compares each pixel with its surrounding neighbor pixels, to classify the pixels as noise. A pixel that differs from the majority of its neighboring pixel is considered as impulse noise. Then, the noise pixels are replaced with the median value of the

neighborhood pixels. The size of a window around each pixel varies corresponding to the median value of the pixels in the 3×3 window. The size of the window is increased, if the median value is detected as an impulse. Then, it is verified whether the center pixel of the window is an impulse or not. If it is detected as a noise, the new value of the center pixel in the filtered image is considered as the median value of the pixel in the window. The center pixel value in the filtered image remains unchanged, if the center pixel is detected as a non impulse. Unless the considered pixel is detected as an impulse, the gray-scale value of the pixel in the filtered image remains same as the gray-scale value of pixel in the input image. Thus, the filter provides dual advantage including the removal of impulse noise from the image and reduction of distortion in the image. The median values are updated iteratively using the new pixels, thus reducing the computational overhead.

Adaptive Median Filtering Algorithm

Input: MRI brain image 'I' **Output:** Preprocessed Image, 'Y'

Step 1: Initialize window size (3×3).

Step 2: Extract Connected Components, CC.

Step 3: $I = I(dx) = \max(CC)$

Step 4: $I = I(dx)$ //Update Image with maximum connected component of pixel.

Step 5: **for** ($i = 2$ to $Row_Size(I) - 1$) // 'i' Row size of image

Step 6: **for** ($j = 2$ to $Column_Size(I) - 1$) // 'j' Column size of image

Step 7: $temp = I_{i-1 \text{ to } i+1, j-1 \text{ to } j+1}$ //Project window over image matrix as, temp

Step 8: **if** ((temp (5) ~ temp (Boundary)) > temp (5)) //Check neighboring Pixel variation

Step 9: $Y(i, j) = Avg. (temp);$

Step 10: **else**

Step 11: $Y(i, j) = median(S);$

Step 12: **End if**

Step 13: **End for 'j'**

Step 14: **End for 'i'**

The pseudo code for the adaptive median filtering algorithm is given above. The pixel components are extracted and the image is updated with the maximum pixel components. The image matrix is generated and window is projected for the specific size of the rows and columns of the matrix. Then, the neighboring pixel variation is checked. If the boundary value is high, then the mean value of the pixels is obtained. Otherwise, the median value is obtained. The window is subsequently moved to the following location in the image, based on the neighboring pixel variation. If there is no variation, the median value is determined. Figure 3(a) and Figure 3 (b) show the input images and Figure 3(c) and (d) show the filtered images. Advantages • the adaptive median filter preserves detail and smoothens non-impulsive noise. • Reduces distortion such as excessive thinning or thickening of object boundaries.2) *Image Normalization* In our proposed work, the image normalization is applied for detecting and eliminating skull from original image input. In this image normalization, canny edge detection method is used for detecting edge of skull from MRI brain image.

a) Edge Detection using Canny

Edge detection is an image processing technique used to find the boundaries of objects within the image.

Edge detection is an image processing technique used to find the boundaries of objects within the image. Canny method [4] is the most powerful and optimal edge-detection method. Since the Canny method uses two different thresholds to detect the strong and weak edges, it is different from other edge detection methods.

It includes the weak edges in the output only if they are connected to the strong edges. The first step of canny edge detection method is to remove the noise in the image by using a Gaussian filter. Here, the Canny implements the 3×3 matrix as filter coefficient. This is given as:

-1	0	1
-2	0	2
-1	0	1

G_x

1	2	1
0	0	0
-1	-2	-1

G_y

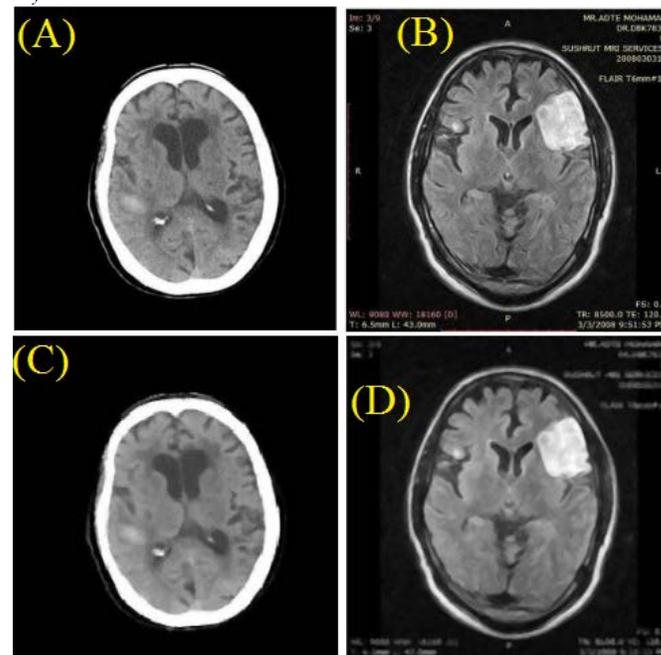


Figure 3(a) and (b) Input images and Figure 3(c) and (d) Filtered images

Then, the smoothed image is filtered with a Sobel kernel and vertical direction G_y [4] in the horizontal direction G_x to get first derivative in both the directions. From these two images, the edge gradient and direction for each pixel are computed. The magnitude at each gradient is estimated as,

$$|G| = |G_x| + |G_y| \quad (1),$$

$$G_x(x, y) = \frac{Y_{i,j+1} - Y_{i,j-1} + Y_{i-1,j+1} - Y_{i-1,j-1} + Y_{i+1,j+1} - Y_{i+1,j-1}}{2} \quad (2),$$

$$G_y(x, y) = \frac{Y_{i+1,j} - Y_{i-1,j} + Y_{i+1,j-1} - Y_{i-1,j-1} + Y_{i+1,j+1} - Y_{i-1,j+1}}{2}$$

(3)

Where, 'Y' is the filtered image, 'i' and 'j' are the row and column limit of image pixel and 'Gx' and 'G' are the gradients

at the 'x' and 'y' direction. $Angle(\theta) = \tan^{-1} \frac{G_x}{G_y}$ (4)

Usually, the gradient direction is always perpendicular to the edges. It is rounded to the vertical, horizontal and two diagonal directions. Figure 4(a) and Figure 4(b) show the output images of the edge detection process.

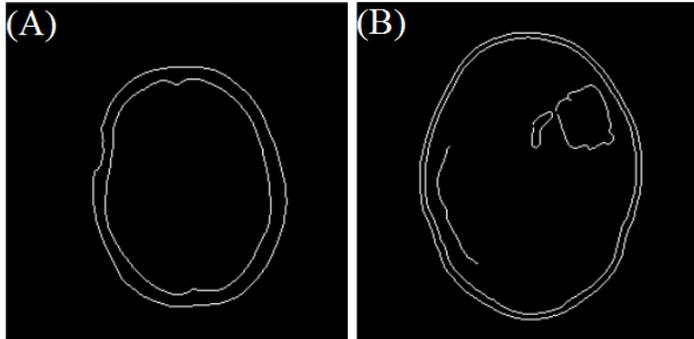


Figure 4(a) and (b) Output images of the Edge Detection process

From this edge information, the pixels in the edge image are considered as zero from the filtered image. Figure 5(a) and Figure 5(b) show the images with pixels of zero values at the edges.

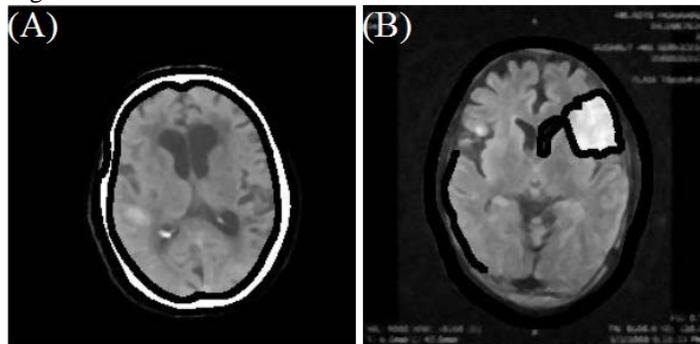


Figure 5(a) and (b) Images with pixels of zero values at the edges

After estimating the gradient magnitude and direction, the image is scanned completely to remove any unnecessary pixels that may not constitute the edge. For this, local maximum of every pixel in its neighborhood along the direction of gradient is checked. Then, the connected components are extracted to verify whether the unwanted pixels are present or not. The algorithm for connected component extraction is described below:

Algorithm for Connected Component extraction

Input: Filtered Image 'Y' **Output:** Labeled Connected Components 'LB' and Normalized image 'Y'

- Procedure**
 Step 1: Convert Filtered image into Binary, 'B'.
 Step 2: initialize Label, $L=1$;
 Step 3: **for** ($i = 1$ to $Row_Size(B)$) // 'i' Row size of image
 Step 4: **for** ($j = 1$ to $Column_Size(B)$) // 'j' Column size of image

- Step 5: $LB_{(ij)} = L$; // Allocate Label
 Step 6: $Nt = Neighbors(i, j)$ Collect Neighbor Pixel
 Step 7: **for** ($t = 1$ to $length(N(i, j))$)
 Step 8: **if** ($B(N(t)) == -1$)
 Step 9: $LB(N(t)) = L$; //Update Label
 Step 10: **end if**;
 Step 11: **end for** 't'
 Step 12: $L = L + 1$;
 Step 13: **end for** 'j'
 Step 14: **end for** 'i'
 Step 15: $Y = Y - \max(LB)$.

The filtered image is converted into binary and label is initialized. Label is allocated to the pixels in the image. The neighbor pixel is collected. The labeled connected component is obtained based on the size of the neighboring pixel values. Figure 6(a) and Figure 6(b) show the images after removal of unnecessary pixels at the edges. The erosion and dilation operations are applied to eliminate the skull from the input MRI image. In the morphological operation, the value of each pixel in the output image is determined based on the comparison of the corresponding pixel in the input image with its neighboring pixels. Figure 7(a) and Figure 7(b) show the input MRI brain image after elimination of skull.

3) Image Enhancement

GMM based intensity equalization method is implemented to enhance the contrast of the MRI brain image. The GMM [29] is used for modeling the gray-level distribution of the image.

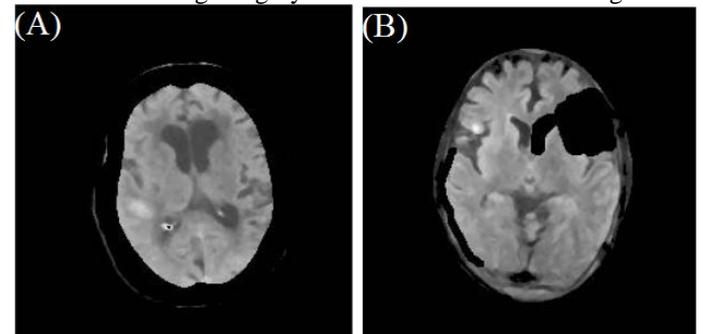


Figure 6(a) and (b) Images after removal of unnecessary pixels at the edges

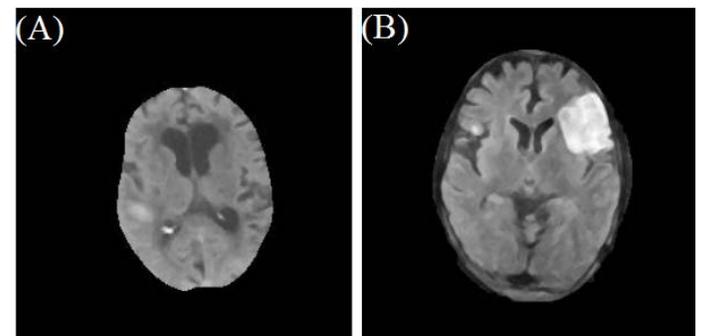


Figure 7(a) and (b) Input MRI brain image after elimination of skull

The dynamic range of the image is partitioned into input gray level Intervals by using the intersecting points of the Gaussian components. The gray levels of the pixels in each and every input interval are transformed into the appropriate output

graylevel interval to generate a contrast equalized image. This transformation process is performed according to the Cumulative Distribution Function (CDF) of the input gray-level interval and main Gaussian component. The lower weight is assigned to the Gaussian components with less variances than the Gaussian components with higher variances, to represent the homogeneous regions in the image histogram. The components are weighted by using the gray-level distribution, while mapping the input interval to the output interval. The Gaussian Kernel Function is defined as:

$$f_g(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left[-\frac{(x-a)^2}{2\sigma^2}\right] \quad (5)$$

The Gaussian mask (G_m) [30] is given as

$$G_m = \begin{bmatrix} (01)(04)(07)(04)(01) \\ (04)(16)(26)(16)(04) \\ (07)(26)(41)(26)(04) \\ (04)(16)(26)(16)(04) \\ (01)(04)(07)(04)(01) \end{bmatrix} \left(\frac{1}{273}\right) \quad (6)$$

Image Enhancement Algorithm

Input: Normalized image, 'Y' **Output:** Enhanced image, 'Y'

Step 1: Apply Gaussian Filter to the Normalized image 'Ye'.

Step 2: Calculate Standard Deviation of 'Y' by using equation (7)

Step 3: Calculate Mean value of 'Ygg' by using equation (8)

Step 4: $L_1 = M - 10 * S_1$;

Step 5: $L_2 = M - 10 * S_2$;

Step 6: Update Y_g based on Limit g L_1 and L_2

Step 7: $M_w = \text{Max}(Y_g)$;

Step 8: Output the enhanced image obtained by using the equation (10)

The image enhancement algorithm is described above. The Gaussian filter is applied to the normalized image. The standard deviation of the normalized image is calculated by using:

$$S = \sqrt{\frac{1}{N} \sum_{i=1}^N (Y_{gi} - \mu)^2} \quad (7)$$

' μ ' is the average value of the normalized image. Then, the mean value of the normalized image is computed using:

$$M = \frac{\sum Y_g}{N} \quad (8)$$

The upper and lower limits are computed and the normalized image is updated based on the limits.

$$Y_g = \{Y_g, \text{if } (Y_g > L_1) \& (Y_g > L_2)\} \quad (9)$$

Finally, the enhanced image is obtained based on the maximum intensity value for the normalized image.

$$Y_e = \frac{Y_g}{M_w} \quad (10)$$

B. Feature extraction

Enhanced GLCM approach is applied for extracting texture based features from the image. The extracted features contain the relevant information of the image. It can be used as an input to the classifier for image classification and segmentation.

1) Enhanced GLCM

During the statistical texture analysis, the texture features are computed from the perceived combinations of the intensities of pixels at the specified positions in the image. The statistics are classified into first, second and higher-order statistics, according to the number of pixels in each combination. GLCM [31] is used to define the textural features and extract the second-order statistical texture features from the image. The values of the co-occurrence matrix elements present the relative frequencies with which two neighboring pixels are separated by a distance 'd'. The gray level of the pixels is denoted as 'i' and 'j'. The pixels are separated by the distance ($\Delta x, \Delta y$) within a given neighborhood. The number of rows and columns in the GLCM is equal to the number of gray levels in the image. The matrix element $P(i, j|d, \theta)$ contains the second order statistical probability values for the variation between the gray levels at a particular displacement distance 'd' and at a particular angle ' θ '. The GLCM features are described below:

a) Contrast

Contrast is defined as the measure of the local variations in the intensity between the neighboring pixels in the image. Contrast affects the view ability of details in an image. It is given by:

$$C_i = \sum_a^N \sum_b^N (a-b)^2 p(a,b) \quad (11)$$

Where ' C_i ' is a contrast value, ' N ' denotes the number of various gray levels, ' p ' represents the probability value, and ' a ' and ' b ' represents the gray levels. The contrast value is found to be high, if there is large amount of variations present in the image. Its value is '0' for a constant image.

b) Correlation

Correlation is performed to extract information from the images. Correlation measures the joint probability occurrence of the specific pixel pairs. It is the linear dependency measure of gray levels on the neighboring pixels or specified points on the texture image. The correlation value is high for the similar gray-level regions. Correlation value is '+1' for a perfectly positively image and '-1' for negatively correlated image. It is

$$\text{given as } C_r = \sum_a^N \sum_b^N \frac{p(a,b) - \mu_x \mu_y}{\sigma_x \sigma_y} \quad (12) \quad \text{Where } \mu_x, \mu_y,$$

and σ denotes the mean value, standard deviations of $p(a)$ and $p(b)$, respectively. C represents a correlation value.

c) Cluster Prominence

Cluster prominence is also a measure of asymmetry. When the cluster prominence value is high, the image is less symmetric. If the prominence value is low, there is a peak in the GLCM matrix around the mean values. For an ultrasound image, a low cluster prominence value indicates small variation in gray-scale.

$$C_p = \sum_{a=0}^{N-1} \sum_{b=0}^{N-1} \{a + b - \mu_x \mu_y\}^4 * p(a, b) \quad (13)$$

d) Cluster Shade

Cluster shade is a measure of the skewness of the matrix and perceptual concepts of uniformity. When the cluster shade is high, then the image is asymmetric.

$$C_s = \sum_{a=0}^{N-1} \sum_{b=0}^{N-1} \{a + b - u_x - u_y\}^3 * p(a, b) \quad (14)$$

e) Dissimilarity

Dissimilarity is a measure of level of dissimilarity of two neighboring pixels. During the dissimilarity measure, there is a linear increase in the weight. In the Contrast measure, weights increase exponentially as one moves away from the diagonal.

$$D = \sum_{a,b=1}^N C_{a,b} |a - b| \quad (15)$$

f) Energy

Energy is defined as a textural uniformity measure of the pair of pixels. The energy values are high, when the gray level distribution exhibits the constant or periodic form. It is defined

as:
$$E = \sum_a P^2(a, b) \quad (16)$$

g) Entropy

Entropy (H) is a measure of the uncertainty associated with a random variable. It is determined by:

$$Ent = \sum_{a=0}^N \sum_{b=0}^N p(a, b) \log p(a, b) \quad (17)$$

Therefore, the entropy value is lower for a homogeneous image and higher for the heterogeneous image.

h) Homogeneity

Homogeneity measures the uniformity of the non-zero entries in the matrix. The homogeneity is measured while assuming the larger values for smaller gray tone differences in the pair of pixel elements. The homogeneity value is high along the diagonal, due to similarity of the gray level values of a lot of pixels. Homogeneity decreases with the increase in the contrast value, while maintaining the energy at the constant level. The homogeneity is defined as

$$C_h = \sum_a \sum_b \frac{P_d[a, b]}{1 + |a - b|} \quad (18)$$

i) Homogeneity

Homogeneity is defined as the closeness of the distribution of elements in the GLCM to the diagonal. Its value ranges from 0 to 1. Homogeneity value is '1' for a diagonal GLCM

$$Homop = \sum_a \sum_b \frac{1}{1 - abs(a - b)} X_{ij} \quad (19)$$

The homogeneity value is lower for the large variation in the gray values. This increases the contrast value. The homogeneity value is high, if the image has little variation. If there is no variation in the image, then the homogeneity is equal to unity. Therefore, high homogeneity refers to the textures that contain

ideal repetitive structures, while low homogeneity refers to the huge variation in the texture elements and their spatial arrangements. An inhomogeneous texture refers to an image with non-repetition of the texture elements and absence of spatial similarity.

j) Maximum probability

The probability value of the center pixel of the window exhibits the maximum value. Maximum probability values occur if a combination of pixels dominates the pairs of pixel in the window.
$$\max pro = \left| \max_{a,b} P_d[a, b] \right| \quad (20)$$

k) Sum of squares: Variance

Variance is a measure of heterogeneity and variability of the gray level of the pixel pairs. High weights are applied to the elements that differ from the average value of $P(a, b)$. The variance value is high, when the gray-scale values of the pixels differ from the mean value. It is calculated as:

$$Var = \sum_{a=0}^{N-1} \sum_{b=0}^{N-1} (a - u_x)^2 * p(a, b) + \sum_{a=0}^{N-1} \sum_{b=0}^{N-1} (b - u_x)^2 * p(a, b) \quad (21)$$

l) Autocorrelation

The autocorrelation function of an image is used to assess the amount of regularity as well as the fineness/coarseness of the texture present in the image.

$$AC = \frac{XY}{(X - a)(Y - b)} \frac{\sum_{a=0}^{X-a} \sum_{b=0}^{Y-b} f(a, b) f(a + m, b + n)}{\sum_{a=1}^{N-1} \sum_{b=1}^{N-1} f^2(a, b)} \quad (22)$$

m) Average Kurtosis

Average Kurtosis (AK) measures the peak ness or flatness of a distribution of pixels relative to a normal distribution. The definition of kurtosis is given as

$$AK = \frac{\sum \left(\frac{1}{\sigma^4} \sum_a \sum_b ((a * b) - \mu)^4 (P_{ab})^{-2} \right)}{N} \quad (23)$$

'N' denotes the number of gray levels.

n) Average Skewness

Average Skewness (AS) describes the degree of asymmetry of the distribution of pixels in the specified window around its mean value. It represents the shape of the pixel distribution. The skewness is calculated using

$$AS = \frac{\sum \left(\frac{1}{\sigma^2} \sum_a \sum_b ((a * b) - \mu)^2 (P_{ab}) \right)}{N} \quad (24)$$

C. PNN classification

PNN [32] is generally used in classification problems. When an input is applied, the pattern layer calculates the distance ranging from the input vector to the training input vectors. This produces a vector whose elements indicate the proximity of the input to the training input. The sum of the contribution for each class of inputs is calculated and total output is produced as a

vector of probabilities. Finally, the maximum value of these probabilities is chosen by the whole transfer function at the output obtained from the summation layer. Then, '1' is generated for the target class and '0' for non targeted class. The PNN architecture is shown in the Figure 8.

1) *Input layer*

Input layer consists of a single neuron for each predictor variable. The input neuron normalizes the range of the values of the predictor variables by subtracting the median value and dividing with the inter quartile range. The input neurons feed the values to each neuron in the pattern layer.

2) *Pattern layer*

Pattern layer comprises one neuron for each image in the training dataset. When presented with the vector of the input values obtained from the input layer, the pattern neuron calculates the Euclidean distance of the test data from the center point of the neuron and then applies the Radial Basis Function (RBF) kernel function using the summation of the input neuron values.

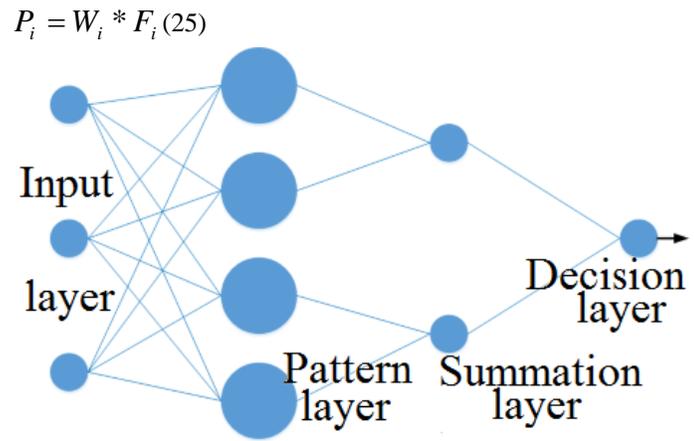


Figure 8 Architecture of PNN

Where W_i is the weight of the processing element and F_i is the input feature from the input layer. The pattern layer (i) classifies the input vectors based on highest matching with the input vector and generates an output. Therefore, a single classification category is generated for any input vector. If there is no relationship between the input patterns and the patterns of the pattern layer, then no output is generated.

3) *Summation layer*

The weighted value obtained from the pattern layer is fed only to the neuron in the summation layer that corresponds to the category of pattern neuron. The summation layer adds the values for the class. This is given as

$$C_j = \frac{\sum_{i=1}^{N_i} \exp\left(\frac{P_i - 1}{\rho^2}\right)}{N_i} \quad (26)$$

Where ' N_i ' is number of training set and ' ρ ' is the smoothing factor.

4) *Decision layer*

The decision layer compares the weighted values for each target category collected in the summation layer and uses the highest vote to predict the target category. Finally, the PNN classifier performs classification of the input image as a normal or abnormal image.

D. *Affine-transform based image registration*

After detecting the abnormal category, then the image is passed to the image registration process. There are two images given as input to the image registration process. One is the given testing image and another one is reference MRI brain image. Here, the reference image for registration is extracted from tag from which the testing image was selected. Since for single person, there is more than 3 number of MRI images in the format of DICOM. These are tagged by proper labeling of each set of images. Either previous or next slice with respect to the tagging of the given image is selected. This selected image is pre-processed and image enhanced. In image registration, the affine transformation combined with FRFT is applied.

1) *Affine transformation*

Affine transformation is a linear mapping method that preserves points, straight lines, and planes. Sets of parallel lines remain parallel after the affine transformation. Generally, the affine transformation technique is used for correcting the geometric distortions or deformations that occur with non-ideal camera angles. It is one of the most commonly used methods for the registration of images. Image registration is the process of transforming different sets of data into a single coordinate system. It includes four simple transformations: translating, rotating, scaling and shearing. These operations preserve the collinearity relationship between the points and the ratio of distances of points along a line. This means that the collinearity of the points before the transformation will remain same after the transformation. The main task of image registration process is to detect these affine transformations in order to build a coherent mapping between the source and target images. The transformation operations are controlled appropriately to construct a mathematical relationship between the two images. The transformation matrices are applied to each pixel location in the image to compute the desired transformation effect using matrix multiplication. An affine transformation corrects some global distortions in the images to be registered.

2) *FRFT*

The FRFT [33], [34] is a new transformation that performs the image analysis into the fractional time-frequency domain. FRFT simultaneously reflects the image information in the time domain and frequency domain, to enable unified time frequency transformation. If $f(x) \in L^2(R)$, its p-order FRFT is defined as

$$F_p(u) = \{F^p[f(x)]\}(u) = \int_{-\infty}^{\infty} K_p(u, x) f(x) dx \quad (27)$$

Where $K_p(u, x)$ is the FRFT kernel function.

$$K_p(u, x) = \left\{ \begin{array}{l} \sqrt{\frac{1 - j \cot \alpha}{2\pi}} \exp\left[\frac{x^2 + u^2}{2 \tan \alpha} - \frac{xu}{\sin \alpha} \right], \alpha \neq n\pi \\ \delta(x - u), \alpha = (2n\pi) \\ \delta(x + u), \alpha = (2n \pm 1)\pi \end{array} \right. \quad (28)$$

Where $\alpha = p\pi/2$ represents the rotating angle. 'p' denotes the order of the FRFT, $p \neq 2n$. $p \in [0, 1]$ and $\alpha \in [0, \pi/2]$, $2\alpha\pi \in$. If $p=0$, then FRFT is $f(x)$. If $p=1$, FRFT is the conventional Fourier transform. The FRFT processed data includes both time and frequency domain information. When 'p' ranges from 0 to 1, the FRFT result varies from the continuous transformation of the input function to the Fourier transformation. The angle of projection is calculated by using:

$$\theta_1 = \tan^{-1}(-y, x) = \frac{1}{2} i [\ln(1 - i(-y, x)) - \ln(1 + i(-y, x))] \quad (29)$$

$$R = \sqrt{x^2 + y^2} \quad (30)$$

Where θ_1 is the angle of projection, R is the radius x and y are the coordinate points of image pixel.

$$Ang(\alpha) = \frac{(o-1)\pi}{N_l} \quad (31)$$

Where ' α ' is the gradient angle, ' o ' is the interval limit and ' N_l ' is the number of angles. The difference in the 'x' and 'y' coordinate points of the pixel is computed by using the equations:

$$ds = \sin(\theta) * \cos(\alpha) - \cos(\theta) \sin(\theta) * \cos(\alpha) \quad (32),$$

$$dc = \sin(\theta) * \cos(\alpha) + \cos(\theta) \sin(\theta) * \cos(\alpha) \quad (33)$$

The difference in the angle of projection is computed based on the difference in the coordinate points.

$d(\theta) = \tan^{-1}(ds, dc) \quad (34)$ The filter coefficient is calculated using the equation:

$$S_p = \exp\left(-\left[\frac{d\theta^2}{2 \log(\sigma)^2}\right]\right) \quad (35)$$

$$f_0 = \frac{1}{\lambda} \quad (36)$$

$$f_0 = \frac{2rf}{C} \quad (37)$$

The Logarithmic Gabor Filter coefficient is calculated by using

$$S_p = \exp\left(-\left[\frac{\log \frac{R}{rf_0}}{2 \log(\sigma)^2}\right]\right) \quad (38)$$

The kernel function of the affine transform is computed by

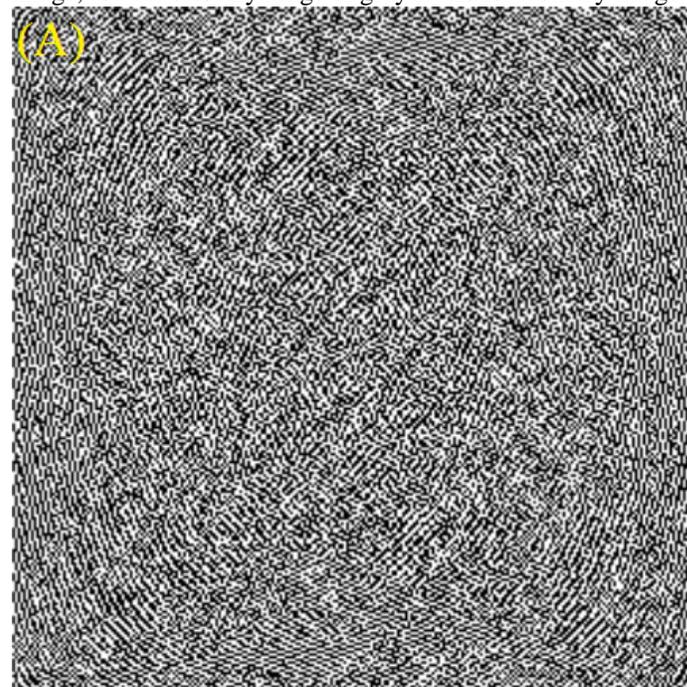
using the Logarithmic Gabor Filter coefficient and filter coefficient as follows:

$$K_p(u, x) = L_g * S_p \quad (39)$$

Where σ is the standard deviation of input image, ds, dc are the differences in 'x' and 'y', $d\theta$ is the difference in ' θ ' and λ 'is the wavelength, 'C' is the column length of image, f is the frequency, rf is the relative frequency, S_p is the filter coefficient, L_g and K_p is the Kernel Function of Affine transform. Figure 9(a) and (b) shows the textures of the image. Figure 10(a) and (b) show the testing images, (c) and (d) show the reference images and (e) and (f) show the registered images.

E. TPC based image segmentation

The TPC segmentation algorithm is applied to cluster out the background and tumor spot in the binary segmented output, if it is classified as an abnormal image. This segmentation process analyses the growing pattern of tumor and represents it as a binary image output. Pixel connectivity is a central concept of both edge-based and region-based approaches to the segmentation. The representation of the pixel connectivity defines the relationship between two or more pixels. To ensure the connection between two pixels, certain conditions on the brightness and spatial adjacency of the pixel are to be satisfied. In order to connect two pixels, the values of the pixels should be obtained from the similar set of values 'V'. For a gray scale image, 'V' denotes any range of gray levels for a binary image.



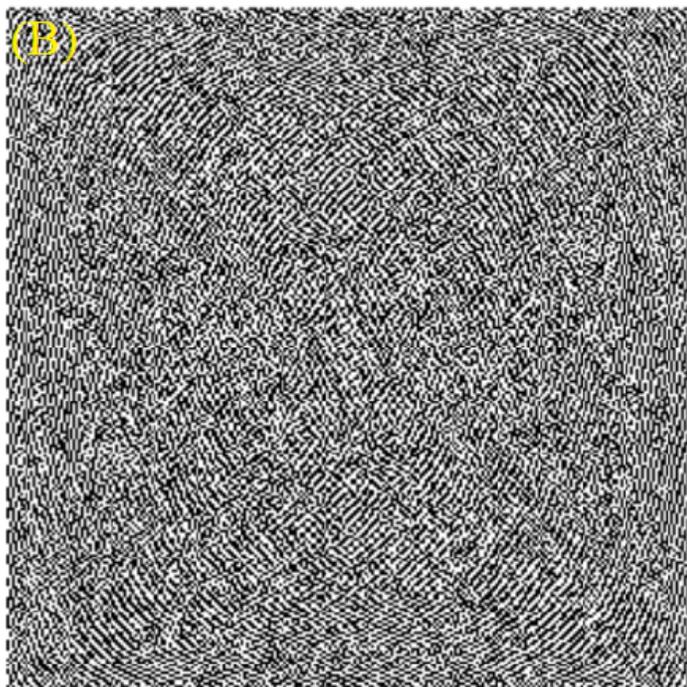


Figure 9(a) and (b) Textures of the image

The adjacency criterion for connectivity is formulated by introducing the neighborhood representation. For a pixel denoted as 'p' with the 'x' and 'y' coordinate values, the set of pixels is given by:

$$R_{im} = \{(x+1, y), (x-1, y), (x, y+1), (x, y-1)\} \quad (40)$$

$$N_s(p) = R_{im} \{(x+1, y+1), (x-1, y-1), (x-1, y+1), (x+1, y-1)\} \quad (41)$$

Where 'x' is the column coordinate value and 'y' is the row coordinate values in the image. The value of the pixel 'p' is obtained from a set of gray level intensity. The pseudo code for the image segmentation algorithm is explained below.

Image Segmentation Algorithm

Input: Fused image 'R_{im}' **Output:** Preprocessed Image, 'S_{im}'

Step 1: Initialize window size (3×3)

Step 2: Calculate Mean value of R_{im} using equation (47)

Step 3: M_x = max (R_{im})

Step 4: **for** (i = 2 to Row size (R_{im})-1) // 'i' Row size of image

Step 5: **for** (j = 2 to Column_size (R_{im})-1) // 'j' Column size of image

Step 6: temp = R_{im(i-1toi+1, j-1toj+1)} //Project window over image matrix as, temp

Step 7: **if** ((temp (5) ~ temp (Boundary)) > Min &&<Max) //Check neighboring Pixel variation.

Step 8: S_{out} i j =;

Step 9: **else**

Step 10: S_{out} i j =0;

Step 11: **end if**

Step 12: **end for** 'j'

Step 13: **end for** 'i'

The mean value of the fused image is calculated by using

$$\text{the } M_n = \frac{\sum R_{im}}{N} \quad (42)$$

The window is projected for the specific size of the rows and columns of the image matrix. Then, the neighboring pixel variation is checked based on the maximum and minimum boundary values. If the neighboring pixel lies within the specific range, then the pre-processed image is generated. Figure 11 (a) shows the binary extracted initial cluster, Figure 11 (b) shows the labeled cluster and Figure 11 (c) shows the initial mask for segmentation. Figure 12 (a) and (b) shows the segmented images.

IV. PERFORMANCE ANALYSIS

The performance analysis results of the proposed TPC based brain MRI image segmentation technique is illustrated in this section. The performance of the PNN classifier for Eight Medulloblastoma Patients is evaluated by comparing it with the traditional Adaboost and enhanced Adaboost [35].

IV. PERFORMANCE ANALYSIS

The performance analysis results of the proposed TPC based brain MRI image segmentation technique is illustrated in this section. The performance of the PNN classifier for Eight Medulloblastoma Patients is evaluated by comparing it with the traditional Adaboost and enhanced Adaboost [35]. The metrics used for evaluating the performance of the proposed technique are

Jaccard Coefficient

Dice overlap

True Positive Rate

False Positive Rate

A real-time dataset is used for the performance analysis of the proposed work. In the real-time image, TR=8500, TE=120, WL=9080, WW=18160, FS=0.3, T=6.5 mm and L=43.0 mm. Oasis [36], Brainweb [37], MIDAS [38], Zenodo [39] and GE DICOM dataset [40] are used for performance evaluation. The Open Access Series of Imaging Studies (OASIS) [36] is a project developed for enabling free availability of the brain MRI datasets to the scientific community. OASIS is made available by the Alzheimer Disease Research Center at the King Abdulaziz University. It includes cross-sectional MRI data of 416 subjects aged from 18 to 96. 3 or 4 individual T1-weighted MRI scans are obtained for each subject. This also includes longitudinal MRI data of 150 subjects aged from 60 to 96. Each subject was scanned two or more times for 373 imaging sessions. Brainweb [37] is a Simulated Brain Database (SBD) that includes a set of realistic MRI data capacities produced by an MRI simulator. Currently, the SBD contains simulated brain MRI data based on two anatomical models: normal and multiple sclerosis (MS). For both anatomical models, full 3-dimensional data volumes have been simulated using three sequences (T1, T2, and proton-density (PD) weighted) based on the slice thicknesses, noise levels, and levels of intensity variation in the brain MRI images.

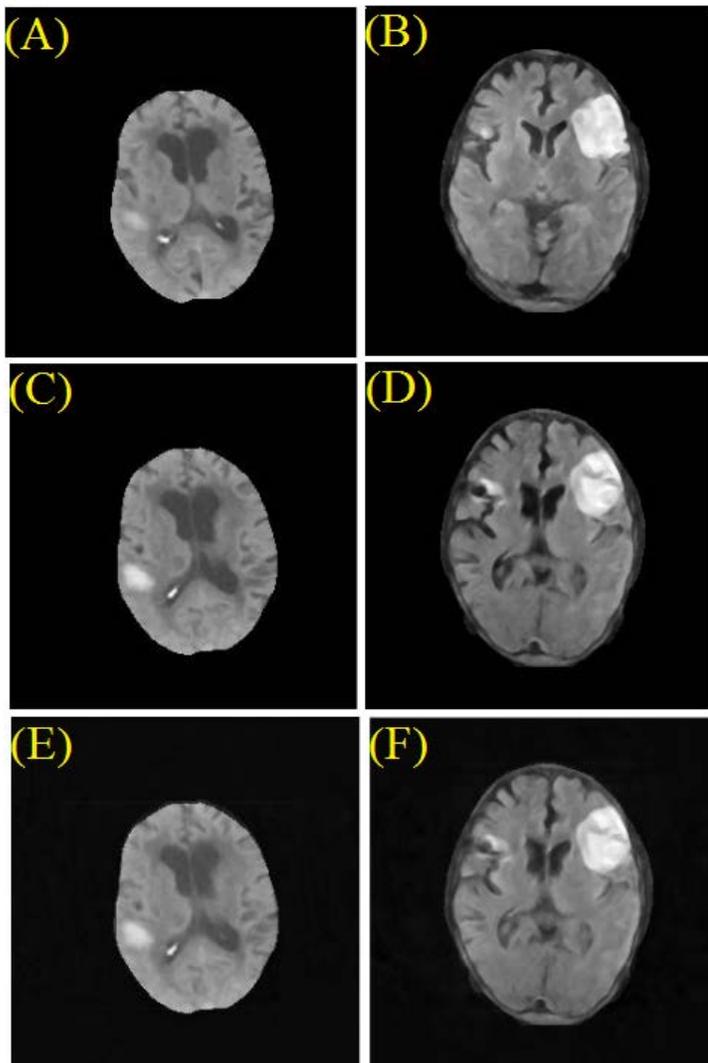


Figure 10 (a) and (b) Testing images, (c) and (d) Reference images and (e) and (f) Registered images

The brain images are obtained in three orthogonal views i.e., coronal, sagittal and transversal. In the simulated MRI volumes for Normal brain and Brain with Multiple Sclerosis Lesions, the parameter settings are fixed to 3 modalities, 5 slice thicknesses, 6 levels of noise, and 3 levels of intensity variation. MIDAS [38] is a MR database includes MRI images of the brain of 100 healthy subjects in which 20 patients were scanned per decade. Images include T1 and T2 acquired at 1x1x1 mm³, Magnetic Resonance Angiography (MRA) acquired at 0.5 x 0.5 x 0.8 mm³, and Diffusion Tensor Imaging (DTI) using 6 directions and a voxel size of 2x2x2 mm³. Zenodo [39] includes a DICOM dataset of MR images of a normal male subject aged 52. The MRI scan is done at the Radiology Department at the King Abdulaziz University Hospital.

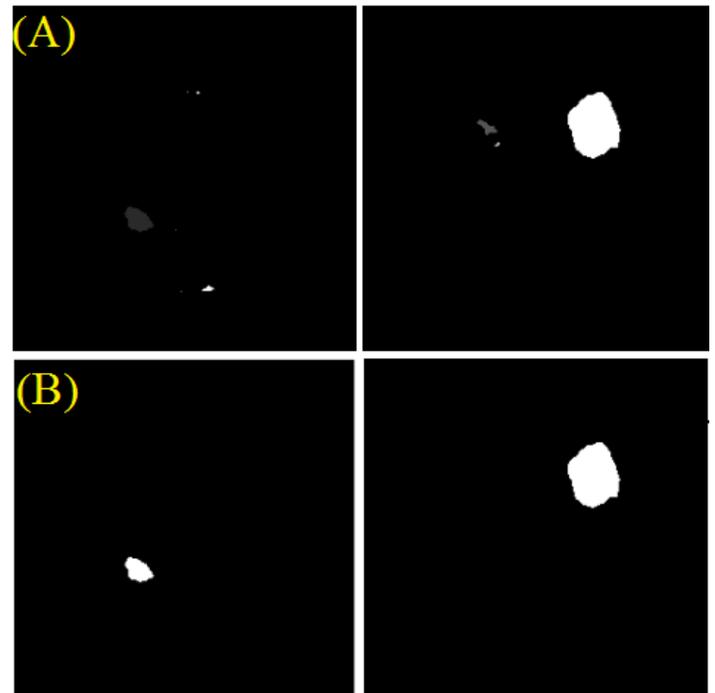


Figure 11 (a) Binary extracted initial cluster (b) Labeled cluster (c) Initial Mask for segmentation

MRI cron is a brain imaging tool that uses NIfTI format for the analysis of the brain images. Two different scans are obtained for the same individual. The MRI cron shows the image orientation correctly, even if the scans are acquired at different orientations.

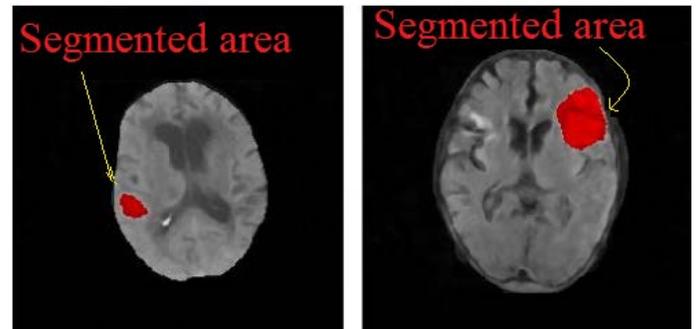


Figure 12 (a) and (b) Segmented Images

The T1-weighted longitudinal MRI brain images are used in our proposed work. The abnormality level of Brain tumor is benign, malignant and meta-static with Multi Sclerosis.

1. Oasis Database – 150 number of subjects and 373 number of images. Each subject contains minimum 2 number of Brain MRI image slices. Normal = 72 subjects. Abnormal = 78 subjects. 2. Brainweb image dataset – 362 numbers of images. Normal = 181 images. Abnormal = 181 images. 3. MIDAS image dataset – 109 number of images. Normal = 109 images. 4. Zenodo image dataset – 117 number of images. Normal = 117 images. 5. GE DICOM dataset – 148 number of Slices for each contains 5 number of images. Totally 740 number of brain MRI images Normal = 124 Slices. Abnormal = 124 Slices. Total number of images used: 1701 Normal images: 1171 Abnormal Images: 530 1190 images are used for training and 510 images are used for testing

A. Jaccard coefficient

The Jaccard coefficient is another widely used spatial overlap measure of similarity indices for labeled regions. Generally, it is written as

$$Jaccard = \frac{|TP|}{(|TP| + |FP| + |FN|)} \quad (43)$$

It is defined as ratio of the number of image samples with correct and incorrect prediction of tumor.

$$Jaccard = \frac{|A|}{(|A| + |B|)} \quad (44)$$

Where ‘A’ is the number of brain image samples in which the presence of tumor is confirmed and ‘B’ is the number of samples in which the tumor detection decisions mismatch.

B. Dice overlap

The Dice overlap is a significant measure of the extent of spatial overlap between the two similarity labeled regions over the average volume of these regions. Furthermore, Dice is represented as the summation of a set of multiple labeled regions in the original image ‘A’ and reference image ‘G’. It is given

$$as: Dice = 2 \frac{|A \cap G|}{(|A| + |G|)} \quad (45) \quad Dice = 2 \frac{|TP|}{(|TP| + |FP| + |FN|)} \quad (46)$$

$$46) Dice = 2 \frac{A}{A + B} \quad (47)$$

C. True Positive Rate

The True Positive Rate (TPR) is the ratio of the positive cases that are correctly classified as positive. TPR is defined as the proportion of the tumor pixels that are correctly classified as tumor by the classifier.

$$TRP = 2 \frac{TP}{TP + FN} \quad (48)$$

D. False Positive Rate

The False Positive Rate (FPR) is the ratio of negatives cases that are incorrectly classified as positive. The FPR is defined as the proportion of the non-tumor pixels that are incorrectly classified as tumor by the classifier. This is calculated by using the equation:

$$TRP = 2 \frac{FP}{FP + TN} \quad (49)$$

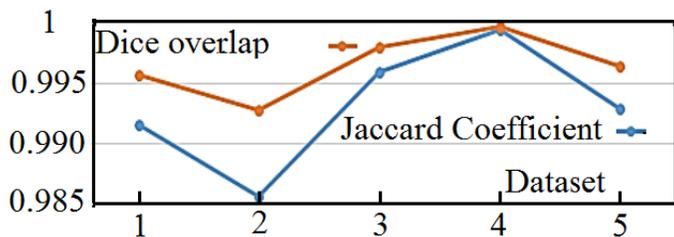


Figure 13 Comparative Analysis of Jaccard Coefficient and Dice overlap

Figure 13 shows the graph illustrating the comparative Analysis of the Jaccard Coefficient and Dice overlap of the proposed technique corresponding to five different datasets. The Jaccard Coefficient and Dice overlap of the proposed technique is higher for the fourth dataset, when compared to other datasets. This implies that the proposed approach achieves better performance in terms of Jaccard Coefficient and Dice overlap.

E. Confusion Matrix

A confusion matrix shows the number of the correct and incorrect classification results of the PNN classification method. Usually, the performance of the PNN classification method is evaluated by using the data in the matrix. This confusion matrix is defined as

Actual \ Predicted	Positive	Negative
Positive	TP	FN
Negative	FP	TN

Where, ‘TP’ is the number of correct classification about the presence of tumor in the brain image, ‘FN’ is the number of incorrect classification of the presence of tumor region as the normal region, ‘FP’ is the number of incorrect classification of the normal region as the tumor region and ‘TN’ is the number of classification of the normal images. Figure 14 shows the confusion matrix for the proposed technique. This shows the classification rate of the normal image is higher. Hence the classification rate of the proposed technique is improved.

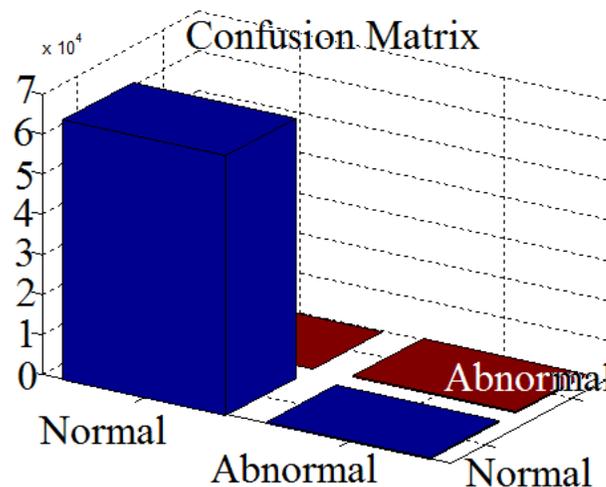


Figure 14 Confusion matrix

F. ROC graph

ROC graph indicates the comparative analysis between the True positive Rate and False Positive Rate of the proposed TPC based Image Segmentation Technique (IST) and existing approaches. ROC analysis is used in clinical applications to quantify the accuracy of the diagnosis systems in the detection of normal regions and tumor regions.

The proximity of the curve to the upper left-hand corner indicates the higher discrimination capability of the proposed technique. A feature set including intensity, PTPSA [35], multi-FD and text on [41] features is compared with the proposed

technique. Figure 15 shows the ROC graph for the proposed TPC based IST and (a) intensity and PTPSA, (b) intensity and multi-FD, (c) intensity, PTPSA and multi-FD, (d) intensity and texton, and (e) intensity, PTPSA, multi-FD, and texton feature combinations. From the figure, it is clearly evident that the proposed technique outperforms the existing feature combinations. Table I shows the comparative analysis of the performance of PNN Classifier for Eight Medulloblastoma Patients.

Table 1 Comparative analysis of the performance of PNN classifier for eight medulloblastoma patients.

PERFORMANCE OF PNN CLASSIFIER FOR EIGHT MEDULLOBLASTOMA PATIENTS				
Classification Method	TPR	FPR	Jaccard	Dice
Traditional Adaboost	0.79	0.36	0.58	0.73
Enhanced Adaboost	0.81	0.39	0.58	0.73
PNN Classifier	0.985	0.0085	0.993	0.9965

The TPR, FPR, Jaccard and Dice of the traditional Adaboost, enhanced Adaboost and PNN classifier are compared. The table shows that the PNN classifier achieves high TPR, Jaccard and Dice and low FPR, when compared to the traditional Adaboost and enhanced Adaboost. The PNN classifier achieves 98.5% TPR and very low FPR. Jaccard of the PNN classifier is 99.3% and Dice value is 99.65%.

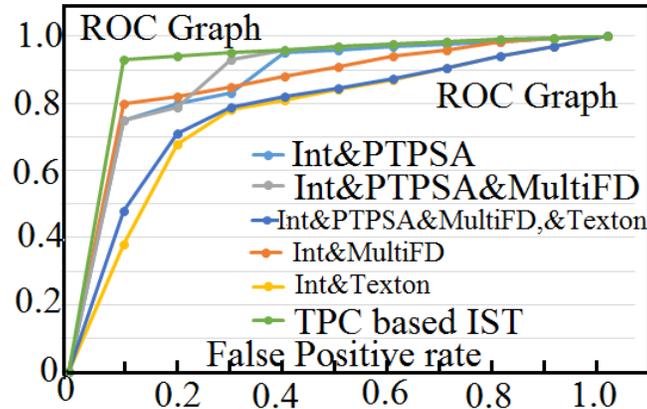


Figure 15 ROC graph for the proposed technique and feature combinations

G. Accuracy, Sensitivity and Specificity

Accuracy is defined as the measure of correctly classification results of the tumor region. Accuracy varies corresponding to the sensitivity. Sensitivity and specificity are the two significant statistical measures of the performance of binary classification test in the medical applications. Sensitivity is a true positive measure indicating the correct classification rate of the tumor region in the image. Specificity is a measure of true negative classifications that denotes the incorrect classification of the tumor region in the image.

$$Accuracy = \frac{N_{TP} + N_{TN}}{N_{TP} + N_{TN} + N_{FP} + N_{FN}} \quad (50)$$

$$Sensitivity = \frac{N_{TP}}{N_{TP} + N_{FN}} \quad (51)$$

$$Specificity = \frac{N_{TN}}{N_{TN} + N_{FP}} \quad (52)$$

Where N_{TP} is the true positive measurement, N_{TN} is the true negative measurement, N_{FP} is the false positive measurement (portion of the image incorrectly classified as tumor), and N_{FN} is the false negative measurement (portion of the image incorrectly classified as not a tumor)

H. PPV and NPV

The PPV and NPV are the two metrics that are useful in the clinical applications, during the availability of the test results. The PPV is the probability of positive detection of tumor and the NPV is the probability of the negative tumor detection results. These two measures are highly influenced by the prioprevalence of tumor. PPV increases with a higher prevalence tumor while the NPV decreases with a higher prevalence.

$$PPV = \frac{TP}{TP + FP} \quad (53)$$

$$PPV = \frac{Sensitivity \times prevalence}{(Sensitivity \times prevalence) + (1 - Spicivity)(1 - prevalence)} \quad (54)$$

$$NPV = \frac{TN}{TN + FN} \quad (55)$$

$$NPV = \frac{Spicivity(1 - prevalence)}{(Spicivity) \times (1 - prevalence) + (1 - Spicivity)(1 - prevalence)} \quad (56)$$

I. Positive and negative Likelihood

Likelihood ratio provides a numerical measure of the effect of the result on probability. It is an alternate method of evaluating the performance of the tumor diagnosis. Because the tumor detection results can be positive or negative, there are two likelihood ratios for each test. The positive likelihood ratio (LR_p) represents the amount of increase in the detection probability, if the tumor detection result is positive. The negative likelihood ratio (LR_n) represents the amount of decrease in the detection probability, if the tumor detection result is negative. Positive Likelihood Ratio (LR_p) is the ratio of the true positive tumor detection rate to the false positive rate.

$$LR_p = \frac{TP}{FP} \quad (57)$$

$$LR_p = \frac{Sensitivity}{(1 - Spicivity)} \quad (58)$$

Negative Likelihood Ratio (LRN) is the ratio of the false negative tumor detection rate to the true negative detection rate.

$$LR_N = \frac{TN}{FN} \quad (59)$$

$$LR_P = \frac{1 - Sensitivity}{Spicivity} \quad (60)$$

Correct Rate is defined as the correct detection rate of the presence of tumor in the MRI brain image. Error Rate is defined as the negative detection rate of the tumor.

Table II shows the values of performance metrics for the proposed technique. The inconclusive rate of the proposed technique is zero. The prevalence rate of the proposed technique is 0.9878. Hence, it is concluded that the proposed approach achieves high correct rate, last correct rate, classified rate, sensitivity, specificity, prevalence, accuracy, PPV, positive likelihood and low error rate, inconclusive rate, NPV and negative likelihood.

Table II Values of Performance Metrics for the proposed Technique

Performance Metrics Values	Values
Correct Rate	0.9931
Error Rate	0.0069
Last Correct Rate	0.9931
Last Error Rate	0.0069
Inconclusive Rate	0
Classified Rate	1
Sensitivity	1
Specificity	0.4584
Positive Predictive value	0.993
Negative Predictive Value	NaN
Positive Likelihood	4.0225
Negative Likelihood	NaN
Prevalence	0.9878
Accuracy	99.31%

V. CONCLUSION

The conclusion and future implementation of the proposed work are discussed in this section. The performance of various image segmentation techniques used for the analysis of human brain is affected by the artifacts such as random noise, intensity inhomogeneity, etc. To overcome the limitations of the existing image segmentation techniques, a novel TPC based segmentation technique is presented for the efficient segmentation of brain MRI image. The proposed approach enables detection of exact location of tumor in the brain. The PNN classifier is used to classify the images as normal or abnormal images. If the image is classified as abnormal, then TPC segmentation process is applied for clustering out the background and tumor spot in the binary segmented output.

Finally, the performance of the PNN classifier is evaluated by comparing it with traditional Adaboost and enhanced Adaboost. The proposed technique achieves superior performance in terms of sensitivity, specificity, accuracy, error rate, correct rate, inconclusive rate, PPV, NPV, classified rate, prevalence, positive likelihood and negative likelihood. In future, this type of image segmentation technique is applied for both T1 and T2weighted Brain MRI images.

Conflict of Interest: The authors declare that they have no conflict of interest.

Compliance with Ethical Standards: Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

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Economic Role of Women in Ancient Kashmiri Society

Zuha Qadir

I. INTRODUCTION

Man's life is interconnected with various living and non-living things. His life depends on social, political, economic, ethical, philosophical and other aspects of social system, which when combined together form a complete society.

So, all the spheres whether political, social, ethical or economic, form an important part of a particular society. Likewise, economy too has an important place in man's life. Without this aspect, the history of a particular society would be incomplete.

The term economics has been defined differently by various economists.

Likewise, Alfred Marshall defines Economics as a study of men in the ordinary business of life. It enquires how he gets his income and how he uses it."(1)

Thus, it is on one side, the study of wealth and on the other and more important side, a part of the study of man. Though the economy relates to the study of man. However, there are considerable differences in men's and women's access to and opportunities to exert power over economic structures in their societies. In most parts of the world, women were virtually absent from or were poorly represented in the economic pursuits.

Even though the women were rarely represented with regard to their role in the economy but it seems unlikely to believe that they might not have played any significant role in the economic progression and development of man, for they accounted half of a family's talent.

Women in Kashmir might have played a dual role – producers of goods and services as well as their domestic chores and wives and mothers. Yet their contribution to the economic development has been neglected. We hardly find any references of women concerning the economic development in the literature of ancient times.

As such the role of women in the economic activities needs to be reinterpreted and framed in the light of whatever scarce references we have. The economic activities of the people of Kashmir during ancient times revolved round agriculture, trade and various artistic activities.

But agriculture was the mainstay of people and a large proportion of population was dependent on agriculture for their income from the very ancient times i.e. from Neolithic period onwards.

The agricultural process involved a number of activities from preparing the soil, to sowing of seeds, to cultivation of plants, to protection of fields, to harvesting of crops and its subsequent appropriation.

"Given manifold responsibilities, man must have been getting much support from his family members, particularly his spouse for in every social make up the spouses have been essentially contributing together in sex regulations, biological reproduction and socialization of their young ones. Both of them

performed various economic functions, like arranging food and shelter for the family as a whole—a phenomenon authenticated by the Burzahom's stones slab engraving depicting a man and woman undertaking a joint venture of hunting. This piece of archaeological information is significant not because it shows as to how men and women coordinated to enlarge the economic provisions of their family, but also because it furnishes us material for supporting the idea that they must have worked shoulder to shoulder in other fields as well."(2)

In support of the female help to the families, will Durant has argued that females were more robust in the primitive societies and equal in stature and endurance to men. He says that the difference in strength, which now divides the sexes, hardly existed in those days, and is now environment rather than innate in nature.

"Women apart from her biological disabilities, was almost equal to a man in stature, endurance, resourcefulness and courage: she was a robust animal, able to perform arduous work for long hours, and if necessary, to fight to death for her children or her clan. The most economic advances in early society, were made by women rather than men. While, for censures, he clung to his ancient ways of hunting and herding, she developed agriculture near the camp, and those busy arts of the home which were to become the most important industries of the later days. It was apparently she who developed sewing, weaving, basketry, pottery, wood working and building and in many cases it was she who carried primitive trade. But when agriculture became more complex and brought larger rewards, the stronger sex took more and more of it into his hands. The growth of cattle –breeding gave the man a new source of wealth, stability and power: even agriculture was at last accepted by the wandering male and economic leadership which tillage had for the time given to women was wrested from them by men."(3)

"However, given the comparative strong physical stature, the contribution of the men in Kashmir (4)" In the overall input labour must have been relatively larger. He must have entailed hard labour. On the other hand the Neolithic women must have been, as they are now, largely engaged in such smooth family affairs as cooking, collection of edibles, fruits, roots, weaving and stitching garments.

Thus, there are reasons to believe that the women folk of cultivators worked in the fields along with their men folk and contributed to the economy by actively participating in the agricultural functions.

Though agriculture formed the main occupation of the inhabitants of the valley, it appears there were several industries which gave employment to a fair proportion of the population. "The most notable of these were the manufacture of textiles, leather goods and jewellery. There were also sculptors, wood workers and potters. We have a few references which suggest that women took part in economic activities other than agriculture. At one place Kalhana tells us of porter women, at another he refers to women who used to sell bakery.

“From a closer study of Damodaragupta Kuttanimata Kavya, we can have “an idea of the curriculum which the courtesans were being taught. It included erotic texts of Vatsyayana, Madanodaya, Dattaka, Vita, Rajaputra and others, the Natya-Sastra of Bharata, Visakhila’s treatise an art, Dentila’s writing, practical arts like arbori-horticulture, needle-work, wood-work, metal-work and cookery and fine arts like painting, cut-work in leaves, music-vocal and instrumental and dance.”(5)”

Since these subjects were included in the curriculum of women and they received formal education in these fields, it is reasonable to presume that many of them might have adopted these as their professions which would have fetched them with handsome money.

“The Nilamata refers to images made of stone, earth, gold, silver, copper, brass, wood, sand, straw and ghee. Instructions for making Sayanamruti images of Vishnu with his feet placed in the lap of Lakshmi are given. Reference is also made to caturmurti Vishnu with four faces, four arms and Ayudhapurusas.”(6)

“The Nilamata Purana testifies to the existence of the art of painting in Kashmir. In connection with the celebrations of Buddha’s birthday, the people are directed to decorate the caityas with beautiful paintings. References are made to paintings painted on the cloth, the wall and the ground. Bhumishobha or decoration of the ground with paintings seems to have been a necessary item of most of the religious and secular functions.”(7) “Damodaragupta refers to courtesans practicing the art of painting for advertising their trade.”(8)

“Somadeva refers to portraits painters carrying out confidential missions of their masters.”(9)

The industries, in which the women were engaged, have to be inferred only from the stray reference to finished products. Thus the articles of dress point to the art of spinning, weaving, dyeing and washing. Similarly pottery, wood work and leatherwork are pointed to by earthen pitchers, wooden pitchers, wooden seats and leather shoes.

“The terms used in the Nilamata for clothing in general are Vastra, ambara, Vasas, Vasna, and Samvita. Cinamsuka is used for silk imported from china, Kambala is woolen blanket and Pravarana-referred to in connection with the festival of new snowfall-seems to be the same as Pravara mentioned in the Mahabharata as a cloth offering protection against cold”(10).

Both woolen and cotton textiles were produced in ancient Kashmir. Apart from the depiction of finery clad figures on the terracotta tiles unearthed at Harwan, there is the direct evidence of Hieun Tsang who records that the people of Kashmir wore clothes of white linen.

These references are indicative of the fact that women, besides, looking after the domestic chores and their children, might have engaged themselves in pursuits like weaving, stitching, wood work, clay modeling, metalwork ect. Which would have contributed to the economy as well.

Apart from practicing these arts and crafts, the women of Kashmir had enrolled themselves in various military ranks, administration etc. They acted as soldiers, captains and many times look the task of Dutis (envoys) as well.

Damodaragupta’s Kuttanimata Kavya gives us a clear indication of the existence of female dutis during the ancient

times, says Damodaragupta.”the female go between (dutis) played a key role in uniting the two parties.”(11).

In this regard, mention may also be made of “Manjari who accompanied Samarabhata to Varanasi.”(12) we find women as military commanders like that of Silla and chudda.

The cultivation of fine arts by the people of Kashmir has an ancient background. The earliest definite corroboration regarding the popularity of music and dancing in Kashmir is provided by archaeology.”A tile from Harwan, with Kharosthi letters which cannot be later than 4th century A.D, shows three musicians.”(13) “the one to left plays a flute; the centre one, cymbals; the third, a pair of drums . Another tile represents a female musician playing on a drum. One more shows a female dancer.(14)

“The statue of a female dancer was also obtained from the courtyard of Kotisar temple.”(15)

“As regards the literary evidence, Kalhana’s Rajatarangini is full of references to ‘Gitanrta’.”Music, we are informed had become popular even with the Buddhist monks. Reference is made of two female musicians songs which expanded is one melodious tone in harmony.”(16)

“It was however, in the 7th and 8th centuries A.D, that these arts attained their full vigor. In fact no student of classical Indian dance can ignore or by pass the commentaries on Bharata’s Natya-Sastra and original works on dance, like those of Udbhata, Louapata, Sankuka, Bhatta, Nayaka and the last but greatest of them all, Abhinavagupta.”(17)

“The 1st reference to dancing in the Rajatarangini is about king Jalauka, the son and successor of emperor Ashoka, who is credited with being an ardent worshipper of Siva and a lover of music and dance. While worshipping at the shrine of Siva, “a hundred among the ladies of the seraglio who had risen to dance, in honour of the god, at the time fixed for dancing and singing, he gave out of joy to Jyestharudra.”(18)

The two dancing girls whom Lalitaditya met in a forest informed him that dancing at that particular place was an ancient custom of their family.”(19)

Kalasa’s liking for the dancing girls is well described by Kalhana.”(20)Harsa had gone so far as to instruct personally the dancing girls to act.”(21)Bilhana testifies to the high skill of ladies of Kasmira in dancing.”(22)

That this profession was not looked down upon is apparent from another passage wherein it is mentioned that king Chakravarman married two professional dancing girls, sisters Hamsi and Nagalata and although they belonged to a lower caste, he made Hamsi his first queen who “enjoyed among the king’s wives the privilege of being fanned with the Chowries.”(23)

In addition to dance and music, we do also have references of drama/theatrical performances.”The words ‘Preksa and ‘Preksanaka’ mentioned in the Nilamata refer to theatrical performance.”(24) “the Nilamata mentions also a peculiar phase ‘Preksadana.””(25)Literally it means “the gift of dramatic performance.”It seems to have denoted a gift made for the arrangement of a dramatic show.”(26)

“There may have existed some dramatic clubs which gave such shows on demand and the injunction of Yathavidha Preksadana.”(27) i.e. the gift for the arrangement of a dramatic show made in the proper procedure may have been made with reference to them. These gifts of various types are not however, defined separately. The Kashmir poet Bilhana extols the ladies of

his native land for the excellent dramatic performances which excelled the acting of heavenly damsels Rambha, Citralekha and Urvashi.”(28)

The simultaneously use of the terms ‘nartaka and ‘nata’ in the Nilamata indicates the difference between the two: the former was used for a dancer, the latter for an actor.”(29) These people received honours from the public on various occasions and were not regarded as degraded.”(30)

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A Night of a Thousand Laughs: A Pragmatic Study of Humour in Nigeria

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Abstract- Humour is a multi-disciplinary field of research. People have been working on humour in many fields like philosophy, psychology, sociology, literature, and linguistics. Within the linguistic field, humour can be evaluated from syntactic, pragmatic and semantic points of view. This paper work represents an attempt to show that research in pragmatic theory can contribute to our understanding of humour. The speech act theory has been selected, an exposition of which is followed by an account of how the theory can be applied to humour. Some research into humour has already been carried out using the speech act model. This is briefly described and evaluated. However, both the application of the theory to humour and its evaluation in this paper are mine.

Speech act accounts of humour are based on the notion that humorous utterances are both unconventional and unpredictable. One way of exploiting our expectations, and thereby creating a comic effect, it is argued, is to violate the norms of conversational principles (Ferrari, 1992). This paper therefore explores how violation of the Gricean maxims is used to create humour in Stand-up comedies in Nigeria. The paper is based on the transcription of five episodes of the popular comedy series, *A Night of a Thousand Laughs* (hence, *ANTL*). The selected texts were transcribed and studied as the unit of analysis. From the research, it is found that the Gricean maxims were applied and violated. Most of the time, during performance, the comedians would have fulfilled the maxims before consciously or unconsciously defying those maxims in their conversation.

As at the point of writing this paper, the researcher held that he had not come across any major scholarly work devoted solely to the study of humour in Nigeria. The research, and its result is therefore expected to provide an additional view and information in the study of humour for the students, lecturers, and other researchers who are or would be interested in the study of humour in Nigeria.

Index Terms- A Night of a Thousand Laughs, conversational maxims, violation of maxims, H.P. Grice, humour, pragmatics

I. INTRODUCTION

This section offers a background to the research on the subject of humour as it is found most relevant to the current study. It has a three-fold aim: to review the literature in order to contextualize the present study of Stand-up comedies in Nigeria in relation to relevant linguistic research, to build the theoretical foundations on which the study is developed, and to establish the methodology utilized in the analysis. The section also offers the

review of literature from three key fields that inform this study: the humour theory; linguistic studies of humour; and pragmatics. Since humour is such a wide-ranging subject area for research across academic disciplines, and in order to set the parameters for this work, it is useful to briefly review the prominent linguistic studies that have been carried out to engage the role of humour. The review is narrowed to the studies of conversational humour most pertinent to the current study.

Humour, Linguistics and Pragmatics

Following Attardo's (1994:16) argument that "it is important to position the linguistic theories of humour in the broader context of the general theories of humour", this section reviews prominent linguistic studies that exhibit and exemplify the three major forms of humour theory. The study of humour has traditionally been seen as a subpart of the study of aesthetics, and therefore has been of interest primarily to philosophers (Edwards, 1967). It has been studied from as far back as Plato and Aristotle (Attardo 1994). The first of these two Greek philosophers to have considered the nature of humour and laughter was Plato (Ferrari, 1992). He believed that the absurd was based on an unfortunate lack of self-knowledge, claiming in *Philebus* that when we laugh at what is ridiculous in others, we are experiencing a combination of both delight and envy, that is, we mix together both pain and pleasure (Plato, 1861). Aristotle also considered the nature of Ludicrous in the second part of *Poetics*. It is held that he also believed the ridiculous a something rather ugly and distorted (Ferrari, 1992; Attardo, 1994).

The studies of humour range across academic disciplines from psychology, sociology, anthropology, literature, medicine, mathematics and linguistics. There are three main traditions in the study of humour across disciplines that form a background for all studies of humour: the relief theory, the incongruity theory, and the superiority theory (Attardo 1994). The relief theory focuses on the psychological or physiological release of tension or energy in humour, particularly through laughter. The incongruity theory describes the cognitive mechanism between different frames of thought in a humorous text. The superiority theory focuses on the aggressive social functions of humour based on the notion that laughter is an evolved cry of victory over an enemy. These approaches to humour are by no means mutually exclusive, but to help us understand something of the essential differences between them, let us consider the following exchange.

(1) Lecturer: What are you doing in my office?

Female student: Looks like I lost my way, sir.

For the proponents of the incongruity theory, the student's reply is humorous because it is unexpected and inappropriate. But according to a modified version of this theory- incongruity

resolution theory- to be comic, the incongruity has to be rendered congruous, but meaningful in some way (Schultz, 1972). Following this, in (1) the student's reply is incongruous because it is an unexpected response to the lecturer's question. However, if we identify the ambiguity, we can reanalyze the lecturer's utterance and this will make the student's reply more appropriate and meaningful. For proponents of the superiority theory, we laugh because we feel 'superior' (or better) to the student, who seems stupid enough to think that the lecturer wants to know why she (the student) has visited him, or to the lecturer who perhaps has failed to make himself understood. Some superiority theorists believe that laughter is a healthy, relatively harmless outlet for human aggression, since it replaces physical attacks on one's opponents, while others believe that on the contrary, any form of victimization or ridicule is wrong (Ferrar, 1992). The relief theorists however may argue that we laugh at (1) when we are no longer bound by the linguistic constraint of univocality, that is, by the requirement that one utterance has only one meaning. In addition to this, we laugh because we are liberated from our inhibitions, which derive from the socially instilled requirement that suppress our feelings of mirth at the student's misunderstanding. These theories are still very much relevant today, in one form or the other, although it is the incongruity theorists who have arguably attracted the most disciples (See Ferrar, 1992; Nerhardt, 1976; Suls, 1983; Morreall, 1983, 1989). Finally, the study of humour which initially was restricted to the fields of philosophy and psychology has now extended its tentacles to become a multidisciplinary field of enquiry. It is now of interest to "sociolinguists (e.g. Fine, 1983; Mulkay, 1988; Davies, 1990); anthropologists (e.g. Douglas, 1968; Johnson, 1978; Apte, 1985); literary theorists (e.g. Chard- Hutchinson, 1991); health professionals (e.g. Robinson, 1991); linguists (e.g. Pepicello and Weisberg, 1983; Raskin, 1985; Attardo, 1994); and pragmatics (e.g. Wilson and Sperber, 1988)". I have however decided to place this study within the framework of pragmatics. The reason for this will become clear when we consider the nature of these two disciplines, linguistics and the nature of humour itself.

Linguistics and Humour

Raskin is arguably the first, and perhaps the most influential linguist to have developed a comprehensive theory of humour. This was based on his own semantic theory (See Raskin, 1985). Although ostensibly working with a Chomskyan framework, Raskin's approach is in fact at odds with one of the base tenets of Chomskyan linguistics. For Chomsky (1986), the central goal of linguistics is the study language as a system of an internalized set of rules or principles. This system is an abstract construct, which can be studied independently of the use to which it is put. Although knowledge of the system is important in verbal communication, it is obviously inadequate when it comes to explaining how language is used and understood in concrete situations. There thus emerges the relevance of the branch of linguistics called *Pragmatics*, which deals with our ability to convey and interpret verbal messages. In other words, pragmatics has to do with speaker meaning, i.e. the interpretation of utterances in context. We don't have to think long about the nature of humour before we come to the conclusion that it is best approached and appreciated within the framework of pragmatics.

The reason for this is not far-fetched. As noted by (Ferrar 1992:16), humour is not a property of sentences but of utterances, and as such it depends on a context for its existence. Based on these facts, it therefore seems to me that there is a lot to gain from approaching humour from this perspective. This work is designed to employ Grice's Cooperative Principle and accompanying maxims as basic theory to investigate the relation between the creation of humour in Nigerian Stand-up comedy and violation of the cooperative principle.

Grice (1989) discusses five ways of failing to observe a maxim. First is flouting of a maxim, in which a speaker fails to observe a maxim in order to lead a hearer to look for a hidden or implied meaning. Second is violating of a maxim, which is quite the opposite of the flouting of maxims, in which a speaker does not want a hearer to understand. Third is infringing of a maxim, which is when a speaker fails to observe a maxim when he or she is helpless to control anything about the conversation. Fourth is opting out of a maxim, which is when a speaker fails to observe a maxim by saying nothing. Fifth is suspending of maxim, in which it is understood that what is said is not completely true or that there are things a speaker ought not to say, such as taboo. However, in this paper, the researcher has decided to use "violation" of maxim as a means of encompassing the five classifications of Grice's. The researcher holds that in whatever form the conversational maxims are not obeyed or duly observed, it can be generalized as a "violation" of the conversational principle. Whether it is flouting of a maxim or infringing of a maxim, opting out of a maxim or completely suspending a maxim, all these are variants of maxim violation. This paper therefore focuses on the violation of maxims in the Nigerian Stand-up comedies. This is with the aim to examine how each of the comedians has refused to conform to the recommendations of the conversational principle.

II. METHODOLOGY

1.1. Data

The main thrust of this study is to see how maxims are violated for comic effect and also in what situations these violations occur. The aim is to investigate and identify how the utterances of the Stand-up comedians violate the maxims while cracking jokes. To this effect, the researcher has chosen to study five (5) different episodes of the Opa William's A Night of a Thousand Laughs (2014 edition). The research deploys the violation of maxims as observed in the conversations of the selected Stand-up comedians, TY Funny, Kolo, Ajebor, Pencil, and Funny bone.

1.2. Analytic Framework

Because pragmatics is the branch of linguistics that focuses on the structure of a language as a communication tool, I have decided to use pragmatic approaches in the analysis of the texts, with emphasis on the cooperative principle and its component; maxims of quality, quantity, relevance and manner, as the framework theory. A critical contribution of Grice's to the pragmatic approach of linguistic analysis is essentially the cooperative activity. Grice (1975:66) argues that communication can only be possible only if the speakers conform to some global standards of communication. According to him:

'Our talk exchanges do not normally consist of a succession of disconnected remarks, and would not be rational if they did. They are characteristically to some extent, a common purpose, or set of purposes, or at least a mutually accepted direction.'

It was on the basis of this observation that Grice postulated the existence of a cooperative principle (CP):

'Make your conversational contribution such as required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged' (Grice 1975:67)

Grice afterwards goes on to identify nine rules or maxims classified into categories which together with the CP, govern all human communication. (See Ferrar 1992; Grice, 1975) The first direct application of Grice's CP to humour research is found in the works of those of Hancher (1980); Martinich (1981); Morreall (1983); and Leech (1983). Nevertheless, Grice did not of course believe that speakers adhere strictly to the maxims all the time they communicate. The claim that jokes could be viewed in terms of violations of maxims dates back to Grice himself, where he considers irony as an example of implicature (Attardo 1994:27). In fact, Grice was interested in the effects that can be obtained when they are violated in some way. He saw violation of the maxims as a means by which speakers are able to "mean more than they say" (Ferrar 1992:45). A basic assumption which underlines this paper work is that a large number of humorous utterances (jokes) involve violations of one or more of Grice's maxims.

III. ANALYSIS

H.P. Grice's Cooperative Principle (CP) is a significant theory that is used to analyze and control people's conversation. Every of our conscious conversations is guided by these maxims. However, irrespective of our consciousness, Grice's maxims are not always observed in our daily conversation. "It seems when the maxims are violated, the speakers apparently wish to end the conversation, or wish to avoid the conversation" (Weiwei, 2012:3). Yet under some circumstances, the violation of cooperative principle and the accompanied four maxims is not only intent to terminate the conversation, but also trigger comedy effects. This means that it is sometimes needed that the maxims be violated for humour to happen in conversations. It can therefore be said that the deliberate violation of conversational cooperative principle is the linguistic basis of humour (Weiwei, 2012: 3). Let us now study some of the selected episodes from *ANTL*, as we attempt to reveal the basic relationship between violation of Grice's CP and creation of humour in the texts.

The Maxim of Quantity and Humour

It means that people do not make contribution more informative than required. When speakers break the quantity maxim consciously, and do not provide what is required or give much more than needed, humour breaks consequently. Let us consider some example.

A. The lack of required information makes humour

(2) Pencil: I dey vex

Audience: Laugh

Pencil: I dey vex for all this... (sighs)

Audience: Laugh

In the above text, the information supplied by the first speaker is inadequate to let his listeners get a thorough understanding of the message. *I dey vex* (I am angry). Why he is angry, nobody knows. The listeners actually do not know why or to whom he is vexing. This essentially triggers laughter in them, because they do not just understand why a person should unnecessarily get angry.

(3) Pencil: One girl, she draw tattoo, she never marry.
She draw butterfly... When she kom marry,
husband do... Pikin* do... So stretch mark come...

Audience: Laugh

The speaker narrates the story of a girl that draws tattoo on some part of her body. But the tattoo turns to something weird after she gets married. The information is not adequately expressed. That actually prompts the audience into laughter, having imagined what the husband and pikin (children) have in common.

B. Provided information more than required makes humour

(4) Ajebor: The Ibadan girl no fit dey talk to you dey chop chewing gum

Lagos girl dey talk to you, "Yeah, how far?" (Chewing gum)

Ibadan girl, if she wan talk to you, she go commot the chewing gum

Only say she go hang am for back of her ear.

Audience: Laugh

This humor occurs when one of the speakers supplies information more than necessary. The speaker supplies the information that Ibadan ladies do not like talking to people with chewing gum in their mouths. Meanwhile, the additional information of how they prefer to hang the chewing gum at the back of their ear is somehow unnecessary to the main point. It therefore induces some laughter in the audience.

The Maxim of Quality and Humour

Conversations demand that the maxim of quality be observed. Every participant in a conversation is expected to be truthful and he is expected to avoid giving false or unconfirmed information, especially one that is not supported by evidence.

A. Exaggerated information makes humour

(5) Pencil: You know say e get some stretch mark wey de some lady body

Dey fit use am wire this Jago hall!

Audience: Laugh

Pencil: Some girl stretch mark, dey fit use am wire this hall.

Audience: Laugh

(6) Pencil: In fact, this D.J. no need too much wire.

Some girls' stretch mark, dey fit use am wire all the equipment wey de here.

Audience: Laugh

How true is the idea that body stretch marks can be used to wire a hall? This is mere exaggeration, and it is meant to create some humour. It is also hyperbolic to imagine that stretch marks can be used to connect electrical equipment. This breaks the conversational maxim of quality that demands one to be truthful,

and not give information that is false or that is not supported by evidence.

B. Understated information makes humour

(7) Funny bone: You know say all these Boko Haram* (pauses), eh God.

Una know dem now, all these boys wey dey do things; BH, yo! You know what I mean, BH baby.

Audience: Laugh.

It is also possible for the conversational principle of quality to be broken when a piece of information becomes understated. This happens in a situation where a speaker decides not to supply the information that is adequate enough to carry the listener along. In the above text, the speaker (Funny bone) initially gives the full name “Boko Haram”, but later decides to use “BH baby”, perhaps because of the fright attached to the sect. The audience somehow realizes that there is something he is trying to hide. This causes them to laugh.

The Maxim of Relation and Humour

The speakers try as much as possible to make whatever they say relevant to the subject of discuss. They are expected to say things that are pertinent to the discussion. Once the contravention of the relation maxim emerges in conversation, the conversation will be directed towards creating humour (Weiwei, 2012:4).

A. Incoherent information makes humour

(8) TY Funny: If you go event you see girl sit down, cross leg...

Somebody dey drop her leg now

Audience: Laugh

TY Funny: Camera video that girl for me

Aud: Laugh

One way a speaker may break the conversational maxim of relation is by combining incoherent pieces of information together in his speech. The speaker in the above text is trying to teach the listeners how to “mess” (fart) in public. He starts his speech by telling the people that anytime they see a lady seated with crossed legs; it may be a means of positioning herself in case she wants to fart. But while doing this the speaker utters two statements that are somehow disjointed, “Somebody dey drop her leg now” (Somebody is dropping her legs now) and “Camera video that girl for me”.

B. Opposing ideas make humour

(9) Kolo: *Na so one mad man carry cutlass, as he carry the cutlass, he no know where to go, na so he enter police station-WHOAH!*

Audience: Laugh

(10) Kolo: As he enter police station, the first door wey he see, if you see the way he take break the door, GBOAH! “Is this a police station or what?”

See where people dey fly commot for police station

Police people wey carry gun, thruway gun, everybody dey take off

Audience: Laugh

(11) Kolo: He see the next door, burst the next door, “Is this a police station or what?”

People, opportunity, the people wey den lock for inside cell, naso den dey take off, everybody.

Audience: Laugh

(12) Kolo: And you know say he get one of their DPO wey dey get big belle, wey dey sit down for inside.

Audience: Laugh

Kolo: As the mad man carry cutlass GBOSA! “Is this a police station or what?”

DPO start to dey shake.

DPO no know when he say, “No o, it is not a police station o. We sell recharge cards, we make phone calls ”

Audience: Laugh

The simple explanation for the texts is the juxtaposition of opposing ideas. In the first place why will a mad man decide to go to the police station, instead of the market? Why will the policemen that are supposed to ensure security in the society drop guns, and run away because of a mad man? The most humorous part of the event is the DPO, who is supposed to order his men to arrest the situation, overwhelmed with fear. Not just that, he, out of trepidation declares the police station a business center where they sell recharge cards and make phone calls. All these contradicting ideas are what induce laughter in the audience.

The Maxim of Manner and Humour

The maxim of manner generally governs the way the participants choose to construct their contributions in the conversation. The basic point is clarity and simplicity. The participants are expected to speak as clearly as possible, using language that is appropriate to the context of conversation. Let’s use this maxim to see how speakers can make listeners draw quite extensive implications by the way they flagrantly go against the maxim of manner.

(13) Kolo: Naso one teacher enter class

We no know say this teacher no well

The teacher gan self no know say we the students, we no well

Audience: Laugh

Kolo: But the way the teacher take enter we suppose don know but we no quick know

Na in the teacher enter, the first thing wey come outside of the teacher mouth na the way in take greet us, na in we take know say e be like say this teacher no well.

The teacher kom say “Now, Janet, tell the class where Christians worship”

Nain the girl kom stand up, “Christians worship in the church”

Because of say na only the girl raise up hand, the aunty kom say “take this cane, flog everybody.”

Audience: Laugh

Kolo: The teacher kom say “now second question”

She kom pose again.

Audience: Laugh

Kolo: She say, “Listen to this”

We say, yes we are listening

Audience: Laugh

Kolo: E say “Who can tell me where Muslims worship?”

Audience: Laugh

Kolo: Nobody gree* answer.

The idiot stammerer guy wey sit down near my side, the guy kom raise up hand...

Na in the guy start... "Ha... ha... uhk" (he stammers)

Audience: Laugh

A speaker is expected to follow the conversational maxim of manner while communicating with others. The general idea is that you should speak as clearly as possible, using language appropriate to your listener and the context. This is somehow found wanting in the speech of both the teacher and the stammerer (Robinson). From the conversation above, it's apparent that both the teacher and the stammerer persist in violating the maxim of manner. At first, the teacher makes a startling introduction to the class. Then the stammerer displays in return a more amazing drama to the other members of the class. The utterance of the stammerer is filled with illegible and unorganized sentences. Through this, readers can tell the humour easily.

IV. DISCUSSION AND CONCLUSION

According to analysis of the texts, we can conclude that humor often results from perceived violations of cooperative maxims. It has been established that Grice's cooperative principle is a precondition to context successful conversation, but in some given situation people try to achieve purpose or carry out special effects. Due to such occasional effects, they have to deviate from the principle consciously or unconsciously. Whereas when the cooperative principle and maxims are violated, we would not simply think speakers disobey the conversational rules or non-cooperate, on contrary, they do implement principles from the other side of coin, herein humor births in the special conversation. What this suggests is that there are some limitations to Grice's cooperative principle. The major weakness in Grice's theory is probably that it paints a rather ideal picture of the social conditions of communication. Although he admits that there are many situations in which speakers do not cooperate, nevertheless, the theory still sees cooperation as the universal disciplines in social interactions. The essay has therefore been able to work out the bond between the violation of Grice's cooperative principle and the creation of humor.

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PERFORMANCE APPRAISAL USING BASIC T-NORMS BY SOFTWARE FUZZY ALGORITHM

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Abstract - Performance Appraisal is the systematic evaluation of the performance of an employee under certain aspects of consideration and to understand the potential of a person for further growth and development of an employee in an organization with specific ratings. This paper presents a design and implementation of a performance appraisal system using the fuzzy logic. It extracts the performance of an employee at each level, thereby generating the ratings automatically with respect to the satisfactory level of the target criteria attained by them. An automated employee rating system based on IBM Lotus Software fuzzy algorithm is used for this purpose to track the employee work performance. The performance will be measured based on certain factors such as Work Achievement, Continual Learning and Communication Skills etc. Based on these attributes, it automatically separates them into five levels of ratings.

Index Terms- Performance appraisal, Fuzzy inference system, Fuzzy Rules, Defuzzification, Triangular Fuzzy Number.

I. INTRODUCTION

Many companies, institutions and organizations use performance appraisal system to evaluate the employee's performance. The performance of an employee is very important for the progress of the company. Also performance appraisal is a vital part of employee's career development. Various decisions like promotions, terminations, banding depends upon the performance evaluation. Many Companies or organizations has its own process of employee's performance appraisal system. It is actually a systematic and periodic process that assesses an individual employee's performance and the productivity. Most of the companies include crisp and uncertain values to evaluate the employee's performance. There are many traditional ways to measure performance of an employee. In the recent inventions, more effective and efficient ways for performance measurement are available. Researchers all over the world are trying to use fuzzy inference techniques to improve the effectiveness of performance appraisal. It is not only applied for the evaluation of performance of an employee, it is also applied in the field of teacher's performance and also in the performance of students to provide their internal marks. In this work, we have proposed to evaluate employee's performance on the basis of different factors, by applying the compositional rule of inference using fuzzy Logic. The present work intends to approach their problem by taking the advantages of fuzzy inference technique in order to improve the employee incentives according to the level of their performance.

Performance appraisal can be defined as a structured formal interaction between a subordinate and his/her immediate supervisor. It usually has a periodic review, in which the work performance of the subordinate is examined and discussed. The appraisal also identifies the weaknesses and strengths as well as opportunities for self-improvement and skills development. In most cases, performance appraisal system is used by managers to evaluate the effectiveness and efficiency of employees and/or other resources within the organization. And also, the appraisal focuses upon the integration and achievement of individual targets, behaviour and performance at work as compared to the goals of the organization.

Performance appraisals are mainly used for judgmental and developmental purposes in order to make good administrative decisions. Performance measures are meant to provide more complete information about an individual's performance. Organizations depends on supervisors to sort out how well individuals under their supervisions perform. The hope is that supervisors can sort out the effects of job changes, collective action, their own likes and dislikes, to make an accurate judgment of how well individuals have performed over a period of time. However, this hope is rarely realized, the supervisors bring their own biases and information-processing problems to the task of performance appraisal, thus the appraisal are often defective. Therefore, the evaluation given may involve information of uncertainty and subjectivity.

In most performance evaluation, the process usually involves awarding numerical values or linguistic labels to employee performance. These values and labels are used to represent the employee's achievement by reasoning using arithmetical or statistical methods. In general, those methods can be classified using numerical score. These numerical scores may refer to another numerical interval-value that refers to a certain category of achievement, which is equivalent to 100 percent value. However, in most cases, the evaluation of employee performance may be influenced by the supervisor's experience, sensitivity

and standard. Thus, the scores awarded by the supervisor are only approximations and there is an inherent vagueness in the evaluation. However, if we looked into the evaluation using fuzzy logic approach, the performance of the employee involves the measurement of ability, competence and skills, which are fuzzy concepts that may be captured in fuzzy terms. Consequently, fuzzy logic approach can be implemented to manage the uncertainty information involved in performance evaluation.

II. FUZZY LOGIC –AN OVERVIEW:

Fuzzy set was proposed by Dr. Lofti Zadeh, a professor of Mathematics from University of California Berkley. According to him the human mind is to effectively employ modes of reasoning that are approximate rather than exact. Fuzzy logic is based on fuzzy set theory which is the extension of classical set theory where elements have varying degrees of membership. Sometimes in human reasoning, a logic based on two truth values i.e. true and false is inadequate. Where Fuzzy uses entire interval between 0 (false) and 1(true) to describe human reasoning. Basically fuzzy logic is a multivalued logic. It is a powerful problem-solving methodology which is a myriad of application in embedded control and information processing. Fuzzy provides a remarkably simple way to draw definite conclusion from vague, ambiguous or imprecise information. In a sense, fuzzy logic resembles human decision making with its ability to work from approximate data and find precise solution.

III. THE CONCEPT OF FUZZY IN PERFORMANCE EVALUATION OF AN EMPLOYEE:

According to professor Zadeh, “Words” or “Sentences” used in day to day conversation can be looked upon as the “linguistic variable” and can be assigned with “Linguistic values”. These values represent the gradual transition from high to low, true to false are called fuzzy variables. A set containing such variables is known as “Fuzzy Set”. The use of linguistic terms in assessing performance has been the main reason for researchers for applying Fuzzy Techniques in the process of employee performance. It has been argued that one of the most appropriate ways of handling multiple variables that contain imprecise data is to use Fuzzy logic reasoning which reflects the way of human thinking. Many researchers have reported work on the applications of Fuzzy logic in Education and Companies. They have presents a Fuzzy rule-based approach for aggregation of employee performance. A suitable fuzzy inference system and related rule has been discussed in this work. It provides the principle behind Fuzzy logic and gives how these principles could be applied by HR or managers to evaluate the employee’s performance.

In general, performance evaluation for employee involves several criteria. Grades accumulated from those criteria can then be judged into single decision. In this work, several linguistic labels for each criterion are proposed. This study explores the evaluation process using more than one attributes.

However, the success of the system especially on the fuzzy inference engine depends much on the experience of selecting membership function and mainly the fuzzy knowledge base. The more expert knowledge involved and validated the rules and membership function, then the more reliable its end result. Thus, as expert systems rely on expert knowledge, fuzzy system also needs expert experience to strengthen the decision rules and capable to handle imprecise value in its reasoning

IV. FUZZY INFERENCE SYSTEM:

Fuzzy inference system (FIS) are also known as a Fuzzy rule-based systems, Fuzzy model, Fuzzy Expert System. This is a main part of fuzzy Logic system. The decision making is an important part of the whole system. The FIS considers suitable rules and based upon the rules the decision is made. This is mainly based on the concept of Fuzzy If-Then rules and fuzzy reasoning. FIS uses “If-Then” statements and the connectors present in the rule “OR” and “AND” to make the decision rules. Here the max-min composition rule of inference is used to get the outputs.

A Fuzzy rule-based is a collection of knowledge in the If-Then format from experts. It describes the relationship between fuzzy input parameters and output. It is used to display how an output is dependent on any one or two or more of the inputs. The rule editor enables the user to define and edit the rules that describe the behavior of the system. As per the input and output parameters fuzzified, rule base is generated by applying reasoning to evaluate the performance of an employee.

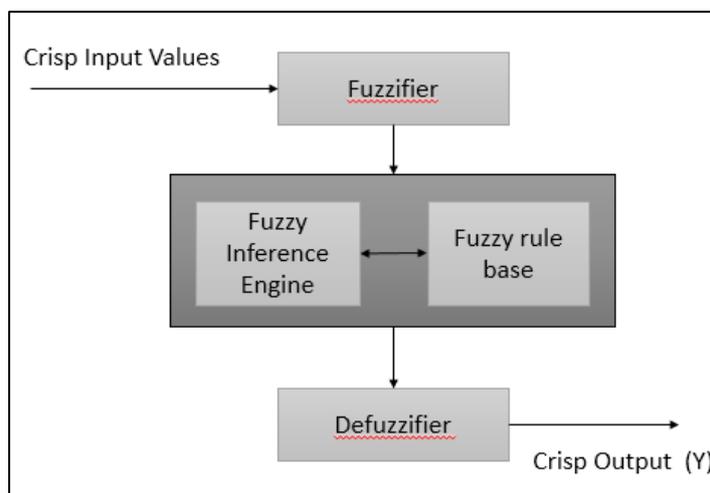


Figure 1: Fuzzy Logic Controller

V. METHODOLOGY:

Structure of a fuzzy logic controller:

In this work we have used the Mamdani model which is one of the most common fuzzy inference techniques. It takes crisp inputs and produces crisp outputs. The philosophy behind using a Mamdani rule base to model crisp system behaviour is that the rules for many systems can be easily described by humans in terms of fuzzy linguistic values. Thus we can effectively model a complex non-linear system, with common-sense rules with fuzzy variables. Below are the main steps in this model:

Step 1: Fuzzification - The first step is to take the crisp inputs and determine the degree to which these inputs belong to each of the appropriate fuzzy linguistic values.

Step 2: Rules evaluation - The fuzzified inputs are applied to the antecedents of the fuzzy rules. If a given fuzzy rule has multiple antecedents, the fuzzy operator (AND or OR) is used to obtain a single number that represents the result of the antecedent evaluation. The rules are formulated by calculating relation between the antecedents using MIN Operator ie. By Mamdani method. And outputs are obtained using Sup-Min method.

Step 3: Aggregation of the rule outputs - The membership functions of all rule consequents previously clipped or scaled are combined into a single fuzzy set.

Step 4: Defuzzification - The last step is to convert the fuzzy outputs in to crisp values. Here we have applied the most popular and accurate defuzzification method, the centroid technique.

The linguistic values as shown below:

Table 1: Linguistic Values

GRADE	LINGUISTIC VARIABLE
A	OUTSTANDING
B	EXCELLENT
C	GOOD
D	AVERAGE
E	POOR

As per step 1, this crisp values are converted into degree of membership (fuzzy values) and for this triangular membership function method is used. A fuzzy set A is called triangular fuzzy number with peak a, left width $\alpha > 0$ and right with $\beta > 0$ if its membership function has the following form,

$$A(x) = \begin{cases} 1 - \frac{a-x}{\alpha} & \text{if } a - \alpha \leq x \leq a \\ 1 - \frac{a-x}{\beta} & \text{if } a \leq x \leq a + \beta \\ 0 & \text{otherwise} \end{cases}$$

A triangular fuzzy number with center a, is represented as:

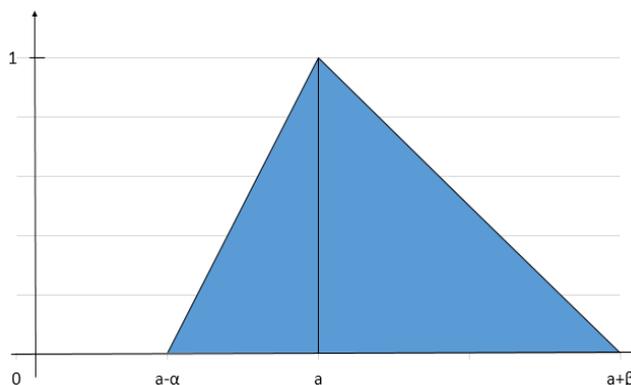


Figure 2: Triangular Fuzzy Number

Linguistic values represented in table 1 is converted into fuzzy values by applying the above mentioned triangular membership function method. The scale is taken from 0 to 100 with fuzzy values ranges from 0 to 1 where 1 as peak or center value. Table 2 represents triangular membership function values for the performance grade.

Table 2: Membership Function

Scale	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.2	.4	.6	.8	1
B	0	0	0	0	0	0	0	0	0	0	0	.2	.4	.6	.8	1	.8	.6	.4	.2	0
C	0	0	0	0	0	0	.2	.4	.6	.8	1	.8	.6	.4	.2	0	0	0	0	0	0
D	0	.2	.4	.6	.8	1	.8	.6	.4	.2	0	0	0	0	0	0	0	0	0	0	0
E	1	.8	.6	.4	.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

The membership degree graph is shown as:

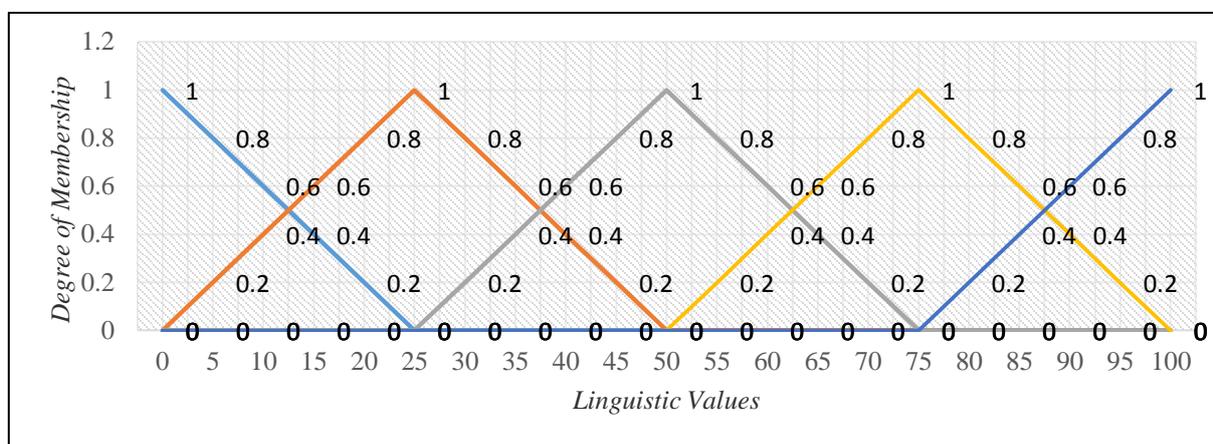


Figure 3: Linguistic Values

After reviewing evaluation criteria of various multinational companies and performance appraisal reports of different organizations evaluation parameters shown in Table 3 have been considered. The evaluation criteria are further split into goal measures to make the evaluation process simple and easy for the evaluator. Those goal measures are represented as antecedents in the fuzzy inference system.

Table 3: Goal criteria and measures

Criteria ID	Criteria Name	Goal Measure1	Goal Measure 2
1	Leadership Skill	Extracting Work	Dividing Work among People
2	Customer Satisfaction	Appreciations	Feedback
3	Following Process	Applying Standards	Complying with Policies

4	Work Achievement	Achieving Work Target	Contribution to Teamwork
5	Communication Skills	Negotiation Skills	Positive Approach
6	Continual Learning	Attending Trainings	Obtaining Certificates

Then multiple antecedents are combined to single input by using OR (MAX) operator. From the employee performance evaluation sheet result criteria “Leadership Skill” is taken here for which employee goal “Dividing Work among People” is taken as Antecedent 1 (AN1) and employee goal “Extracting Work” is taken as Antecedent 2 (AN2)

Antecedent 1 and Antecedent 2 are combined to form a single input criteria as shown below:

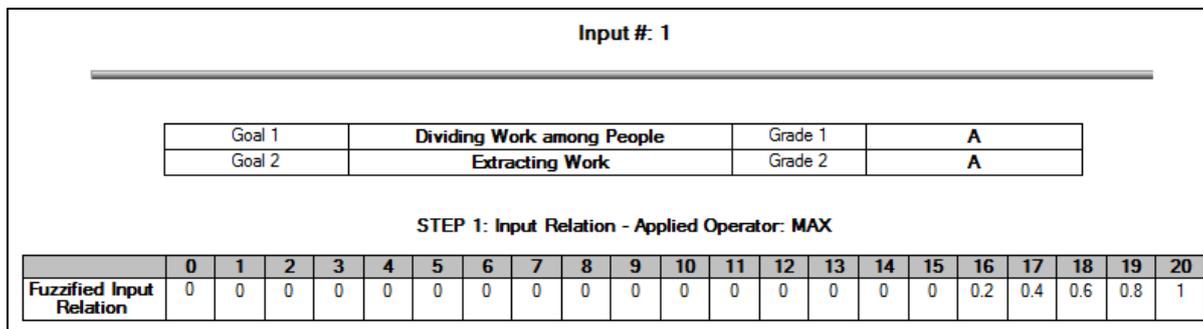


Figure 3: Input Relation for Input 1

Input relation for different set of antecedents are calculated and shown below.

Input #	AN1	G1	AN2	G2	R0	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20
1	Dividing Work among People	A	Extracting Work	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0.4	0.6	0.8	1
2	Feedback	A	Appreciations	B	0	0	0	0	0	0	0	0	0	0	0	0.2	0.4	0.6	0.8	1	0.8	0.6	0.6	0.8	1
3	Complying with Policies	A	Applying Standards	C	0	0	0	0	0	0	0.2	0.4	0.6	0.8	1	0.8	0.6	0.4	0.2	0	0.2	0.4	0.6	0.8	1
4	Achieving Work Target	A	Contribution to Teamwork	D	0	0.2	0.4	0.6	0.8	1	0.8	0.6	0.4	0.2	0	0	0	0	0	0	0.2	0.4	0.6	0.8	1
5	Positive Approach	A	Negotiation Skills	E	1	0.8	0.6	0.4	0.2	0	0	0	0	0	0	0	0	0	0	0	0.2	0.4	0.6	0.8	1
6	Attending Trainings	B	Obtaining Certificates	A	0	0	0	0	0	0	0	0	0	0	0	0.2	0.4	0.6	0.8	1	0.8	0.6	0.6	0.8	1

Figure 4: Input relation for set for inputs

Rule relation matrix for the antecedents are framed by using t-norm (MIN operator) and a total of 25 rule relations are formulated by combining 5 grades. Below figure shows the rule relation matrix for the input grade as both are taken as OUTSTANDING (A).

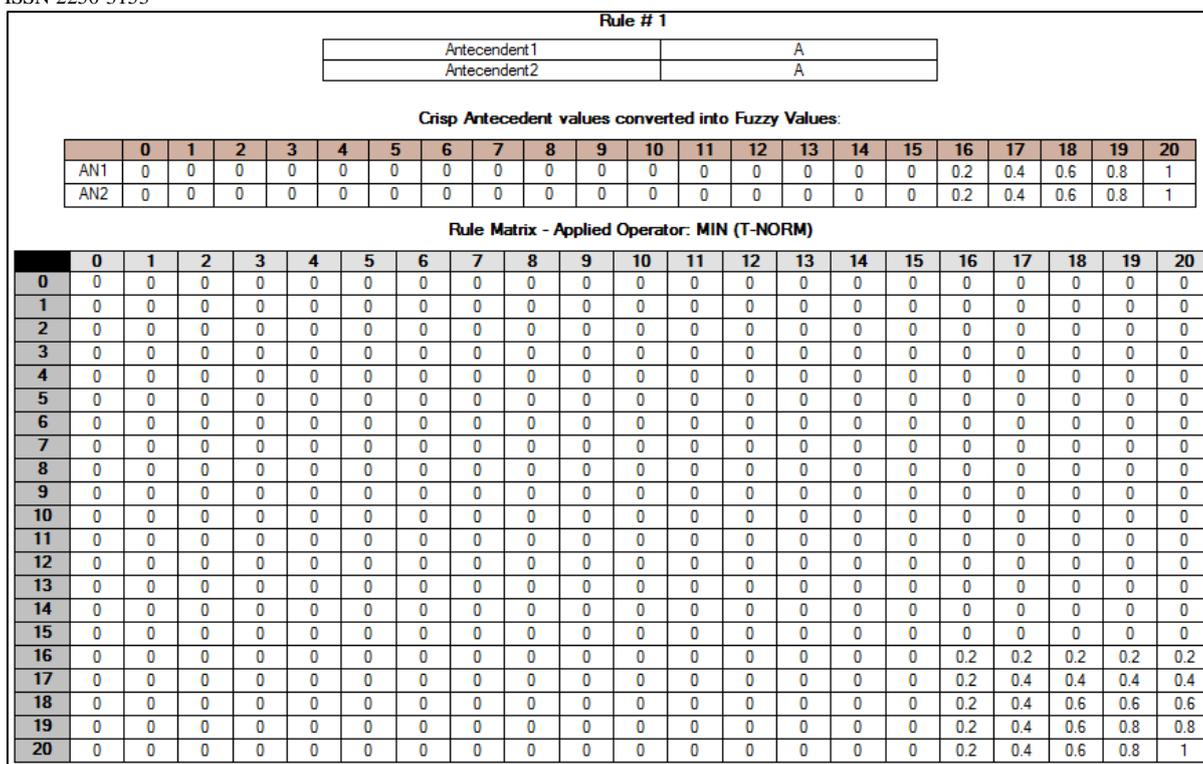


Figure 5: Rule matrix for Rule # 1

Rule relation matrix for different set of antecedent values shown in figure 6 and 7.

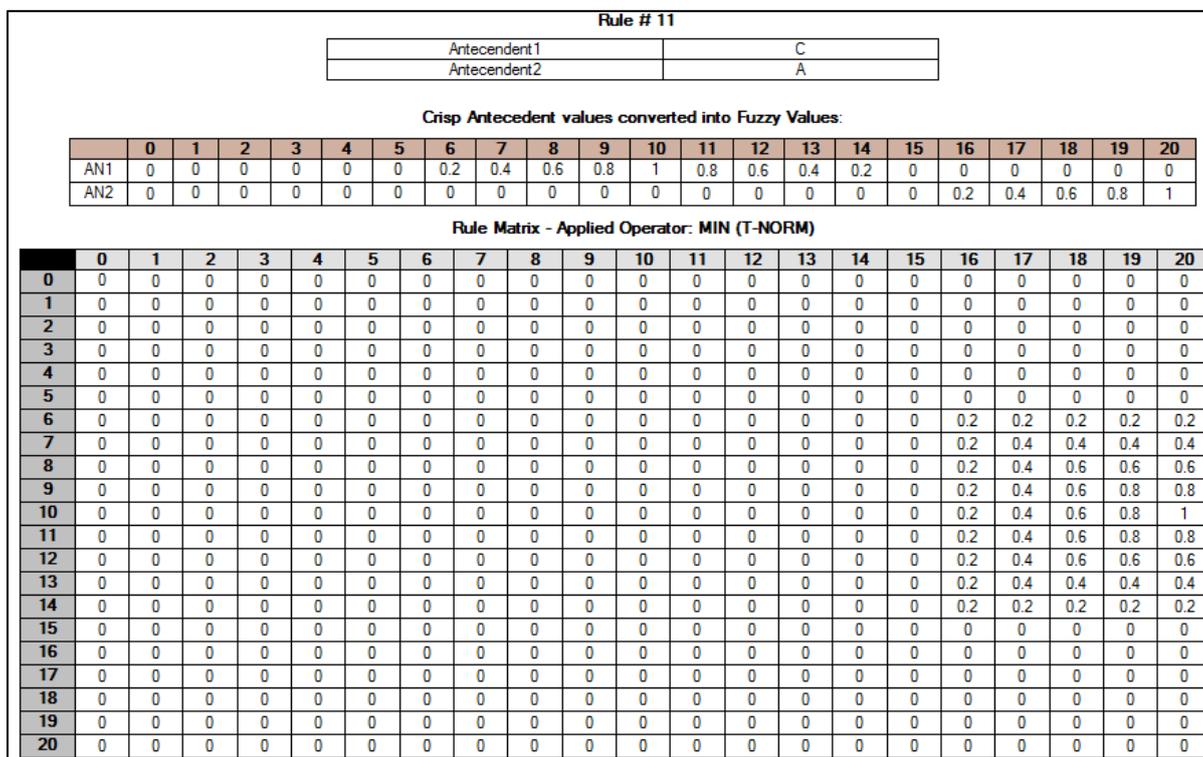


Figure 6: Rule matrix for Rule # 11

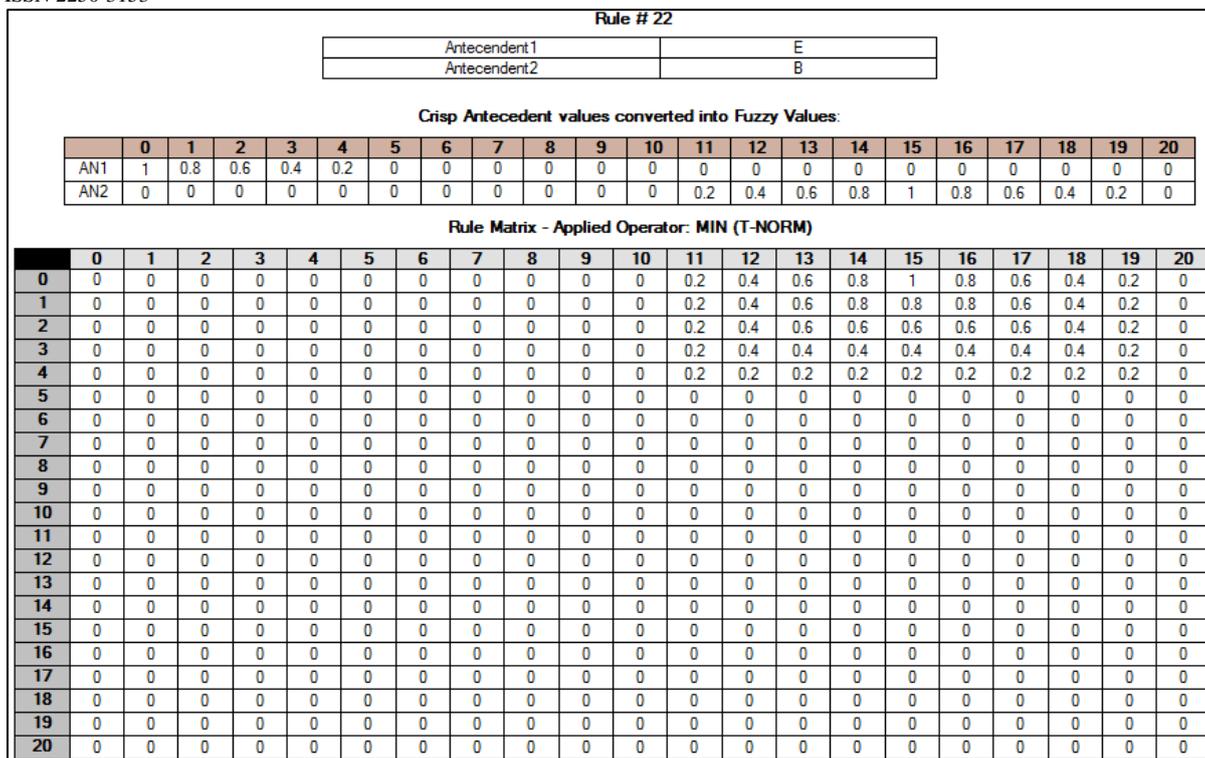


Figure 7: Rule matrix for Rule # 22

An algorithm is scripted using IBM Lotus script, which would automatically calculate the results of (Input o Relation) for all the 25 rules using Sup-Min method. The outputs obtained from Sup-Min operation for all the rules are then aggregated by Max operator. Then it is de-fuzzified using centroid method. The final output is obtained as below:

Table 4: Fuzzy Output

Output #	Result Criteria	Result Grade Rating
Y1	Leadership Skill	4.666666667
Y2	Customer Satisfaction	4.044117647
Y3	Following Process	3.3125
Y4	Work Achievement	2.53125
Y5	Communication Skills	2.5
Y6	Continual Learning	4.044117647
Y	Rating Summary	3.516441993

VI. CONCLUSION:

This study focuses on the implementation of fuzzy logic approach in the employee appraisal system. It emphasizes on the mapping of uncertainty data in performance measurement system into fuzzy values which consist of labels and confidence values. IBM Notes software is used to build the entire system. Here performance appraisal result is obtained for one employee by taking multiple goal criteria with two goal measures for each goal criteria. The obtained performance result which adds more value to the output instead of giving simple grading. It is important to point out that the aim of the proposed system is not to replace the current system of evaluating performance but it may be used to strengthen and improve the present system of evaluation by providing additional information for appraiser to make decision in performance evaluation and management of resources in an organization.

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Error Analysis in the Use of Simplex Method in Determining the Optimal Solution in Linear Programming

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Abstract- Simplex Method of Linear Programming is a repetitive optimizing technique to determine the possible output in order to maximize a profit in a business plan. A good foundation in Mathematics is the main tool in getting the solution. Many papers aimed to find out the Mathematics performance and the factors affecting the learner's performance and yet this problem remained unsolved. The objective of this paper is to analyze the common errors committed by the Second Year Bachelor of Science in Accountancy students at the University of Northern Philippines. The scores of the written examination of the respondents were interpreted using error analysis. It was found out that the common errors are: basic application of the operations of numbers, determining the entering variable, miscopied values, incomplete variables in the final answer, and unfinished solution. These errors maybe due to ignorance to the rules in applying the simplex method. The study recommends giving higher percentage to basic operations in the total score of the written examination of students, Furthermore, the College should give seminars to the Accountancy students on how to manage their time in solving Mathematical problems.

Index Terms- Error Analysis, Simplex Method, Optimal Solution

I. INTRODUCTION

Situation Analysis
One of the challenges that Mathematics mentors is facing today is on how to give a quality education. There had been many studies in the factors affecting the Mathematics performance of the students and many recommendations had been made but still the problem in the Mathematics performance of the students remains a problem. These recommendations done by previous researchers may help minimize the problem but not actually solving the problem. One of the factors could be the fact that the idea of Mathematics is purely computations and thus affecting the students' performance. They forgot to realize that these computation skills they learn in Mathematics is actually a tool to solve life real situations,

Linear Programming is a method of dealing with decision problems that can be expressed as constraints linear models. The primary objectives of all linear programming models are certainly of the parameters and linearity objectives of the objective function and all constraints as mentioned by Sirug [1].

The simplex method of linear programming is a repetitive optimizing technique. It repeats the process of mathematically

moving from an extreme point to another extreme point until an optimal solution is obtained according to Victoriano [2].

One reason why students get the answers incorrectly is because of errors that they do in solving problems. Some of the many are operations on sign numbers, operations on fraction and giving the correct final answer. It is the aim of this study to analyze the common errors committed by the Bachelor of Science in Accountancy second year students in solving optimal solution using simplex method. The findings of this study may help minimize these common errors by reiterating to them the rules in performing operations. This may help them solve linear programming problems with mastery and accuracy.

II. FRAMEWORK OF THE STUDY

As mentioned by Li [3], student's errors are the symptoms of misunderstanding. Among many different types of errors, systematic errors occur to many students over a long time period and is relatively easy and thus possible to research with current knowledge and tools. The cause of systematic errors may relate to students' procedure knowledge, conceptual knowledge and tools. The case of systematic errors may relate to students' procedure knowledge, conceptual knowledge, or links between these two types of knowledge. An error can be a mistake, blunder, miscalculation, or misjudge and such category fails under systematic errors.

Cohen [4] said that the purposes of error analysis are to (1) identify the patterns of errors or mistakes that students make in their work, (2) understand why students make the errors, and (3) provide targeted instruction to correct the errors. When conducting an error analysis, the teacher checks the student's mathematics problems and categorizes the errors. The following is a list of errors that students commonly make in various mathematical areas.

The College of Business Administration and Accountancy is screening their students, in particular the Bachelor of Science in Accountancy every semester. It can be concluded that those who passed the screening successfully are knowledgeable enough to meet the academic requirements of the course. It is with this assumption that these students have good foundation in their Mathematics which is actually required in their course. Having this background, the mistakes they commit during exam is not actually of the reason that they do not know how to perform the operation but fails to analyze the error they had committed. Because of this reason that this study was made, that is to determine the common errors committed in solving for the

optimal solution of a linear programming problem. The errors.
result of this study may be minimize if not eliminate the common

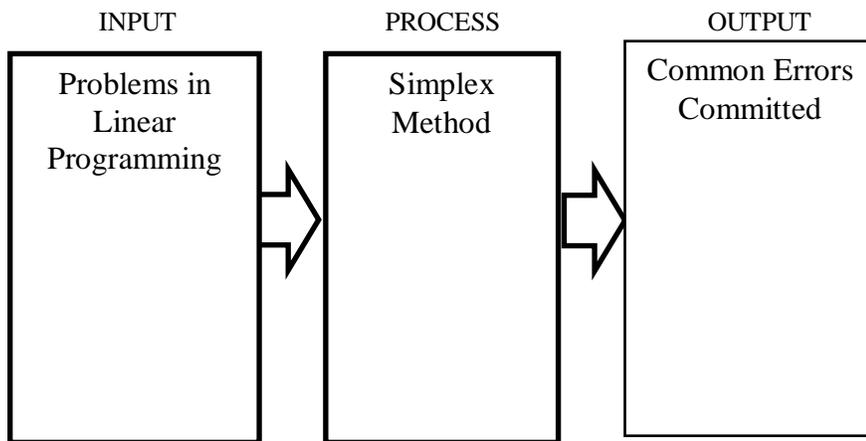


Figure 1: Common Errors Committed by the BSA Second Year Students

Linear Programming Problems were given to the respondents and they are to solve for the optimal solution using the simplex method. The common errors committed by the respondents were identified and analyzed.

Statement of the Problem

This study aimed to analyze the common errors in solving optimal solution using the Simplex Method of the second year accountancy students at the University of Northern Philippines during the second Semester of School Year 2015-2016.

Specifically, it sought to answer the following questions: What are the common errors committed by the respondents in solving the optimal solution using the simplex method? What is the weakness of the respondents in solving the optimal solution using the simplex method?

The Review of Literature

This part consists of the summary of studies of several researchers which were considered relevant to this study.

Errors in mathematics may arise for a variety of reasons. They may be due to the pace of work, the slip of a pen, slight lapse of attention, lack of knowledge or a misunderstanding. Some of these errors could be predicted prior to a lesson and tackled at the planning stage to diffuse or un-pick possible misconceptions. In order to do this, the teacher needs to have the knowledge of what the misconception might be, why these errors may have occurred and how to unravel the difficulties for the child to continue learning.

(<https://www.ncetm.org.uk>)[5]

Optimization, also called mathematical programming, helps find the answer that yields the best result--the one that attains the highest profit, output, or happiness, or the one that achieves the lowest cost, waste, or discomfort. Often these problems involve making the most efficient use of resources--including money, time, machinery, staff, inventory, and more. Optimization problems are often classified as linear or nonlinear, depending on whether the relationship in the problem is linear with respect to the variables.(<http://www.gurobi.com>)[6].

Research Design

This study made use of the descriptive method of investigation. This design aims to gather data from existing conditions. Further, the qualitative design was also used. This is appropriate for the study since it made use of quantitative techniques to show the errors of the students in solving linear programming.

Sources of Data

The population of this study were the second year Bachelor of Science in Accountancy (BSA) students. Section A with 39 students. The topic was taken from the course Quantitative Technique in Business. Specifically, the topic on Linear Programming in getting the optimal solution using the simplex method. Only the maximization problems were considered. This was taken during the second semester of school year 2015-2016.

Instrumentation and Data Collection

An examination was given to the students with three items that was taken from the course book on Basic Quantitative Methods for Business. The three problems were taken from Chapter Three of the said book whose topic is on linear programming on simplex methods particularly on standard linear programming model involving maximization problem. The first problem deals with two variables whose numerical coefficients are whole number, the second problem consists of three variables with whole numbers as numerical coefficient, and the third problem has three variables wherein the numerical coefficient of the optimal solution is decimal number.

Analysis of Data

The data gathered and collected were subjected for analysis and interpretation using the appropriate statistical tool. The raw data were gathered and tabulated for easier understanding. The frequency was used to present the common errors committed by the respondents and rank was used to present the weakness of the respondents in linear programming by simplex method.

III. RESULTS AND DISCUSSION

The test given to the students consists of three items. The first item is a two variable problem wherein x_1 and x_2 were considered. This is a basic problem and a good way to determine the common error of the respondents.

Problem 1: Maximize $100x_1 + 80x_2$
 Subject to : $4x_1 + 2x_2 \leq 100$
 $2x_1 + 4x_2 \leq 140$
 $x_1, x_2 \geq 0$

The first error identified that is common in the first problem is determining the entering variable.

The students failed to write the correct entering variable. This is one of the steps in solving standard linear programming maximization model using simplex method. The entering variable is identified from the previous tableau constructed to determine the pivot row and column. This is the column wherein it intersects with the pivot row.

In the study of Egodowatte [6], the result indicated a number of error under variable, the main reason was lack of understanding of basic concept of the variable in different context.

The second error that was identified was the incomplete values for the all variables in the final answer. The student failed to realize that he has two variables and therefore must have values for each of these variables in the final answer. Students usually fail to write the value of a certain variable when it is equal to 0.

This is the same with the study of Nasser [7] which revealed that some of the errors and misconceptions were due to lack of conceptual understanding whereas others were due to lack of procedural fluency.

The third error was on multiplication of numbers. The student fails to give the correct product in multiplying a series of number to one number outside the parenthesis.

There are five test papers which were submitted that was not solved completely. One factor could be, the students do not have time to continue solve the problem or they do not know the next step to be done.

In the study of Siniguan [8] the data gathered were analyzed to explore difficulties faced by students when solving problems. The major results of the study showed that the student's difficulties are on the inability to translate problem into mathematical form and inability to use correct Mathematics.

Problem 2: Maximize: $P = 50x_1 + 100x_2 + 150x_3$
 Subject to: $2x_1 + 2x_2 \leq 200$
 $3x_3 \leq 150$
 $4x_1 + 4x_3 \leq 600$
 $x_1, x_2, x_3 \geq 0$

The second problem consists of three variables x_1, x_2 , and x_3 .

The first common error identified in solving this three variable problem is the same as the first problem which was the replacement of the entering variable.

Most people would say that a careless error is one that could have easily been prevented if only they had paid a bit more attention to what they were doing as mentioned by Marcinat [9]

The second common error in the solution of the second problem is the application of division. They forgot that multiplication and division by zero to any number gives the product or quotient of zero.

The third common error is writing the correct numerical coefficient of the variable in the tableau. This error is due to lack of presence of mind of the student. It could be because the student is not focused on the problem he is solving or he is overwhelmed with the steps that he has to perform in order to obtain the optimal solution. As mentioned by Elbrink [10] carelessness and lack of attention can result in calculation errors. Procedural errors occur when a student computes or applies a procedure incorrectly. These types of errors suggest that students do not understand the concept related to the procedure. As a result, students do not have an understanding of why or how a procedure works; therefore, students do not recognize the importance applying and computing the procedure correctly.

Another error is rule violation in performing the test ratio, identifying the intersectional element of the pivot column and pivot row that the student is working with.

Lastly, in this problem, the common mistake committed was conversion of fraction to decimal number.

Problem 3: Maximize: $P = 10.50x_1 + 11.75x_2 + 10.50x_3$
 Subject to: $5x_1 + 12x_2 + 8x_3 \leq 1400$
 $7x_1 + 9x_2 + 9x_3 \leq 1250$
 $4x_1 + 3x_2 + 6x_3 \leq 720$
 $x_1, x_2, x_3 \geq 0$

The first error that was identified in this problem is performing the operation on division.

Before children attempt formal division calculations, they need to understand the process of repeated subtraction, or the 'measurement model' (Owens, 1993). This model is vitally important as later written methods will be based upon it. (Stated in <https://www.ncetm.org>) [11].

The second common error is the miscopied entry. Again this may be because the student is not focused on his work or we may say that the students cannot work and think well under time pressure since this is the last item to be solved within the period. There were ten of the respondents who did not finish solving the problem. This means that the students need more time to think and comprehend the steps in solving optimal solution using simplex method.

Weakness of the respondents in solving the optimal solution using the simplex method

Table 1 presents the summary of the common errors committed by the respondents in solving the optimal solution using simplex method.

TABLE I: Summary of the Common Errors Committed by the Respondents

Kinds of Error	Frequency	Rank
Wrong Value of the entering variable	13	4.5
Miscopied entry from previous solution	18	1
Wrong Quotient	16	2
Unwritten variable	13	4.5
Wrong entry of numerical coefficient	14	3
Wrong entry of entering Variable	9	6

It is shown from the table that there are 6 common errors committed by the respondents. It could be noted that the top 3 common errors are miscopied entry from previous solution, wrong quotient, and wrong entry of numerical coefficient. It can be said that the common errors of the respondents are result of their being careless, not focused and not analyzing what they are solving.

IV. CONCLUSION

This research tried to analyze the common errors in solving optimal solution using simplex method.

Specifically, it identified the common errors committed by the respondents and their weakness in solving optimal solution using simplex method.

This study made used of descriptive method of investigation. The quantitative design was also used. The 39 Bachelor of Science in Accountancy was used as the respondents of the study. The questionnaire used to gather the data was constructed by the researcher. It consisted of three items taken from the course book of Math 114 (Quantitative Technique in Business).

The following are the findings of the study: The common error committed on the first question consisting of two variables were determining the entering variable, incomplete values in the final answer, multiplication of numbers, lack of time. The same error was done in the second question with three variables. There is also an error identified in the division of numbers and wrong entry of numerical coefficient. On the third question, all the errors in the first and second was also committed. The third

question consisted of three variables with the optimal solution of having decimal numerical coefficients.

The weakness of the respondents is Miscopied entries from the previous solution with a frequency of 18 and which ranked first as the common error.

Based from the results of the study, the common errors committed by the BSA second year students are determining the entering variables, wrong final answer, incorrect multiplication and division, and other errors which are categorized as violation to the rules of the simplex method.

As reflected from the findings, the weakness of the respondents is the result of their being careless in solving optimal solution using simplex method and inability to work with accuracy even under time pressure.

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A Study on different types of Super plasticiser used for Self-Compacting Geo-polymer Concrete.

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Abstract- This paper presents an experimental study of the influence of different superplasticizer on compressive strength at 7th and 28th days with its flow test characteristics, this concrete is prepared with fly ash based self-compacting geopolymer concrete (SCGC). Two superplasticiser (SP) were taken for the comparison, which are being generally used and easily available in market.

MasterGlenium ACE 30 is an innovative second generation of polycarboxylic ether polymers superplasticiser.

Vs.

Conplast SP550 is based on Sulphonated Naphthalene Polymers and is supplied as a brown liquid instantly dispersible in water.

Both SP were added in same quantity and same mix design, both different SP mixes were ideal to each other for pre-mixing, during mixing and post mix operations.

Amount of plasticiser and the type of plasticiser used are making major concentration points. Which is shown in this paper. This behaviour of plasticiser is tested on the all 8M, 12M and 16M mixes, flow test and 7th, 28th and 90th days strength are compared and on that basis conclusions are given.

Index Terms – Comparison of superplasticiser, Molar concentration in Self compacting Geo-polymer concrete, Self compacting Geo-polymer concrete.

I. INTRODUCTION

Geopolymer concrete (GC) is one of the recently developed construction material which in next future could partially re- place cement from concrete industry. Geopolymer comprises of two main components, namely the source materials and the alkaline liquids. The source material must be rich in silica (Si) and alumina (Al) content to have a full potential to be used for alumino-silicate based geopolymer concrete. The by-product materials, such as fly ash, rice husk ash or silica fume and GGBS or natural minerals such as kaolinite and clay could be used as source materials. The alkaline liquids could be from soluble alkali metals that are usually sodium or potassium based solution and the most common alkaline liquid used in GC is a combination of sodium hydroxide (NaOH) or potassium hydroxide (KOH) and sodium silicate (Na₂SiO₃) or potassium silicate (K₂SiO₃). Self-compacting geopolymer concrete (SCGC) can be considered as an advanced and innovative construction material in the concrete technology. As the name implies, it does not need any

compacting efforts to achieve full compaction and utilizes fly ash together with alkaline solution and super plasticizer as a binder for matrix formation and strength. The geopolymer paste is used to bind the loose coarse aggregates, fine aggregates and other unblended materials together in the presence of super plasticizer to attain the required workability for SCGC. This improved concreting operation, which could offer many benefits and advantages over conventional concrete. These include; ease of filling in restricted and narrow sections, enhanced consolidation around reinforcement and bond with the reinforcement, better quality of concrete, reduction of on-site maintenance, faster rate of construction, lower overall costs, and improved concreting operation. A significant progress of health and safety could also be achieved through reduction of CO₂ emission due to elimination of Portland cement production, suspending the use of vibrators and considerable minimization of environmental noise loading on and around a construction site.

The sustainable production of self compacting geopolymer binder hinges on controlling the mix proportion, determining the right quantities of NaOH and Na₂SiO₃ solution required to activate the source material Fly Ash and optimizing the super plasticizer dosage. The composition of SCGC mixes includes substantial proportions of fine-grained inorganic materials and this gives possibilities for utilization of mineral admixtures such as fly ash, which are currently waste products with no practical use and are costly to dispose-off. The particles fraction of size less than 0.125 mm is considered as the fines content of the geopolymer paste and should also be taken into consideration in calculating the water to geopolymer solids ratio because the water to geopolymer solids ratio is an important parameter to control the workability as well as the compressive strength of SCGC. Moreover, the fine aggregates significantly affect the fresh properties of SCGC than the coarse aggregate. In self-compacting concrete (SCC) mixes, it is believed that the high volume paste helps to minimize the friction between the sand particles and enhance the workability and use of improved particle size distribution is also very important. Self-compacting concrete mix design methods mainly use blended sands to achieve an optimized aggregate grading curve. The major role of super plasticizer in SCGC is to get adsorbed on to binder grains, impart a negative charge to them, which repel each other and get deflocculated and dispersed. This gives better work- ability and superior performance for the SCGC by improving the plastic and hardened properties, enhances the microstructure and leading to higher compressive strength. Similarly in cement based SCC, super plasticizer is used to produce flowable concrete in cases where placing in hard to reach areas or locations.

A. Materials Used:

Fly ash: Low calcium dry fly ash Containing 80% silicon and aluminum constitutes.

Alkaline liquid: Contribution of sodium silicate solution, and sodium hydroxide solution.

Aggregates: Local coarse aggregates like 20 mm, 14mm, 7mm and fine aggregates in saturated surface dry condition.

Super plasticizer: To improve workability, high range water reducing naphthalene based and polycarboxylic based super plasticizer is used.

SP dosages of 3%, 4% and 5% were found insufficient to produce the required workability such as flow- ability and resistance to segregation. However, mixes with super plasticizer dosage of 6% and 7% provided the desired workability properties and were within the range of EFNARC limits of SCC.

Water: To improve workability or to maintain the ratios which affect strength, Pure potable water having ph near to 7.

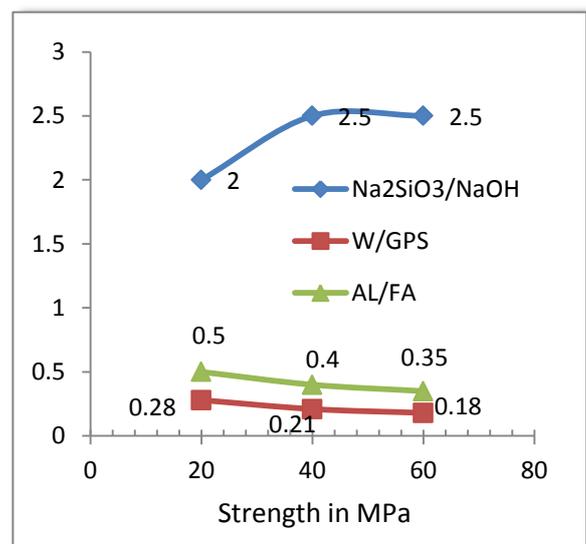


Figure 1 Main 3 ratios of GPC & its relation to strength of geopolymer concrete in normal curing conditions.

1. Water to Geopolymer Solids Ratio (W:GPS)

The W and GPS components are the total of water (from sodium silicate, sodium hydroxide and any extra water) and geopolymer solids (from fly ash, sodium hydroxide solids and sodium silicate solids) respectively. Testing has shown that the compressive strength of GPC increases as the W:GPS ratio by mass decreases, while the workability expectedly decreases. This is universally agreed upon by GPC researchers.

2. Alkaline Liquid to Fly Ash Ratio (AL:FA)

This ratio, second to the W:GPS, forms the second important ratio in the mix design of GPC. There is an interconnectivity between the ratios of W:GPS and AL:FA, therefore generally as AL:FA increases compressive strength increases. In some studies, AL:FA has been kept constant.

3. Ratio of SS to NaOH Solution (Na₂SiO₃:NaOH)

The Na₂SiO₃:NaOH solutions ratio, which then also affects the W:GPS and AL:FA ratios, is important as it contributes to the properties of the alkaline liquid which is the activator in the binder-producing reaction in any GPC. It is unanimously agreed upon that as this ratio increases so too does the compressive strength. This ratio has been bracketed as NaOH is costlier than Na₂SiO₃, and research of very high ratios (above 2.5) has not been carried out.

4. Molar Concentration of Sodium Hydroxide

A second parameter that affects the quality/content of the alkaline liquid is the molar concentration of NaOH. Experimental results from previous research have all shown that a higher concentration in the NaOH solution results in higher compressive strength Effects of a concentration greater than 16M have not been investigated yet.

This graph pericularly shows, the main 3 ratios which affects, major properties of SCGC or normal geo-polymer concrete.

Density of SCGC is in range of 2450-2600kg/m³.

II. MIX DESIGN

SCGC			Kg per m ³
		Fly ash	400
		CA	780
		FA	870
		Na₂SiO₃	143
Molar Concentration	16	NaOH solution total	57
		Solid	25.308
		water	31.692
		SP	28
		Extra water	48

In this mix design like wise 16M, 8M and 12M can be made for low strength.

The mass of NaOH solids was measured as 444 grams per kg of NaOH solution with a concentration of 16 M. Similarly, the mass of NaOH solids per kg of the solution for other concentrations was measured as 8 Molar: 262 grams, 10 Molar: 314 grams, 12 Molar: 361 grams, and 14 Molar: 404 grams.

Same mix design was done with both SP polycarboxylic and Naphthalene based super plasticiser.

III. Results

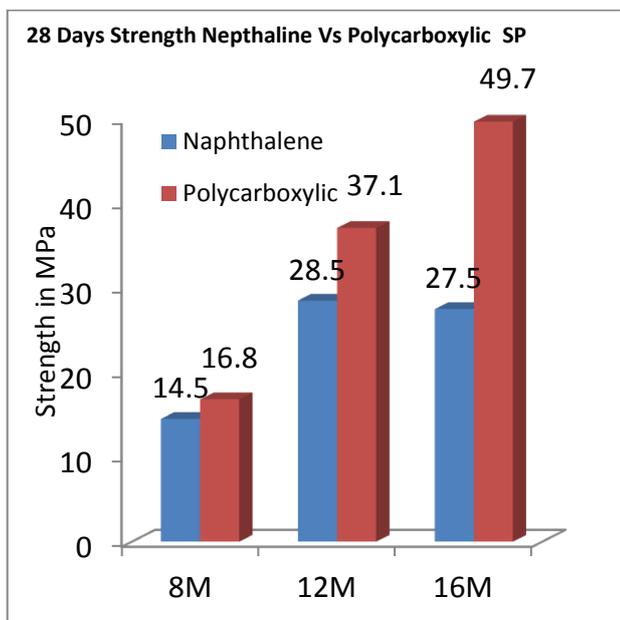


Figure 2 results of two similar mix designs with different SP, in that polycarboxylic based SP is ahead.

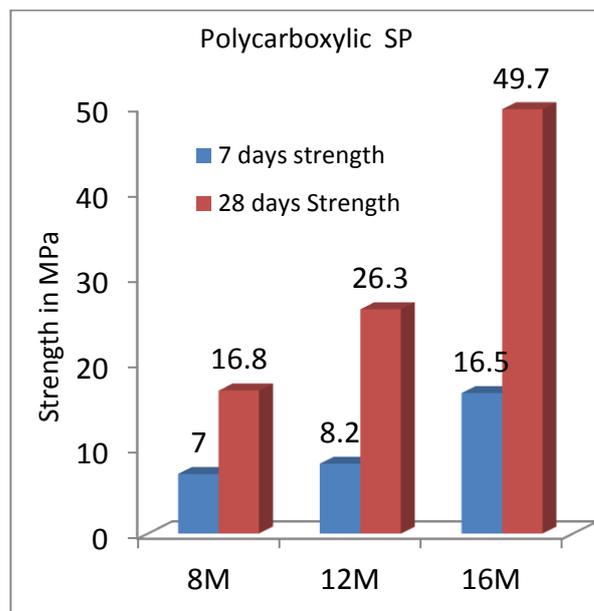


Figure 4 Separate result of Mix design with polycarboxylic SP

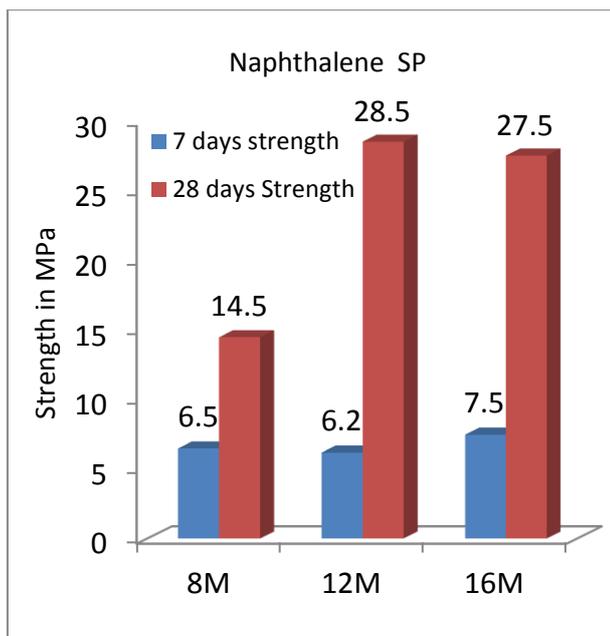


Figure 3 Separate results of Naphthalene SP for 7th and 28th day strength result

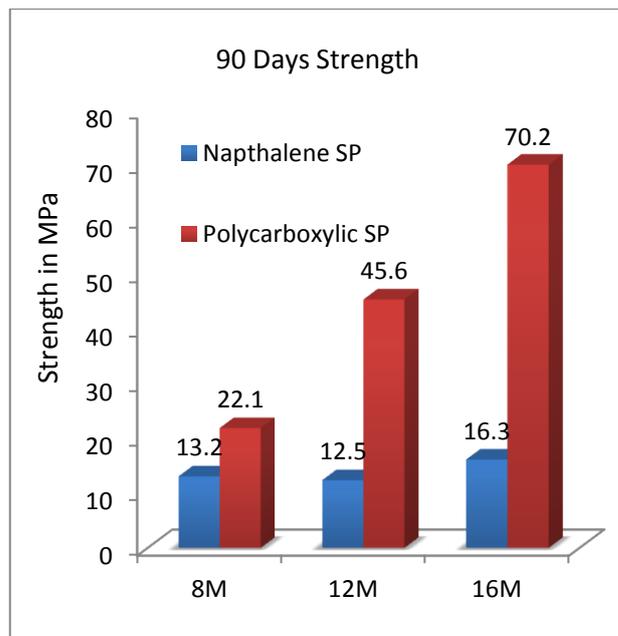


Figure 5 90 Days Strength comparison Polycarboxylic SP Vs. Naphthalene SP

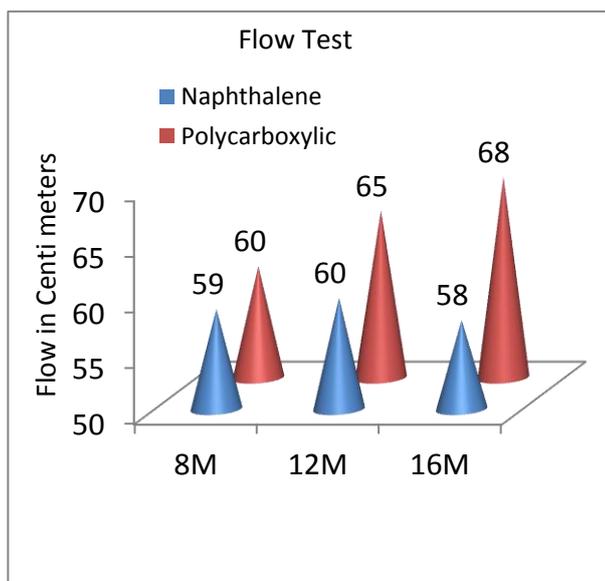


Figure 6 Here SP dosages was same for both SP and each mix but still variation is observed in the flow test result, moreover in flow test also polycarboxylic SP is performed well

IV. CONCLUSIONS:

1. It is clear that the polycarboxylic SP is more suitable SCGC in all aspects.
2. Also cube surface and setting of the concrete were comparatively better observed in case of polycarboxylic SP.
3. More-over 90 days strength was also reduced in the usage of the naphthalene based SP.
4. Behaviour at 90 days of naphthalene SP was not desirable, so it is not advisable to use naphthalene based SP.

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Edge Detection Through Integrated Morphological Gradient and Type 2 Fuzzy Systems

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Abstract—We present, in this paper, effective edge detection methods using type 2 fuzzy inference systems which are known for their uncertainty handling ability. These methods are clubbed up with morphological gradient to enhance their edge detection capabilities. We emphasize on the application of generalized type 2 fuzzy system to the image and detection of edge. We then compare the Morphological Gradient with the type 1 fuzzy system, integrated interval type 2 fuzzy system (Interval type 2 fuzzy logic applied upon Morphological Gradient Technique) and generalized type 2 fuzzy system (Generalized type 2 fuzzy logic applied upon Morphological Gradient Technique). Also these edge detectors are tested on images added with 0.001 white gaussian noise and salt and pepper noise. Recall, precision and PFOM are also calculated for each system and compared.

Keywords—Morphological Gradient, Sobel, Laplacian of Gaussian, Fuzzy Logic, Mamdani, Fuzzification, Type Reduction, Defuzzification.

I. INTRODUCTION

An edge may be the result of changes in light absorption, its shade, texture and color, and these changes can be used to determine the depth, size, positioning, alignment and surface properties of a digital image. An edge is not only the boundary between an object and the background, but also the boundary between overlapping objects. In analyzing the image digitally, edge detection involves filtering extraneous and immaterial information to select the edge points. The detection of minute changes, which may be mixed up by noise, depends on the pixel threshold of change that defines an edge. Detection of such continuous edges is very strenuous and time consuming especially when an image is corrupted by noise[1].

Edge detection of an image reduces significantly the amount of data and filters out information that may be regarded as irrelevant, preserving the important structural properties of an image[2]. Therefore, edges detected from the original image contain major information, which can be stored in very less space than the original image. The main goal of the vision systems based on computational intelligence techniques is to achieve better edge detection when image processing is performed under high noise levels

The main application areas of edge detection include geography, military, medicine, robotics,

meteorology and pattern recognition systems[3][4][5][6]. The paper is organized as follows. The integrated fuzzy system is described in section II and the simulations and results are shown in section III. Section IV and V give the conclusion and future scope respectively.

II. FUZZY LOGIC APPROACH

Various edge detection methods have been developed in the process of finding the perfect edge detector. Most of these can be categorized as gradient based and laplacian based edge detectors[7]. In this paper, a type 1 fuzzy system and two type 2 fuzzy systems are implemented.

The first step in the process is determining if the image is a color image and converting it into a grayscale image for the sake of simplified analysis. To this extracted grayscale edge map, we apply the morphological gradient.

A. Morphological Gradient

The morphological gradient can be defined as the difference between intensity values of two neighboring pixels that belong to a given structural element, for a gray scale image. A classic definition of morphological gradient is given in (1)

$$\nabla(f) = \delta_g(f) - \varepsilon_g(f) \quad (1)$$

We use D instead of $\nabla(f)$. The coefficients z_i are calculated as shown in Fig. 1 and Fig. 2 shows the directions in which the difference in intensity values are calculated using eq 2. The edge S, for one pixel, is calculated with eq 3 by summing up the difference of intensity values calculated in all 4 directions for that pixel[8].

$$D1 = \sqrt{(z_5 - z_2)^2 + (z_5 - z_8)^2} \quad (2a)$$

$$D2 = \sqrt{(z_5 - z_4)^2 + (z_5 - z_6)^2} \quad (2b)$$

$$D3 = \sqrt{(z_5 - z_1)^2 + (z_5 - z_9)^2} \quad (2c)$$

$$D4 = \sqrt{(z_5 - z_3)^2 + (z_5 - z_7)^2} \quad (2d)$$

$$S = D1 + D2 + D3 + D4 \quad (3)$$

$z_1 = f(x-1, y-1)$	$z_3 = f(x+1, y-1)$	$z_3 = f(x+1, y-1)$
$z_4 = f(x+1, y)$	$z_5 = f(x, y)$	$z_6 = f(x+1, y)$
$z_7 = f(x-1, y+1)$	$z_8 = f(x, y+1)$	$z_9 = f(x, y+1)$

Figure 1 3x3 matrix indicating the coefficients Z_i .

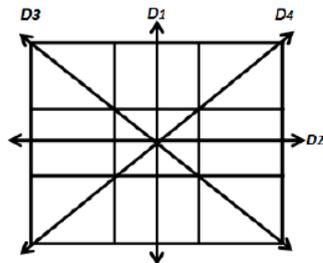


Figure 2 3x3 matrix indicating the directions D_i

B. Fuzzy Inference System

The basic difference between integrated type 2 fuzzy system (IT2FS) and generalized type 2 fuzzy system (GT2FS) is that for each value, the membership degree at each point in the uncertain range is 1 or equal in IT2FS and different in GT2FS [9][10]. It is depicted in Fig 3, 4 respectively.

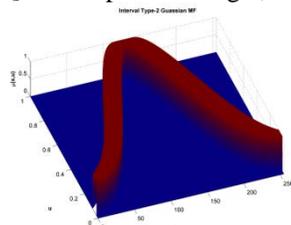


Figure 3 Interval type 2 membership function

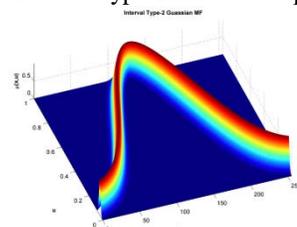


Figure 4 Generalized type 2 membership function

The outputs D_i of the morphological gradient, are given as the inputs to the generalized type 2 fuzzy inference system. The basic block diagram of fuzzy inference system is shown in Fig 5. The crisp inputs are fuzzified using the fuzzification process where the fuzzy sets are created based on the

gray scale value of images and membership functions are assigned [11]. The membership functions are shown in figure (4). Gaussian membership functions are used in the entire approach.

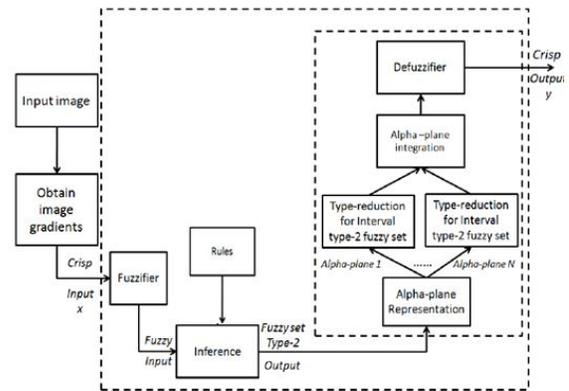


Figure 5 Block diagram of generalized type 2 fuzzy inference system.

$$low_i = \min(D_i) \tag{4}$$

$$high_i = \max(D_i) \tag{5}$$

$$medium_i = low_i + (high_i - low_i)/2 \tag{6}$$

$$\sigma_i = high_i / 5 \tag{7}$$

$$edge_i = 1 \tag{8}$$

$$no_edge_i = 0 \tag{9}$$

$$\sigma_i = edge_i / 4 \tag{10}$$

$$m_1 = high_i, m_2 = m_1 + FOU \tag{11}$$

$$\tilde{\mu}(x) = [\underline{\mu}(x), \bar{\mu}(x)] = igausmtype2(x, [\sigma_x, m_1, m_2]) \tag{12}$$

$$m_x = \frac{m_1 + (m_1 * FOU) + high_i}{2} \tag{13}$$

$$m_x = \frac{m_2 + m_1}{2} \tag{14}$$

$$\sigma_u = \frac{\delta}{2\sqrt{6}} + \epsilon \tag{15}$$

$$p_x = gaussmf(x, [\sigma_x, m_x]) = \exp[-\frac{1}{2}(\frac{x-m_x}{\sigma_x})^2] \tag{16}$$

$$\tilde{\mu}(x, u) = gaussmf(u, [\sigma_u, p_x]) = \exp[-\frac{1}{2}(\frac{x-p_x}{\sigma_u})^2] \tag{17}$$

The Gaussian membership functions for each D input are obtained using eq (12)–(17), and the means of each function are obtained with eq (11) and the σ value is obtained with (7). The inference system has one output S (the edge), the linguistic values used for the output are: *edge* and *no_edge*, and we selected the range $[0, 1]$, since the input image was normalized in this range, where the minimum value for the output is represented by (9) and maximum by (8). The Footprint of uncertainty (FOU), is assumed a random value between 0 and 1. In Fig. 6, we show

the linguistic variables with generalized type-2 membership functions.

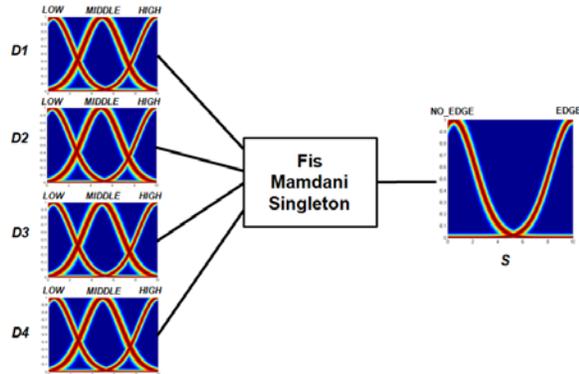


Figure 6 Generalized type 2 fuzzy membership functions for input and output.

Next, we use 3 rules that help describe the existing relationship between the image gradients. The fuzzy rules are the following.

- a) If (D1 is HIGH) or (D2 is HIGH) or (D3 is HIGH) or (D4 is HIGH) then (S is EDGE)
- b) If (D1 is MEDIUM) or (D2 is MEDIUM) or (D3 is MEDIUM) or (D4 is MEDIUM) then (S is EDGE)
- c) If (D1 is LOW) and (D2 is LOW) and (D3 is LOW) and (D4 is LOW) then (S is NO_EDGE).

Next, to perform inference, the theory of alpha planes was used and performed using (18).

$$\tilde{A}\alpha = \{(x, u), \mu_{\tilde{A}}(x, u) \geq \alpha | \forall x \in X, \forall u \in J_X \subseteq [0, 1]\}$$

$$= \int_{\forall x \in X} \int_{\forall u \in J_X} \{(x, u) | f_x(u) \geq \alpha\} \quad (18)$$

To carry out the defuzzification process, the heights method of type reduction was used [12][13]. This method replaces each rule output set by a singleton that is the maximum point of the membership function in the output, and after that calculates the centroid of the type-1 set by using these singletons [14][15]. The output of the heights defuzzification is given by (19)

$$h(x) = \frac{\sum_{l=1}^M l \mu_B^l(l)}{\sum_{l=1}^M \mu_B^l(l)} \quad (19)$$

The type reduction was performed applying the theory of Karnik and Mendel, and this reduction is given by (20)(21)[16][17]

$$y_l = \frac{\sum_{i=1}^L f^{-i}(x')h^i + \sum_{j=L+1}^M f^j(x')h^j}{\sum_{i=1}^L f^{-i}(x') + \sum_{j=L+1}^M f^j(x')} \quad (20)$$

$$y_r = \frac{\sum_{i=1}^R f^i(x')h^i + \sum_{i=R+1}^M f^{-i}(x')h^i}{\sum_{i=1}^R f^i(x') + \sum_{i=R+1}^M f^{-i}(x')} \quad (21)$$

The results of alpha planes are integrated by (22)(23)[18][19],

$$\hat{Y}_j^r(x') = \frac{\sum_{i=1}^N \alpha_i \alpha_i \hat{y}_j^r(x')}{\sum_{i=1}^N \alpha_i} \quad (22)$$

$$\hat{Y}_j^l(x') = \frac{\sum_{i=1}^N \alpha_i \alpha_i \hat{y}_j^l(x')}{\sum_{i=1}^N \alpha_i} \quad (23)$$

After realizing the type reduction and integrating the results of all alpha planes, defuzzification was performed by using the average of y_l and y_r , to obtain the defuzzified output of a generalized singleton type-2 FLS (24) [18] and the final edge map is obtained..

$$\hat{Y}_j(x') = \frac{\hat{Y}_j^l(x') + \hat{Y}_j^r(x')}{2} \quad (24)$$

III. SIMULATION RESULTS

The simulation results of the edge detectors implemented in MATLABR2010a software [20] are shown. This simulation is done on the test image lena and two synthetic images, square and polar shown in figure 11[21], created in MATLABR2010a. The results of Morphological gradient, Integrated Type 1 fuzzy logic system and Integrated interval T2FS and integrated generalized T2FS are shown in fig 7, 8, 9, 10 respectively..

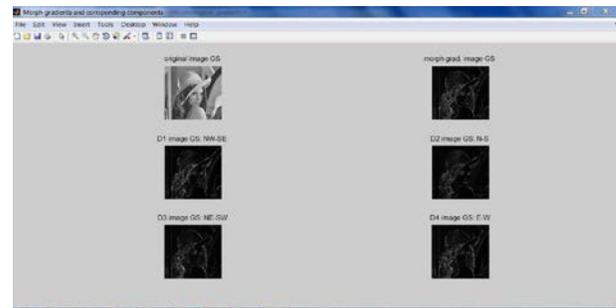


Figure 7 Simulation result of the morphological gradient with the test image lena.

In the simulation results, MG+T1FS indicates integrated morphological gradient and Type 1 fuzzy system. Similarly, MG+IT2FS represents integrated morphological gradient and integrated type 2 fuzzy system and MG+GT2FS denotes integrated morphological gradient and generalized type 2 fuzzy system.

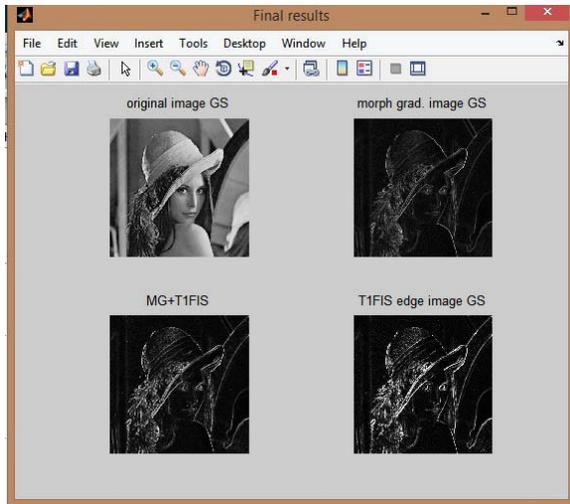


Figure 8 Simulation result of T1FS and integrated T1FS.

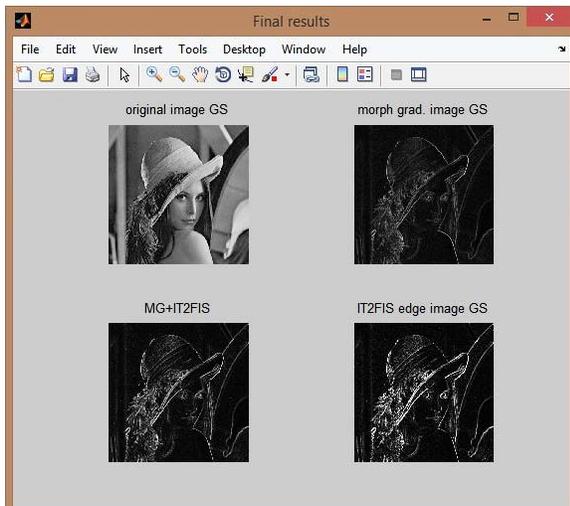


Figure 9 Simulation result of IT2FS and Integrated IT2FS.

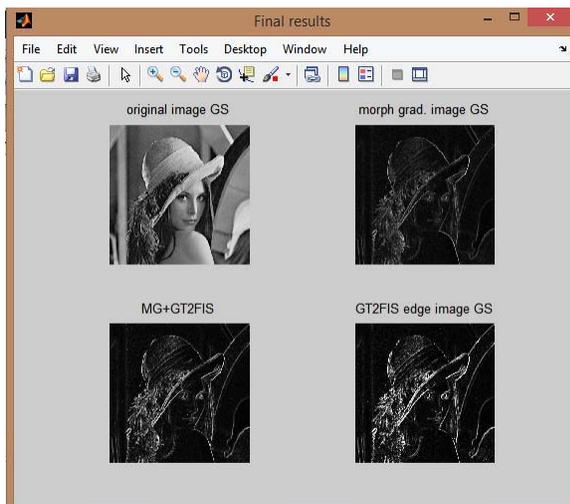


Figure 10 Simulation result of GT2FS and Integrated GT2FS.

The Pratts Figure of Merit is calculated on the synthetic images and the values are shown in Table 1. The Peak Signal to Noise Ratio values of these edge detectors with the synthetic images in noiseless conditions, with 0.001 white Gaussian noise and salt and pepper noise are tabulated in Table 2, while precision and recall values are shown in Table 3.

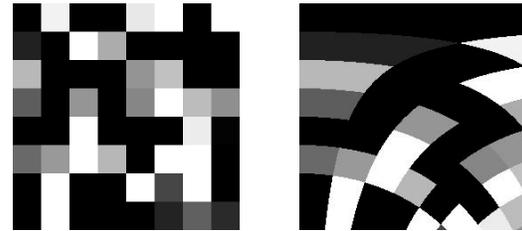


Figure 11 Square and Polar Synthetic Image

Table 1 PFOM values for noiseless synthetic images

Edge Detector Used	Type of Image	Pratts Figure of Merit
MG +T1FS	Square	0.8935
	Polar	0.8669
MG + IT2FS	Square	0.9264
	Polar	0.9177
MG + GT2FS	Square	0.9233
	Polar	0.9134

Table 2 PSNR values for noiseless and noisy synthetic images.

Edge Detector Used	Type of Image	PSNR (in dB)		
		Noiseless	Salt and Pepper noise	0.001 Gaussian noise
MG +T1FS	Square	12.9071	9.8923	11.5839
	Polar	12.5996	8.4562	10.7294
MG +IT2FS	Square	12.2094	10.9246	11.9045
	Polar	13.1846	10.4479	12.7368
MG +GT2FS	Square	13.8984	11.9386	13.3372
	Polar	13.4434	11.3788	12.9173

Table 3 Precision and Recall values of the implemented edge detectors.

Parameter	MG + T1FS	MG + IT2FS	MG + GT2FS
Precision	0.600216	0.600218	0.600398
Recall	0.992896	0.992892	0.992653

It can be noted that, regardless of the presence of noise, integrated GT2FS gives the maximum performance in terms of PSNR and Recall. Integrated IT2FS gives highest PFOM value while, Precision value is the highest for integrated TIFS.

IV. CONCLUSION

The edge detectors with integrated morphological gradient and type 2 systems are implemented. All the fuzzy systems are found to be working very well with reference to at least one of the parameters. But, it is to be noted that their performance might vary with the image it is tested upon.

V. FUTURE ENHANCEMENTS.

These integrated fuzzy logic techniques can be further implemented on videos and probably extended for uses in motion detection etc. It can also be tested on various other types of corrupt images affected with shot noise, quantization noise etc.

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Academic Achievement and LET Performance of the Bachelor of Elementary Education Graduates, University of Northern Philippines

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Abstract - This study was conducted to analyze the performance of the Bachelor of Elementary Education (BEE) 2013 graduates of the University of Northern Philippines (UNP). It determined the academic achievement in three subject components such as general, professional, and specialization and performance along the components of the Licensure Examination for Teachers (LET). The relationship of academic achievement to LET performance was also looked into. This study employed the descriptive method of research which is a combination of documentary analysis and correlation designs. The data gathered were treated statistically using mean and Simple Correlation Analysis. The findings showed that the respondents exhibited good academic achievement, most of the examinees passed the LET in all the components. There was a higher percentage of passer than non-passer in the LET. Academic achievement is significantly related to LET performance. Educational Institutions should continue to seek professional development ventures for the improvement of teaching competence and professional preparations. Thus, come out with quality output in the success of board examination leading graduates towards employment.

Index Terms – alumni, licensure exam, graduates, teacher, education, performance

INTRODUCTION

Educational institutions in a dynamic society are continuously concerned with employing competent teachers and instructors who could provide quality educational output. This need is shouldered within the portals of Teacher Education Institutions which produce teachers who could cope with challenges of changing time. The Teacher Education Institutions, therefore are keeping themselves abreast of changes for their program answer the needs and concerns of educational institutions. The qualifications, values, and attitudes of teachers towards the learners and the teaching profession are vital for the success of educational program.

As cited by Navarro et al. (2003), significant problems confronting higher education in the country have continuously resurfaced with the mass graduation of dysfunctional college

graduates who are ill-prepared to join the country's labor force are the most evident. Various World Bank-funded studies on the current state of Philippines higher education have unanimously described the level of education as "very sick." The Congressional Commission on Education (EDCOMM) which the Congress of the Philippines created in 1990 to review the status of higher education gave the following significant findings: 1) Mismatch between industry needs and academic training of students in colleges and universities is very evident; 2) Colleges and universities were offering courses in over-subscribed areas of studies, e.g. commerce, education and the like, irrespective of national development needs; 3) State supported institutions were competing with the private sector in the field. At great cost to the government, these state institutions were not producing quality graduates as expected; 4) The poor quality of graduates in higher education was attributed to poor quality teachers, inadequate teaching and learning facilities, and ill-structured curricular offerings.

With the above findings it is evident that the quality of higher education is put into question and a decline in standards exist. Sta. Maria (1995) in his article, "Higher Education in Trial" as stated by Navarro et al. (2003) claimed that the decline in standard is indicated by the low performance of graduates in government professional examinations and increasing unemployment of college graduates. Massive failures in government examinations could be attributed to the inadequate preparation of the candidates who in some cases hardly squeezed through the course. On the other hand, the increasing unemployment problem maybe attributed to the relevance factor-that is the tendency of the students to go into such overcrowded courses and other "soft" disciplines. Many degree holders either find employment outside their field of specialization or are forced to accept menial jobs. Thus, the so called mismatch between the product of the universities and the need of the Philippines as a developing country can reasonably be regarded as failure in quality.

Studies are conducted to evaluate performance and follow-up graduates enable the institutions to appraise the curricular offerings and come up with plans that will certainly equip the

students with the best possible trainings suited to maximize their contributions to the society.

This study evaluated the BEED program graduates of 2013. This served as a response to the growing demands of the changing world.

OBJECTIVES OF THE STUDY

This study was conducted to analyze the performance of the Bachelor of Elementary Education (BEED) 2013 graduates of the University of Northern Philippines (UNP) in the Licensure Examination for Teachers (LET) and its relationship to academic achievement.

Specifically, this study sought to answer the following questions:

1. What is the level of academic achievement of the graduate respondents in terms of the following:
 - A. General Education Courses:
 - a.1 English,
 - a.2 Filipino,
 - a.3 Mathematics,
 - a.4 Natural Science,
 - a.5 Social Sciences,
 - a.6 Humanities, and
 - a.7. Physical Education (PE)?
 - B. Professional Education Courses:
 - b.1 Theory/Concept Courses,
 - b.2 Methods/ Strategies Courses,
 - b.3. Field Study Courses, and
 - b.4. Special Topic Courses?
 - C. Specialization Courses?
2. What is the performance of the graduates in the Licensure Examination for Teachers (LET) for Elementary School Teachers for the Examination Period 2013 in terms of the following components:
 - a. general education courses, and
 - b. professional education courses?
3. What is the percentage of passer and non-passer in the LET?
4. Is there a significant relationship between LET and academic performance of the graduates?

THEORETICAL FRAMEWORK

Several related studies and literature are reviewed to back up the study as follows:

Academic Achievement

Rabanal (2011) found out that the overall academic performance of the teacher education graduate respondents in general education, professional education, and major courses in UNP Main and Candon Campuses was "Good".

The findings of Quintinita (2006) revealed that as a whole, the teacher education students of UNP for the School Year 2005 to 2006 manifested a "Good" or satisfactory level of academic performance.

In the study of Bañez (2002), she also found out that the level of academic achievement of the BSE, BSIE, and BEED graduates for the Period 1996 to 2000 when taken as a whole was "Good."

Esguerra (1993) found out in her study that the overall performance in the professional subjects of the teacher education graduates of Regions I, II, and NCR was "Good." The same level of performance was observed in all the professional subjects taken in college such as Principles and Methods of Teaching, Administration and Supervision, Foundations of Education, General Psychology, and Principles of Guidance. She also found out that the NCEE ratings and professional subject performance showed a highly significant relationship with the Professional Board Examination for Teachers (PBET) performance of the teacher education graduates. Professional subjects taken up by the students while they were still in college were good preparations for them to take the PBET.

Malinnag (1990) found out that the UNP-CTE graduates had "Good" average grades in general and professional subjects, and an "Average" performance in the PBET. In 1986 to 1988, the average grades in general and professional subjects significantly influenced their PBET performance.

On Board Examination Performance

Rabanal (2011) found out that teacher education graduate respondents failed to achieve the passing rate in the Licensure Examination for Teachers. The respondents performed above the national percentage of passing. LET performance was significantly related to fourth year high school average grades, high school graduated from, residence while studying, and field of specialization and only parents' occupation did not yield significant relationship. On the other hand, academic achievement of the respondents in general Education, professional education, and major courses significantly correlates with the LET performance.

Figuerres (2010) on her study, an analysis of the performance of UNP in the Licensure Examination for Teachers, 2001-2010 found out that for the LET Examination period 2001 to 2010, the UNP Institutional Percentage Rates for the LET Elementary Level had been consistently higher than the National Passing Rates. For the same period, the UNP Institutional Percentage Rates for the LET Secondary level had been higher than the National Percentage Rates. On the other hand, Specialization Course is a factor that significantly affect LET performance.

Bañez (2002) found out in her study that the CTE LET takers' overall mean rating in their LET performance in general education, professional and major subjects was "Below Passing Mark." This was obtained according to her because those who did not pass garnered low scores that pulled down the general averages of all the LET passers. She also found out that in the Main Campus when the six variables: average grade in senior high school, score in the UNP College Admission Test, average grade in general education, professional and major subjects when taken singly, all the variables were not significant at .05 level of significance. However, the combined effects of the variables on LET performance showed significance at .05 level. This further implies as she said that each student variable cannot stand alone but needs all the others in order to influence the LET performance. This further implies that those students who garnered higher senior high school average, UNP CAT score, and average grade in general education, professional and major subjects and attended more in LET review are those who garnered higher LET results.

Malinnag (2000) found out that the PBET performance of the BSE, BSIE, and BEEd were significantly different in 1986 but not in 1987. The 1988 BSE and BEEd graduates had a comparable performance in the PBET. There is a significant positive relationship between the PBET performance and the average grade in general subjects of the CTE graduates.

Esguerra (1990) also found out that significant correlation existed between the performance in the board examination and their achievement in the professional subjects such as Math and Surveying, Design and Construction, and Hydraulics of the Bachelor of Science of Civil Engineering students. This finding according to her denotes that a good achievement in the professional subjects indicates a good performance in the board examination.

CONCEPTUAL FRAMEWORK

The paradigm drawn from the conceptualization of the study is shown below.

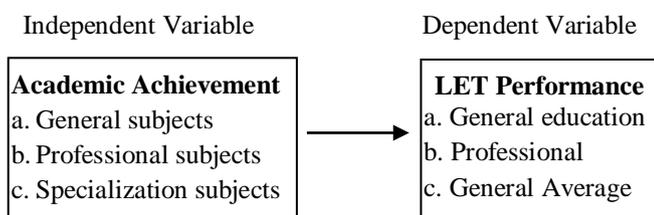


Figure1: The Research Paradigm

The paradigm shows that the academic achievement of the respondents tend to affect their performance in the licensure examination.

Assumptions

In this study, the researcher considered the following assumptions:

1. The LET ratings are valid and reliable.
2. The grades attained by the respondents are reliable, fair, and accurate measures of their achievement in the general, professional, and major subjects.

Hypothesis

This study was guided by the hypothesis that there is no significant relationship between LET and academic performance.

METHODOLOGY

This study employed the descriptive method of research which is a combination of documentary analysis and correlation design.

The respondents of the study were the 63 BEED graduates, 44 General Education (GE) and 19 Early Childhood Education (ECE) of UNP, School Year 2012-2013.

This study utilized documents as its main source of data. Records of the College of Teacher Education (CTE) office served as reference for the respondents' academic achievement in general, professional, and major subjects. On the other hand, results of LET ratings issued by the Office of Educational Statistics Task Force of the PRC for the Examination Period 2013 were utilized.

The data gathered were treated statistically using the following tools:

1. Frequency and percentage were used to determine the passers and non-passers of the LET.
2. The mean was used to determine the level of performance of the graduates in the different areas of the LET and their achievement levels in general education, professional, and major courses.
3. The Simple Linear Correlation Analysis was used to find out if there existed a significant relationship between LET performance and academic achievement.

RESULTS AND DISCUSSIONS

The Academic Achievement of the BEEd 2013 Graduates

Table 1 shows the academic achievement of the BEEd graduate respondents in general education, professional education and specialization subjects.

The table shows that the respondents obtained a good performance ($\bar{x} = 2.17$) in their overall academic performance

in General Education Subjects. Taken singly, both G.E. and E.C.E. respondents got good performance ($\bar{x} = 2.08$ and 2.09 respectively). The standard deviation shows that the grades of the ECE ($SD = 0.28$) and GE respondents ($SD = 0.27$) were close to each other.

Table 1: The Academic Achievement of the BEEd Graduates

Courses	Gen.Ed.			ECE			As a Whole		
	N=44			N=19			N=63		
	X	DR	SD	X	DR	SD	X	DR	SD
a. General Education									
a.1 English	2.31	G	0.26	2.25	G	0.31	2.28	G	0.29
a.2 Filipino	2.19	G	0.27	2.18	G	0.24	2.19	G	0.26
a.3 Mathematics	2.53	P	0.42	2.53	P	0.33	2.53	P	0.38
a.4 Natural Science	2.09	G	0.28	2.11	G	0.29	2.1	G	0.29
a.5 Social Sciences	2.10	G	0.26	2.09	G	0.30	2.1	G	0.28
a.6 Humanities	1.65	VG	0.15	1.72	VG	0.23	1.69	VG	0.19
a.7 PE	1.71	VG	0.23	1.75	VG	0.21	2.28	G	0.29
As a whole	2.08	G	0.27	2.09	G	0.27	2.17	G	0.28
b. Professional Education									
b.1.Theory/ Concept Courses	2.08	G	0.20	2.02	G	0.30	2.05	G	0.25
b.2 Methods/ Strategies Courses	1.95	VG	0.36	2.08	G	0.18	2.02	G	0.27
b.3.Field Study Courses	1.68	VG	0.20	1.69	VG	0.17	1.68	VG	0.19
b.4 Special Topic Courses	1.85	VG	0.25	1.85	VG	0.22	1.85	VG	0.24
As a whole	1.89	VG	0.25	1.91	VG	0.22	1.90	VG	0.24
	2.21	G	0.20	2.01	G	0.21	2.11	G	0.21
Overall	2.06	G	0.24	2.00	VG	0.23	2.06	G	0.23

Legend:

- 1.0 – Excellent (E) 2.01 to 2.5 – Good (G)
- 1.01 to 1.5 – superior (S) 2.51 to 3.0 – passing (P)
- 1.51 to 2.0 – very good (VG)

The table further reveals that the respondents performed “Very Good” ($\bar{x} = 1.69$) in Humanities while in Mathematics they performed “Poor” ($\bar{x} = 2.53$). On the other hand, they performed “Good” ($\bar{x} = 2.01-2.5$) in English, Filipino, Mathematics, Natural Sciences, Social Sciences, and Physical Education Subjects.

The above findings further show that English, Science and Mathematics are the subjects that must be developed among teacher education graduates. This is recognized by the Department of Education (Dep. Ed) and the Commission of Higher Education (CHED) that they come up with a program called, Teacher Induction Program (TIP) for newly hired teachers focused on teaching Science, Mathematics and English subjects. This was a yearly project of the Department of Education (Dep. Ed) and the UNP CTE Main Campus

being considered as Centre of Training for Teachers in Region I from SY 2008 to 2012.

The overall performance of the respondents in professional education subjects was “Very Good” ($\bar{x} = 1.90$). The G.E. respondents got a “Very Good” ($\bar{x} = 1.89$) performance while the E.C.E. got a good ($\bar{x} = 1.91$) performance. The standard deviation shows that the grades of the ECE (SD = 0.22) and GE (SD = 0.25) are close to each other. Among the courses in professional education, it is noted that the students are “Very Good” in field study courses ($\bar{x} = 1.68$) and special topic courses ($\bar{x} = 1.85$). They only performed “Good” in Theory ($\bar{x} = 2.05$) and Methods (2.02). The grades of the students in Field study Courses are close or similar to each other (SD = 0.19) compared to the Methods /Strategies courses (SD = 0.27), Theory/ Concept courses (SD = 0.25), and special topic courses (.024).

The above findings show that the students are prepared to apply the practicum, theories/ concepts and methods/ strategies they learned in teacher education program.

The overall performance of the respondents in specialization subjects was “Good” ($\bar{x} = 2.11$). The G.E. respondents got a mean score of 2.21 and E.C.E. got 2.01 both described as “Good.”

Level of Performance in the LET of the BEEd Graduate Respondents

This section presents the level of performance of the BEEd graduates in the Licensure Examination for Teachers for the Examination Period 2013.

Table 2: LET Performance of the BEED Graduate Respondents, University of Northern Philippines for the Examination Period 2013

LET Components	General			ECE			As a whole		
	X	DR	SD	X	DR	SD	X	DR	SD
	N=44			N=19			N=63		
General Education	79.75	P	4.14	76.84	P	5.76	78.30	P	4.95
Professional Education	78.5	P	6.19	77.15	P	7.47	77.83	P	6.83
General	79.0	P	5.08	77.03	P	6.34	78.02	P	5.71

Legend:

- DR -Descriptive Rating
- P - Passed
- F - Failed

Table 2 shows that the BEEd graduate respondents passed ($\bar{x} = 77.83-79.75$) all the components of the LET.

Percentage of Passer and Non-Passer

Table 3: Percentage of Passer and Non-Passer

Profile	Gen.Ed.		ECE		Overall	
	f	%	F	%	f	%
Passer	35	79	16	84	51	81
Non-Passer	7	16	3	16	10	16
Did not take	2	5	-	-	2	3
Total	44	100	41	100	63	100

Of the 44 Gen.Ed. respondents 35 or 79% passed the LET, 7 or 16% did not pass, and two or 5% did not take the LET. On the other hand, from the 19 ECE, 16 or 84% are passers and three or 16% are non-passers. As a whole, 51 or 81% are passers, 10 or 16% are non-passers, and two or 3% did not take the LET.

Correlation Coefficients Showing Relationship between LET Performance and Academic Performance

Table 4 shows the correlation coefficients showing relationship between LET and academic performance of the respondents.

The academic performance of respondents in almost all the courses is significantly related to their LET performance. This means that the higher the competencies the students has acquired and learned in their academic subjects, the higher their performance in the LET. The table further reveals that only Ed. Tech 121 and specialization subjects were not significantly related to LET. This means that their performances in these subjects apparently did not affect their performance in the LET.

This finding is parallel to the finding of Rubio (1992) who found out that there was a very highly significant relationship between the licensure examination performance of the nursing graduates and their academic performance. This means that academic achievement can be a good predictor of a high degree of performance in the licensure examination.

In the study of Figuerres (2010) “An Analysis of the Performance of UNP in the Licensure Examination for Teachers, 2001-2010” was also found out that Specialization Course is a factor that significantly affects LET performance.

The finding is also in congruence with the study of Esguerra (1990) who also found out a significant relationship in the performance of the Bachelor of Science of Civil Engineering students in their board examination and their achievement in the professional subjects such as Math and Surveying, Design and Construction, and Hydraulics. This finding according to her denotes that a good achievement in the professional

subjects indicates a good performance in the board examination.

Table 4: Correlation Coefficients Showing Relationship Between LET Performance and Academic Performance

Academic Performance	Correlation Coefficient (r)	Probability
General Education Courses	0.486**	p < 0.05
English	-0.404**	p < 0.05
Filipino	-0.443	p < 0.05
Mathematics	-0.316**	P < 0.05
Natural Sciences	-0.495**	p < 0.05
Social Sciences	0.502**	p < 0.05
Physical Education (PE)	-0.005	p < 0.05
Professional Education Courses	-0.077	p > 0.05
Theory/Concept Courses	-0.415**	p < 0.05
Methods/Strategies Courses	-0.386**	p < 0.05
Field Study Courses	0.204	p > 0.05
Special Topic Courses	0.245	p > 0.05
Specialization Courses	-0.365**	p < 0.05

**Significant at .01 level

CONCLUSIONS

1. The respondents exhibited a good academic achievement.
2. The BEd graduate respondents passed all the components of the LET.
3. There was a higher percentage of passer than non-passer in the LET.
4. LET performance is significantly related to the academic achievement of the respondents.

RECOMMENDATIONS

1. A higher level of academic performance of teacher education graduates should be maintained in order to achieve a higher level of performance in the LET.
2. Since there is a significant relationship between the LET performance and academic performance of the BEd graduate respondents, the college should continue the policy of Teaching Aptitude Test in order to have a high performance in the LET and the syllabi should be continually enhanced in order to get higher academic achievement leading to a higher performance in the LET.
3. Another study should be conducted for the succeeding periods to continuously evaluate teacher education curriculum considering other variables such as UNP-CAT and TAT, and employment status.

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The Effects of Hagiazo Chi Alpha Campus Ministry in the Lives of Its Members

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Abstract - This study was conducted to look into the effects of Hagiazo Chi Alpha Campus Ministry in the lives of its members. It is an accredited student organization of the University of Northern Philippines (UNP). The respondents are the student members and leaders enrolled during the School Year 2013-2014. The survey method with the use of questionnaire and interview was used in gathering the data needed for the study. Findings showed that the respondents are from different places in the Philippine provinces of Ilocos Sur, Ilocos Norte, Kalinga and Abra and most of them are staying in dormitories as they study in the university. Most of their fathers are farmers while their mothers are housewives with 1-4 children in the family. The following are the Campus Ministry practices: one on one discipleship, counselling, large gatherings, connect groups, leaders' training, film viewing, prayer meeting, and outing. The overall level of perception of the respondents on the organization's practices is effective. Based from the data gathered, the following are the perceived effects of the ministry in their lives: discovered the purpose of life, better relationship with God, family and others, forgiveness to oneself and others, better performance in studies, found a community serves as a family and the discovery and development of skills and abilities. Since the campus ministry is an instrument of God to touch the lives of the students, it may continue to reconcile students to Christ, develop leaders, make disciples, and transform the family, the campus, the marketplace and the world.

Keywords: Hagiazo, Campus Ministry, Student Organization, Students

INTRODUCTION

Chi Alpha Campus Ministry is a vibrant world-wide campus community that exists to partner with schools in developing God-fearing students, building them as excellent leaders and preparing them to become catalysts of change in their families, the campus, the marketplace and the world. Hagiazo Campus Community is the local chapter of Chi Alpha in UNP and an accredited student organization. The name "Chi Alpha" are Greek letters representing the first letters of the two words "Christou Apostoloi" meaning "Christ's Apostles," or "Christ's Ambassadors" while "Hagiazo" is a Greek word

meaning "set apart for God's purpose." Hagiazo Campus Ministry (usually called Hagiazo Community by the members) is open to all students regardless of background. Its vision is "Spirit-empowered community of multiplying committed, set-apart servant leaders." And its mission statement is "Reconciling students to Christ, making disciples, developing leaders, transforming the family, the campus, the marketplace and the world." Any interested student in order to become a member should abide to the vision, purpose and philosophies of the said organization.

In this student organization, students are established to become ambassadors of Christ, emulating His life and living out His principles in every aspect of their lives. They are also empowered to be excellent student leaders who can impact their campus, the market place and the world. On the other hand, they are encouraged to discover their purpose in life. Munroe (2007) said that accomplishments without a purpose are meaningless. Life without an understanding of life's purpose leads to disillusionment and emptiness. A sense of purpose gives life meaning. It moves you beyond existence to a fulfilling and productive life. If you don't know your purpose, it will be impossible to fulfill it. Life without purpose is an experiment.

This study evaluates the effects of the said organization in the lives of the students. This serves as a response to Commission on Higher Education (CHED) Memo Order No. 9 Series of 2013, Section 4 of which states that an educational institution seeks to form individuals who can later become productive citizens of the country and the world. Its responsibility is not only confined to the teaching and development of job skills, but also to the acquisition of life skills and values. The individuals produced by the educational institution should be able to contribute positively to the progress of his/her country, and to the upliftment of the human conditions. Student affairs and services, therefore, must systematically and deliberately address this end objective of producing citizens suited to the aims of the country and of humanity. Higher Education Institutions must provide a set of student-centered activities and services in support of academic instruction intended to facilitate holistic student development for active involvement in nation building.

These shall be collectively known as Student Affairs and Services. (http://www.ched.gov.ph/wx-content/uploads/2013/07/CM_-No.09-s2°1s.pdf).

The findings identify the strengths of the community to help produce citizens suited to the aims of the country and of humanity.

OBJECTIVES OF THE STUDY

This study was conducted to look into the effects of Hagiazon Campus Ministry in the lives of the students of the University of Northern Philippines (UNP).

Specifically, this study sought to answer the following questions:

1. What is the profile of the members in terms of :
 - a. gender,
 - b. civil status,
 - c. occupation of parents,
 - d. number of children in the family,
 - e. residence address, and
 - f. residence while studying?
2. What are the level of perception of the members on the organization practices along the following:
 - a. one on one discipleship;
 - b. counselling;
 - c. large gathering;
 - d. connect groups;
 - e. leaders' training,
 - f. film Viewing,
 - g. prayer meeting, and
 - h. outing?
3. What are the perceived effects of the campus ministry in the lives of the students?
4. Is there a significant relationship between the perceived effects of the campus ministry and each of the following:
 - a. personal profile, and
 - b. organization practices?

THEORETICAL FRAMEWORK

Several readings are reviewed to back up the study as follows:

Hagiazon Chi Alpha Campus Ministry

It is an accredited student organization of the University of Northern Philippines aimed to partner with schools in developing God-fearing students, building them as excellent leaders and preparing them to become catalysts of change in their families, the campus, the market place and the world.

The following are the community's philosophy:

1. Encourage students to discover their purpose in God in the context of loving and caring community.
2. Establish them to become ambassadors of Christ, emulating His life and living out His principles in every aspect of their lives.
3. Empower them to be excellent student leaders who will impact their campus, the market place and the world.

On Campus Ministry

“ For everything that was written in the past was written to teach us, so that through endurance and the encouragement of Scriptures we might have hope .” Romans 15:4 (NIV)

For many centuries, students have enlivened the church through their vision, energy, and excitement. The first known examples of campus fellowships sprung up in European universities in the 17th and 18th centuries. These fellowships normally took the form of voluntary student societies. Charles Wesley started the most famous of these societies in 1726 at Oxford. Derisively known as the holy club, this small band of students gathered for Bible study and for outreach to the poor and hungry. Later joined by John Wesley, this group had a powerful impact as they sent forth to Wesleys to America for missions' work. Even more importantly, the Holy Club became the beginning and the center of a world- wide movement when they were dubbed with the nickname of Methodists.

In no area had a greater impact upon the church at large than in reminding it of its missionary responsibility. As J. Edwin Orr notes in his excellent book *Campus Aflame*, student movements invariably develop a missionary trend.

One of the first examples of this was the great mission work of Count Zinzendorf and the Moravians in the early 1700s. This ministry and its accompanying revival began with a group of students at the University of Halle in Germany who gathered together to pray for world evangelism.

Modern American foreign mission also owes its beginnings to students. In 1806 a group of students at William College in Massachusetts prayed together twice a week. After one such meeting they were caught in a thunderstorm, and took refuge under a haystack (hence the now famous Haystack Prayer Meeting). During this time, God move sovereignly over them and impressed them with the need for world missions. Led by Samuel J. Mills, Jr., the son of a Congregational minister, the group dedicated their lives to the cause of foreign missions.

At the initiatives of students from Princeton, various students groups joined together in 1887 to form the Intercollegiate

YMCA, the first national campus ministry. This organization was the under the oversight of the Young Men's Christian Association (YMCA), whose work at that time was primarily evangelistic and secondarily social. The Intercollegiate YMCA grew rapidly; by 1885 it had over 10,000 student members (of a total student population of under 100,000) on 181 campuses. God also used the Intercollegiate YMCA to spawn a gigantic missionary movement, the Student Volunteers. At the invitation of Evangelist D. L. Moody, 251 students gathered at a month long summer conference in Mt. Hermon, Massachusetts in 1886.

The outlook for campus ministry in the 1920s looked bleak amidst growing liberalism in colleges, the Intercollegiate YMCA, and in denominational ministries as their parent denominations liberalized. But God raised up many evangelical non-denominational campus ministries which formed between 1930 and 1960. Inter-Varsity Christian Fellowship came to the United States from England by way of Canada in 1938, and it rapidly spread to become the largest evangelical campus ministry today. UCLA birthed Campus Crusade for Christ in 1951. The Navigators, which started as a ministry among the military, moved into college ministry in 1951. A host of other smaller campus ministries proliferated to fill the vacuum left by the demise of the Intercollegiate YMCA. The Assemblies of God was birthed in the fires of revival that swept the world at the turn of 20th century.

Within the United States, Chi Alpha Christian Fellowship is now an over 200 colleges and universities. To coordinate a ministry of this size, the nation has been divided into eight regions. Additionally, three divisions, Eastern, Central and Western, have a representative in the national office in Springfield, Missouri. This administrative structure allows for areas of both high and low concentrations of campuses to be ministered to effectively.

In the spring of 2006, a web-based survey of college and university chaplains and campus ministers within denominational campus ministries, specialized ministry organizations, and congregation-based campus ministries was launched. The denominational campus ministries selected for inclusion included:

- Assemblies of God;
- Evangelical Lutheran Church of America;
- Presbyterian Church (USA);
- Roman Catholic;
- Southern Baptist Convention (SBC);
- United Methodist Church.

The specialized ministry organizations that were included consisted of the following:

- Fellowship of Christian Athletes;

- Inter Varsity Christian Fellowship.
(<http://www.campusministrystudy.org/description.shtml>)

Conceptual Framework

The paradigm drawn from the conceptualization of the study is shown below.

Independent Variables

Dependent Variable

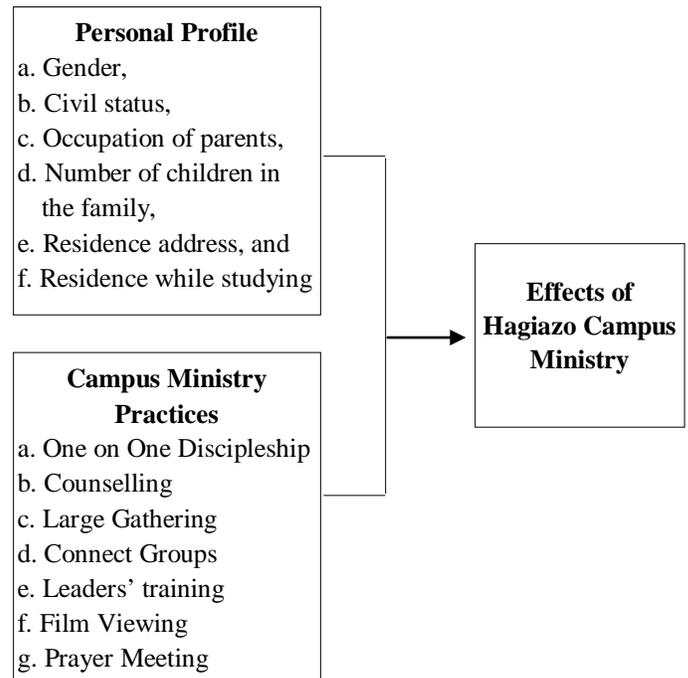


Figure 1: The Research Paradigm

The paradigm shows the relationship between the independent variables (personal profile and problems encountered) and the dependent variable (effects of the campus ministry).

Assumption

In this study, the researcher assumed that the responses of the students are their honest assessment of themselves.

Hypothesis

This study is guided by the hypothesis that there is no significant relationship between the perceived effects of Hagiazo community and the personal profile of the respondents, and organization practices.

METHODOLOGY

This study employed the descriptive method of research which is a combination of documentary analysis and correlation design. The respondents of the study are 38 members and leaders enrolled in the different degree programs at different levels during the School Year 2013-2014. The survey method

through questionnaire, documentary analysis and interview were used in gathering the data needed for the study.

Two sets of questionnaires were used in this study. Part I served as questionnaire for the personal-related factors and Part II was a questionnaire on the organization practices and effects of the campus ministry in the lives of its members. The following norms for interpretation is used on the level of perception on organization practices:

Level of Perception on Organization Practices

4.21 – 5.00	Very Effective
3.41 – 4.20	Effective
2.61 – 3.40	Fair
1.00 – 1.80	Not Effective
1.81 – 2.60	Not so Effective

The data gathered were treated statistically using the following tools:

1. Frequency counts and percentages were used to determine the profile of the respondents, and the effects of the campus ministry in their lives.
2. Mean was used to look into the level of perception of the members on the organization practices.
3. The Simple Linear Correlation Analysis was used to find out if there exists a significant relationship between the effects of the campus ministry and to their personal profile, and organization practices.

RESULTS AND DISCUSSIONS

Profile of the Students in the Campus Ministry

Table 1 shows the profile of the students in the campus ministry. **On Sex.** It can be seen in the table that among the respondents, 10 or 26% are males and 28 or 74% are females .

On Civil Status. The table further shows that all (38 or 100%) the respondents are still single.

On Parents’ Occupation. It is gleaned in the table that the number of the fathers of the respondents who are non-professionals (41 or 87%) outnumbered the fathers who are professionals (6 or 13%).This finding holds true with the mothers.

On the Number of Children in the Family. The figures show that 29 or 76% of the respondents belonged to families having 1 – 4 children while 9 or 24% of the respondents belonged to families having 5 – 9 children.

On Residence. Most of the respondents (31 or 81%) are from the province of Ilocos Sur.

On Residence While Studying. It can be gleaned in the table that most (30 or 79%) of the respondents are staying in dormitories while pursuing their courses.

Table 1: Personal Profile of the Respondents

Profile	F	%
Sex		
Male	10	26
Female	28	74
Total	38	100
Civil Status		
Single	38	100
Married	-	-
Total	33	100
Father's Occupation		
Professional	3	7
Non-Professional	35	92
Total	38	100
Mother's Occupation		
Professional	3	7
Non-Professional	35	92
Total	38	100
No. of Children in the Family		
1-4	29	76
5-9	9	24
Total	38	100
Province		
Ilocos Sur	31	81
Ilocos Norte	1	3
Abra	5	13
Kalinga	1	1
Total	38	100
Residence While Studying		
Home	8	21
Dormitory	30	79
Total	38	100

Level of Perception on Organization Practices

Table 2 shows the level of perception of the students on organization practices

Table 2: Item Mean Ratings Showing the Level of Perception on Organization Practices

Organization Practices	\bar{x}	DR
One on one Discipleship	4.37	Very Effective
Counselling	3.95	Effective
Large Gathering	4.37	Very Effective
Connect Groups	4.66	Very Effective
Leaders’ training	3.81	Effective
Film Viewing	3.97	Effective

Prayer Meeting	4.68	Very Effective
Outing	3.34	Effective
Overall	4.14	Effective

It can be seen on the table that the members perceived prayer meeting ($\bar{x} = 4.68$) as “Very Effective.” According to the experiences they were sharing regarding this community practice, they were able to pour out their hearts before the Lord, they honestly tell everything happening to them, they were able to experience His love and embrace and there they find being released with shame, guilt, condemnation and accusations. Prayer is powerful according to them for they see themselves being changed by the Lord as they communicate with Him. They also perceived connect groups ($\bar{x} = 4.66$) as “Very Effective” to them. They meet their own group once a week with their connect group facilitator. What they appreciate in here according to them is the chance for them to share about their lives, feel belonged and part of a family. Some appreciate the games they are doing as part of their activity for they find it relaxing and know each other better. They also study the Word of God, pray and encourage one another. Likewise large gathering ($\bar{x} = 4.37$), is also found “Very Effective” to them. They said that they are excited to see all the members gathered together and to fellowship with one another, listen to life testimonies, sing praises and worship the Lord, and also the sharing of the Words of God. And so with one on one discipleship ($\bar{x} = 4.37$). The very confidential things about their lives that they cannot share in their connect groups, they can share it in one on one discipleship. They will meet their own connect group facilitator for their one on one. There were those who were very grateful that they were able to share their past and went on the process of healing. According to them, they find healing, deliverance and experienced changed life through the Words of God. On the other hand, they perceived Film Viewing ($\bar{x} = 3.97$), Counselling ($\bar{x} = 3.95$), and Leader’s Training ($\bar{x} = 3.81$) as “Effective” to them while Outing ($\bar{x} = 3.34$) is only “Fair” .

As a whole, the perception of the members on the organization practices is “Effective” ($\bar{x} = 4.14$).

Effects of the Campus Ministry in the Lives of Its Members

Table 4 shows the perceived effects of the campus ministry in the lives of the respondents.

It is revealed in the table that out of the 38 respondents, 23 or 61% perceived that their relationship with God, family, and others became better. As they testified, the better relationship with God resulted to a better relationship with their families and others. Moreover, there are 22 or 58% who discovered life’s purpose. According to them, life before was no hope, there was no meaning. They did not know what life is all about and they

cannot appreciate it because of their past. There are also 22 or 58% who performed better in their studies. They revealed that they just go and study for compliance before but later on found themselves excelling. They believed that this happened to them by the grace of God and change happened to them when they came to discover the purpose of their lives. Furthermore, 20 or 53% claimed that they found a community where they belonged, cared, and being helped with their problems. They said that it is a great help on their part to have a community accountable to them while they are away from their families. On the other hand , 16 or 42% were able to discover and develop their skills and abilities. According to them, as they appreciated life, they found out that they possess God-given potentials and would like to use them in accordance to His purpose.

Table 4: Effects of the Campus Ministry

Impact	f	%
Discovery of Life’s Purpose	22*	58
Better Relationship with God, Family, and Others	23*	61
Forgiveness to Oneself and Others	16*	42
Better Performance in Studies	22*	58
Found the Community as a Family	20*	53
Discovery and Development of Skills and Abilities	16*	42

*Multiple Response

And finally, there are also 16 or 42% learned how to forgive themselves and others. These students experienced different kinds of hurts and pains who needed healing. Healing is a process. They needed help every step of the way. They confessed that it is only the enablement of God that they were able to forgive those who caused them hurt and pain. They said that they are very grateful that they learned to forgive for they realized they too were forgiven by God.

Results of the Relationship between Effects of the Campus Ministry in the Personal Profile of the Respondents

Table 5 shows the correlation coefficient showing relationship between the effects of the campus ministry and their personal profile.

It was found out that the perceived effects of the campus ministry in the lives of students is significantly related to the occupation of the parents. This means that those whose parents are professionals tend to have a greater effects of the campus ministry in their lives. This finding implies that these respondents recognized the importance of the community and they perceived it to be of great help as they pursue their studies while away from home.

Table 5: Correlation Coefficients Showing Relationship between Effects of the Campus Ministry and their Personal Profile

Personal Factors	Correlation Coefficient (r)	Probability
Sex	.150	p < 0.05
Occupation of parents	.386*	p > 0.05
No. of children	-.158	p < 0.05
Residence While Studying	-.072	p < 0.05
Problems in Life	.269	p < 0.05

*Significant at .05 level

Results of the Relationship between Effects of the Campus Ministry and Organization Practices

Table 6 shows the correlation coefficient showing relationship between the effects of the campus ministry and organization practices.

Table 6: Correlation Coefficients Showing Relationship between Effects and Organization Practices

Organization Practices	Correlation Coefficient (r)	Probability
One on one Discipleship	.243	p < 0.05
Counselling	.248	p < 0.05
Large Gathering	-.055	p < 0.05
Connect Groups	.272	p < 0.05
Leaders' training	.440**	p < 0.05
Film Viewing	.044	p > 0.05
Prayer Meeting	.419**	p < 0.05
Outing	.080	p < 0.05

**Significant at .01 level

An analysis of the data shows that organization practices significantly correlates to the perceived effects of the campus ministry in the lives of the students. This means that organization practices contribute to the perceived effects of the campus ministry in the lives of the students. This further implies that the community is being used by God to touch and change lives.

CONCLUSIONS

1. Majority of the respondents are females, single, non-professional parents, belonging to families having 1-4 children and most are staying at dormitories while studying.
2. The overall level of perception of the respondents on the organization practices was effective.
3. These are the perceived effects of the campus ministry in the lives of the students: better relationship with God, discovery of life's purpose, learned how to forgive oneself and others, better performance in studies, they are being helped in their problems, felt cared and belonged, and their skills and abilities are being discovered and developed.
4. The perceived effects of the campus ministry in their lives is significantly related to the occupation of parents and organization practices.

RECOMMENDATIONS

1. Since the campus ministry is being used by God to touch and change lives, it may continue to reach students to transform the campus, market place, nation, and the world by the grace of God.
2. Another study may be conducted for the succeeding periods to continuously evaluate the effects of the campus ministry in the lives of students. A tracer study may also be conducted to find out the impact of the ministry in the lives of the graduates.

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Phytochemical based pesticides as Grain Protectants

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Abstract- The quantitative and qualitative food losses and feed commodities is mainly done by insect –pests which are prolific in nature and causes development of hot spots as a result of metabolic heat by developing insect populations, thereby create favourable conditions to various pathogens. Thus they cause two way spoilage of food commodities resulting into economic loss as well as loss to public health.

Keeping these points in view ,the present investigation is aimed to study essential oil based insecticide effective against stored grain insects and prepare their nanopesticides for efficient delivery. This work will surely be able to generate scientifically validated data on the bioactivity profile against targeted stored grain insects like *Callosobruchus maculatus* and *Tribolium castaneum*.

Index Terms- Essential Oil, Insecticide, Bioactivity, *Callosobruchus maculatus* , *Tribolium castaneum*.

I. INTRODUCTION

Food grain losses due to insect infestation during storage are a serious problem, particularly in the developing countries [1, 2]. Losses caused by insects include not only the direct consumption of kernels, but also accumulation of exuviae, webbing, and cadavers. High levels of the insect detritus may result in grain that is unfit for human consumption and loss of the food commodities, both, in terms of quality and quantity. Insect. It is estimated that more than 20,000 species of field and storage pests destroy approximately one-third of the world's food production, valued annually at than \$100 billion among which the highest losses (43%) occurring in the developing world [3, 4]. The quantitative and qualitative damage to stored grains and grain product from the insect pests may amount to 20–30% in the tropical zone and 5– 10% in the temperate zone [5, 6]. Food grain production in India has reached 250 million tonnes in the year 2010-2011, in which nearly 20–25% food grains are damaged by stored grain insect pests [7, 8]. The efficient control and removal of stored grain pests from food commodities has long been the goal of entomologists throughout the world.

The major pests of stored grain and pulses of the Indian subcontinent are classified in to two groups, namely, primary pests: those which are capable of penetrating and infesting intact kernel of grain and have immature stages develop within kernel of grain and secondary pests which cannot infest the whole grain but feed on as broken kernels, debris, high moisture weed seeds, and grain damaged by primary pests. In general, the immature stages of the secondary pest species are found external to the grain. The important primary pests are the rice weevil, *Sitophilus oryzae* (L.), granary weevil, *Sitophilus granaries* (L.), (Coleoptera: Curculionidae), lesser grain borer, *Rhyzopertha*

dominica (F.), (Coleoptera: Bostrichidae), Khapra beetle, *Trogoderma granarium* (Everts), (Coleoptera: Dermestidae), and the pulse beetle *Callosobruchus chinensis* (L.) (Coleoptera: Bruchidae). The secondary pests are rust-red flour beetle, *Tribolium castaneum* (Herbst), (Coleoptera: Tenebrionidae), rusty grain beetle, *Cryptolestes ferrugineus* (L.), (Coleoptera: Cucujidae). Fumigation is still one of the most effective methods for the prevention of stored product losses from insect pests[9].

II. METHODS

Bioassay

Fumigant Toxicity Assay:

In order to test the toxicity of essential Oil vapors to the adults of *T.castaneum* and *C.maculatus* , gas tight glass bottles of 300ml volume with plastic screw caps were used as exposure chambers. A small piece (6x8) cms filter paper strips were kept inside the glass bottle to serve as an oil diffuser after the appropriate amount of pure essential oil has been applied on it. Doses were calculated based on nominal concentrations and assumed 100% volatilization of the oils in the exposure vessels /glass bottles. In each bottle 5 insects/replication were used and kept inside plastic vials fitted with 40 copper wire net on both the ends. This arrangement with the insects was suspended into the 300 ml glass bottle and then sealed with its cap. This whole set was considered as one replication. 3 such Replns for each concentration of oil was taken. After 24 hrs of exposure to essential oil vapors the dead insects were counted . Several doses (1,2,3,4,5 to 10%) were tested for each essential oil.

Repellency Bioassay:

Repellency was arranged in 9 cm test arenas. Whatman filter paper No.1 was cut into half. Test solutions were prepared by dissolving 0.5, 1.6, 2.4, 3.2 and 4 µl (.05,0.16,0.24, 0.32,0.40 % respectively) in 1 ml acetone. The paper disc was cut into 2 equal halves and then joined to a full disc with a sticking tape. Each prepared conc was applied to one half of a filter of the filter paper disc as uniformly as possible with a micropipette. The other half of the filter paper disc was treated with acetone alone and termed as untreated. This dried disc was kept inside the petridishes . Ten adults of mixed sexes of each beetle species were released separately at the centre of the filter disc and the petridish was covered . 10 replicates/conc was prepared. Observation on the no. of insects on the treated and untreated halves was recorded after 3hrs. % repellency was computed using the formula-

$$PR = \frac{Nc - Nt}{Nc + Nt} \times 100$$

Where Nc – No. of insects on the control half

Nt – No. of insects on the treated half

Contact Toxicity assay

The insecticidal activity of various essential oils against the adults of *T.castaneum* was evaluated by direct contact application assay. 20, 40, 60, 80 and 100 µl/ml (2, 4, 6 and 8% solutions) in acetone were prepared. Males and females of *T.castaneum* were transferred into petridishes and chilled for 2-5 min to reduce their mobility. One µl of the test solution was applied to the dorsal surface of the insect insects with the micropipette. Ten insects were treated /conc of the test solution and this was termed as one replication. Ten such replications for each dose were done. After treatment, insects were transferred into empty 12 cms diameter glass petridishes. Insects were examined after 24hrs of treatment.

Ovicidal activity:

Fresh, intact chickpea seeds were placed in plastic jars into which 20 pairs (10M and 10F) of pulse beetle /CM were released for egg laying. After 7 days the chick pea seeds containing the eggs were sorted. 3, 6, 9, 12 µl essential oil of rosemary officinalis was dissolved in 1ml acetone to make (0.3%, 0.6, 0.9, 1.2%) solutions. Total 50 viable eggs /Repln were mixed thoroughly with the test solution and air dried and considered as one replicate. 5 replicates for each concentration were used. Treated chick pea seeds were placed in 300 ml glass bottles and their mouth covered with muslin cloth and left as it is for 1 month for egg hatching and adult emergence. Data on egg hatching was recorded.

III. DISCUSSION

Essential oil of *Mentha viridis* showed 90% adulticidal activity against *Callasobruchus maculatus* adults followed by essential oil of *Rosemarinus officinale* exhibiting only 65% adulticidal activity at 4% in vapor toxicity. Essential Oil of *Rosemarinusa officinalis* showed highest larvicidal activity 85% towards *Tribolium castaneum* larvae at 3.0% concentration. In the ovicidal assay, essential oil of *Rosemarinus officinale* showed the highest egg mortality towards egg of *C. maculatus* at various concentrations. None of the essential oils showed repellent activity towards both the insects except essential oil of *Mentha viridis*. Apart from these, oleoresins of some species like *coriandrum sativum* and *cinnamon zeylanicum* has been extracted and their chemical characterization is under process.

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PERFORMANCE TEST ON VAPOUR COMPRESSION REFRIGERATION SYSTEM USING R290 & R134a MIXTURE

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Abstract- This paper deals with the evaluation of the performance of a refrigeration system by using different refrigerant mixtures. This refrigeration system works under vapour compression cycle with the basic principle " The liquid when evaporates absorbs heat". The refrigerant continues changing from liquid to vapour state when absorbing heat and from vapour to liquid when giving out heat. The refrigerants used in the system are R134a (Tetrafluoroethane), R290 (Isobutane) and Blend of Tetrafluoroethane and Propane (R134a and R290). This project deals with a comparison study of the performance of different refrigerant mixtures mentioned below with R134a kept as a comparison parameter. The above refrigerants are mixed based on weight proportions in different ratios, and their following mixtures used are:

Analysis-1: R134a

Mixture-1: R134a 80% and R290 20%

Analysis-2: R134a (with L.S. heat exchanger)

Mixture-2: R134a 80% and R290 20% (with L.S. heat exchanger)

The usage of R134a must be phased out according to Kyoto Protocol due its high global warming potential (GWP) of 1300. In the present work, an experimental investigation has been conducted with hydrocarbon refrigerant mixtures as an alternate to R134a

Index Terms- R134a 80% and R290 20%, R134a 80% and R290 20%, COP, refrigeration input.

1. INTRODUCTION

In India, about 80% of the domestic refrigerators use R134a as refrigerant due to its excellent thermodynamic and thermo physical properties. But R134a has high GWP of 1300. The higher GWP due to R134a emissions from domestic refrigerators leads to identifying a long term alternative to meet the requirements of system performance, refrigerant-lubricant interaction, energy efficiency, environmental impacts, safety and service. The Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) calls for reductions in emissions of six categories of greenhouse gases, including hydro fluorocarbons (HFCs) used as refrigerants. Refrigerators are identified as major energy consuming domestic appliance in household environment. Many researchers have reported that

hydrocarbon mixed refrigerants is found to be an energy efficient and environment friendly alternative option in domestic refrigerators.

2) COMPONENTS AND FABRICATION:

Compressor: The reciprocating compressor sucks the low pressure and low temperature refrigerant during its suction stroke and delivers it as high pressure and high temperature. The reciprocating compressors are built in sizes ranging from a fraction horse power to several hundred horse power. These are used of refrigerant plant ranging in sizes from 0.25 ton to 1000 tons capacity per unit.

Reciprocating Compressor has piston, cylinder, inlet valve, exit valve, connecting rod, crank, piston pin, crank pin and crank shaft. Inlet valve and exit valves may be of spring loaded type which get opened and closed due to pressure differential across them. Let us consider piston to be at top dead centre (TDC) and move towards bottom dead centre (BDC). Due to this piston movement from TDC to BDC suction pressure is created causing opening of inlet valve. With this opening of inlet valve and suction pressure the atmospheric air enters then cylinder. Air gets into cylinder during this stroke and is subsequently compressed in next stroke with both inlet valve and exit valve closed. Both inlet valve and exit valves are of plate type and spring loaded so as to operate automatically as and when sufficient pressure difference is available to cause deflection in spring of valve plates to open them.

After piston reaching BDC it reverses its motion and compresses the air inducted in previous stroke. Compression is continued till the pressure of air inside becomes sufficient to cause deflection in exit valve. At the moment when exit valve plate gets lifted the exhaust of compressed air takes place. This piston again reaches TDC from where downward piston movement is again accompanied by suction. This is how reciprocating compressor.

Evaporator: The process of heat removal from the substance to be cooled or refrigerated is done in the evaporator. The liquid refrigerant is vaporized inside the evaporator (coil or shell) in order to remove heat from a fluid such as air, water etc.

Evaporators are manufactured in different shapes, types and designs to suit a diverse nature of cooling requirements. Thus, we have a variety of types of evaporators, such as prime surface types, finned tube or extended surface type, shell and tube liquid chillier, etc. In the dry-expansion evaporator, the liquid refrigerant is generally fed by an expansion valve. The expansion

valve controls the rate of flow of refrigerant to the evaporator in such a way that all the liquid is vaporized and the vapour is also superheated to a limited extent by the time it reaches the outlet end. At the inlet of the evaporator, the refrigerant is predominantly in the liquid form with a small amount of vapour formed as a result of flashing at the expansion valve.

As the refrigerant passes through the evaporator, more and more liquid is vaporized by the load. The refrigerant, by the time it reaches the end of the evaporator, is purely in the vapour state and that too superheated. Thus the evaporator in its length is filled with a varying proportion of liquid and vapour. The amount of liquid in the evaporator will vary with the load on the evaporator. The inside of the evaporator is far from dry but wetted with liquid. All the same, this type is called the dry-expansion system to distinguish it from the flooded system and also probably because by the time the refrigerant reaches the evaporator outlet it is no more wet (no liquid) but dry (superheated) vapour.

The evaporator becomes cold and remains cold due to the following reasons:

- 1 The temperature of the evaporator coil is low due to low temperature of the refrigerant inside the coil.
- 2 The low temperature of the refrigerant remains unchanged because any heat it absorbs is converted to latent heat as boiling proceeds.

The three heat-transfer resistances in evaporators are:

- (a) Refrigerant side for the transfer of heat from solid surface to the liquid refrigerant.
- (b) Metal wall.
- (c) Cooled-medium side which could be due to air, water, brine or any other fluid or a wetted surface on a cooling and dehumidifying coil.

The heat transfer from solid surface to the evaporating refrigerant is of primary interest here. However, the mechanism of boiling is so complex because of the influence of such factors as surface tension, saturation temperature, latent heat and nature of the solid surface, in addition to the usual transport properties, that it is very difficult to predict the heat-transfer coefficient analytically. Nevertheless, no attempt is made here to present correlations applicable to evaporating refrigerants which are available in the large amount of published information available on the subject.

Expansion tube: An expansion device is another basic component of a refrigeration system.

The basic functions of an expansion device used in refrigeration systems are to:

1. Reduce pressure from condenser pressure to evaporator pressure, and
2. Regulate the refrigerant flow from the high-pressure liquid line into the evaporator at a rate equal to the evaporation rate in the evaporator

Under ideal conditions, the mass flow rate of refrigerant in the system should be proportional to the cooling load. Sometimes, the product to be cooled is such that a constant evaporator temperature has to be maintained. In other cases, it is desirable that liquid refrigerant should not enter the compressor. In such a case, the mass flow rate has to be controlled in such a manner that only superheated vapour leaves the evaporator. Again, an ideal refrigeration system should have the facility to control it in such a way that the energy requirement is minimum and the

required criterion of temperature and cooling load are satisfied. Some additional controls to control the capacity of compressor and the space temperature may be required in addition, so as to minimize the energy consumption. The expansion devices used in refrigeration systems can be divided into fixed opening type or variable opening type. As the name implies, in fixed opening type the flow area remains fixed, while in variable opening type the flow area changes with changing mass flow rates. There are basically seven types of refrigerant expansion devices. These are:

1. Hand (manual) expansion valves
2. Capillary Tubes
3. Constant Pressure or Automatic Expansion Valve (AEV)
4. Thermostatic Expansion Valve (TEV)
5. Float type Expansion Valve
6. Electronic Expansion Valve

Capillary tubes: This is the type of expansion device used in this system. Instead of an orifice, a length of a small diameter tube can offer the same restrictive effect. A small diameter tubing is called capillary tube, meaning hair-like. The inside diameter of the capillary used in refrigeration is generally about 0.5 to 2.28 mm (0.020 to 0.090). The longer the capillary tube and/or the smaller the inside diameter of the tube, greater is the pressure drop it can create in the refrigerant flow; or in other words, greater will be the pressure difference needed between the high side and low side to establish a given flow rate of the refrigerant. The length of the capillary tube of a particular diameter required for an application is first roughly determined by empirical calculations. It is then further correctly established by experiments. The capillary tube is not self-adjusting. If the conditions change, such as an increase in the discharge/condenser pressure due to a rise in the ambient temperature, reduction in evaporator pressure, etc. the refrigerant flow-rate will also change. Therefore a capillary tube, selected for a particular set of conditions and load will operate somewhat less efficiently at other condition. As soon as the plant stops, the high and low sides equalize through the capillary tube. For this reason, the refrigerant charge in a capillary tube system is critical and hence no receiver is used. If the refrigerant charge is more than the minimum needed for the system, the discharge pressure will go up while in operation. This can even lead to the overloading of the compressor motor. Further during the off-cycle of the unit, the excess amount will enter the cooling coil and this can cause liquid flood back to the compressor at the time of starting. Therefore, the refrigerant charge of the capillary tube system is critical. For this reason, a refrigerant liquid receiver cannot be used. The charge should be exactly the quantity as indicated by the manufacturer of the refrigeration unit. Since the capillary tube equalizes the high side with the low side during the off-cycle, the idle pressures at the discharge and suction of the compressor will be equal. Therefore at the time of starting, the compressor motor need not overcome the stress of the difference of pressure in the suction and the discharge sides. In other words the compressor is said to start unloaded.

The capillary tube is quite a simple device and is also not costly. Its pressure equalization property allows the use of a low starting torque motor. The liquid receiver is also eliminated in a capillary tube system because of the need to limit the refrigerant charge.

All these factors help to reduce the cost of manufacture of the systems employing a capillary tube as the throttling device.

The capillary tube is used in small hermetic units, such as domestic refrigerators, freezers and room air conditioners.

The following are the various types of capillary tube devices,

1. Capillary tube
2. Hand-operated capillary tube valve
3. Automatic or constant pressure capillary tube valve
4. Thermostatic capillary tube valve
5. Low side float valve
6. High side float valve

The automatic capillary tube valve is used in the work.

The pressure reduction in a capillary tube occurs due to the following two factors:

1. The refrigerant has to overcome the frictional resistance offered by tube walls. This leads to some pressure drop, and
2. The liquid refrigerant flashes (evaporates) into mixture of liquid and vapour as its pressure reduces. The density of vapour is less than that of the liquid. Hence, the average density of refrigerant decreases as it flows in the tube. The mass flow rate and tube diameter (hence area) being constant, the velocity of refrigerant increases since $v = \rho VA$. The increase in velocity or acceleration of the refrigerant also requires pressure drop.

Several combinations of length and bore are available for the same mass flow rate and pressure drop. However, once a capillary tube of some diameter and length has been installed in a refrigeration system, the mass flow rate through it will vary in such a manner that the total pressure drop through it matches with the pressure difference between condenser and the evaporator. Its mass flow rate is totally dependent upon the pressure difference across it; it cannot adjust itself to variation of load effectively.

The flow through a helical capillary is divided into two distinct regions: a liquid single-phase and a two-phase region. In figure, point 1 denotes condenser exit and point 2 denotes the capillary inlet. There is a small pressure drop from point 1 to 2 due to sudden contraction to capillary diameter. The refrigerant is sub-cooled between points 2 and 3, saturated liquid at point 3 and is a two-phase mixture between points 3 and 4. Point 4 denotes capillary exit.

Balance point of compressor and capillary: The compressor and the capillary tube, under steady state must arrive at some suction and discharge pressures, which allows the same mass flow rate through the compressor and the capillary tube. This state is called the balance point. Condenser and evaporator pressures are saturation pressures at corresponding condenser and evaporator temperatures. The mass flow rate through the compressor decreases if the pressure ratio increases since the volumetric efficiency of the compressor decreases with the increase of pressure ratio. The pressure ratio increases when either the evaporator pressure decreases or the condenser pressure increases. Hence, the mass flow rate through the compressor decreases with increase in condenser pressure and/or with decrease in evaporator pressure.

Condenser: Refrigerator condenser is one of the main operating components that make up the cooling system on a standard refrigerator. It consists of a series of copper tubes that overlap in a grid or coiling pattern. On most models, the condenser is located at the back of the unit, though some may be installed on

the bottom or along one side of the unit. While its size can vary, it often covers at least half of the area of the refrigerator wall, and some even cover the entire wall of the unit.

Combined with the evaporator unit within the fridge, the condenser removes heat from inside the refrigerator and transfers it to the outside of the unit. A series of copper tubes or pipes connect the two devices, and liquid refrigerant passes through these tubes to travel from one to the other. As the refrigerant passes through the evaporator, it collects heat energy from within the refrigerator or freezer, leaving the inside of the unit cold enough for food storage. The extra heat energy warms the refrigerant, causing it to transform into a gaseous material. This gaseous refrigerant then travels down to the condenser. As the refrigerant passes into the condenser, a fan blows air onto the copper tubes. This cools the refrigerant inside, and the excess heat energy is exhausted into the room. Once the heat leaves the refrigerant, it transforms back into a liquid, then travels back into the evaporator to repeat this cooling cycle. To maximize the operating life of a refrigerator, owners must perform routine maintenance tasks, which include cleaning the refrigerator condenser coils. By keeping these coils free of dirt and debris, owners will often find that the unit is less likely to break down. A clean unit is also able to operate more efficiently, which may result in lower utility costs. Before attempting to clean the coils, users should unplug the unit or switch off the electrical breaker to reduce the risk of injury. The refrigerator should then be pulled away from the wall to allow access to the unit. Some coils are covered by a plate or panel, which typically slides or snaps off by hand. Once the condenser is exposed, users can clean the coils with a vacuum hose attachment or a stiff brush. It's important to work carefully during this task to avoid bending or damaging the tubes.

There are three types of condensers, viz.

- (a) Air-cooled,
- (b) Water-cooled and
- (c) Evaporative.

As their names imply, air-cooled condensers use air as the cooling medium, water-cooled condensers use water as the medium and the evaporative condenser is a combination of the above, i.e. uses both water and air. In this system we are using an air cooled condenser.

Refrigerant: Any substance capable of absorbing heat from another required substance can be used as refrigerant. Example:- ice, water, air, etc. A mechanical refrigerant which will absorb the heat from the source (which is at low temperature) and dissipate the same to the sink (which is at higher temperature than source). Either in the form of sensible heat (as the case of air refrigerant) or in the form of latent heat (as the case of vapour refrigerant).

Refrigerant-R134a

Tetrafluoroethane is an inert gas used primarily as a "high-temperature" refrigerant for domestic refrigeration and automobile air conditioners. These devices began using 1,1,1,2-tetrafluoroethane in the early 1990s as a replacement for the more environmentally harmful R-12 and retrofit kits are available to convert units that were originally R-12-equipped.

Other uses include plastic foam blowing, as a cleaning solvent, a propellant for the delivery of pharmaceuticals (e.g. bronchodilators), wine cork removers, gas dusters and in air

driers for removing the moisture from compressed air. 1,1,1,2-Tetrafluoroethane has also been used to cool computers in some over clocking attempts. It is also commonly used as a propellant for air soft air guns. Tetrafluoroethane, when compressed as inside gas duster cans, is a clear liquid which boils when exposed to atmospheric pressure at room temperature (as seen here) and can be extracted from common "canned air" canisters by simply inverting them during use.



R134a is the most widely used refrigerant in domestic refrigerators. It must be phased out soon according to Kyoto protocol due to its high global warming potential (GWP) of 1300. Hence we come up with several hydrocarbon mixtures as an alternative to R134a refrigerant.

1. Compressor Specifications

- Number of cylinders - One
- Working position Vertical
- Method of compression Single acting
- Number of times of compression of gas Single stage
- Cooling system Air-cooled
- Compressor 1/6 hp, 2440 rpm, 1.1amp(max)
- Motor use (Single phase)

2. Condenser

3. Evaporator

4. Pressure Gauges

5. Energy Meter

6. Control Valves

7. Capillary Tubes

8. Channel Temperature Indicator

All the components are fitted and connections are given accordingly and all the gauges are fixed.

3) OBSERVATION:

4)

Pressure and Temperature observations analysis-1: R134a

Time taken	P1	P2	P3	P4	T1	T2	T3	T4
(min)	(psi)	(psi)	(psi)	(psi)	(°C)	(°C)	(°C)	(°C)
15	23	210	220	30	29.2	43.4	38.7	22.2
30	26	220	225	32	21.9	55.4	43.8	20.8
45	30	225	230	34	18.3	76.6	50.5	19.2
60	34	228	234	36	14.4	84.6	78.2	15.7

Time taken	P1	P2	P3	P4	T1	T2	T3	T4
(mins)	(psi)	(psi)	(psi)	(psi)	(°C)	(°C)	(°C)	(°C)
15	26	190	195	30	26.7	45.4	39.7	21.8
30	28	185	190	32	24.3	48.6	45.4	19.4
45	30	180	185	33	19.8	49.9	38.7	16.7
60	32	180	180	33.5	11.7	52.4	37.4	14.3

Pressure and Temperature observations mixture-1-R-134a 80% and R290 20%

Time taken	P1	P2	P3	P4	T1	T2	T3	T4
(mins)	(psi)	(psi)	(psi)	(psi)	(°C)	(°C)	(°C)	(°C)
15	26	190	195	30	26.7	45.4	39.7	21.8
30	28	185	190	32	24.3	48.6	45.4	19.4
45	30	180	185	33	19.8	49.9	38.7	16.7
60	32	180	180	33.5	11.7	52.4	37.4	14.3

Pressure and Temperature observations with analysis 2-R134a (with I.S.HEAT EXCHANGER)

Time taken	P1	P2	P3	P4	T1	T2	T3	T4
(mins)	(psi)	(psi)	(psi)	(psi)	(°C)	(°C)	(°C)	(°C)
15	68	276	278	80	34.5	49.3	42.8	23.7
30	72	280	280	82	34.2	52.2	43.2	23.9
45	72	280	280	82	34.3	53.8	43.1	24.1
60	72	275	280	82	33.4	54.2	43.3	23.6

Pressure and Temperature observations with Mixture 2 – R134a
 80% &
 R290 20% (with L.S.HEAT EXCHANGER)

Time taken (mins)	P1 (psi) (°C)	P2 (psi) (°C)	P3 (psi)	P4 (psi)	T1 (°C)
15	68 42.8	276 23.7	278	80	34.5 49.3
30	72 43.2	280 23.9	280	82	34.2 52.2
45	72 43.1	280 24.1	280	82	34.3 53.8
60	72 43.3	275 23.6	280	82	33.4 54.2

Temperature and time taken for cooling

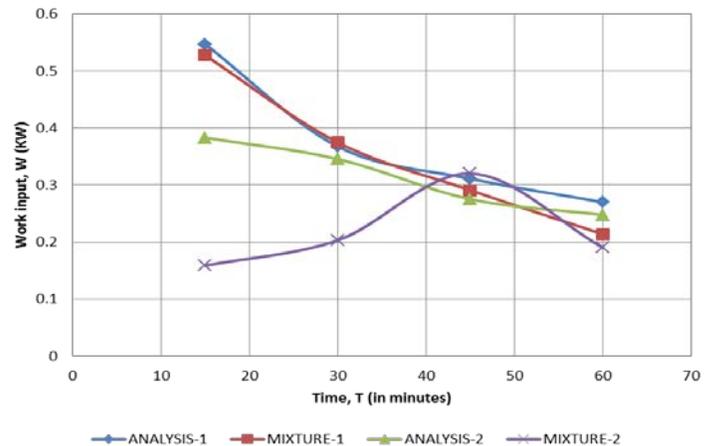
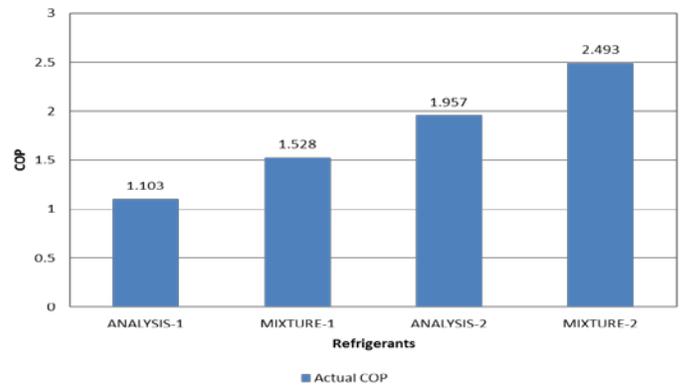
REFRIGERANT	Initial Temperature of Water Temperature of Water (°C) (min)	Time (°C)	Final
ANALYSIS-1 60		30.2	4.6
MIXTURE -1 60		29.5	1.4
ANALYSIS- 2 60		30.3	2.8
MIXTURE- 2 60		35.8	9.6

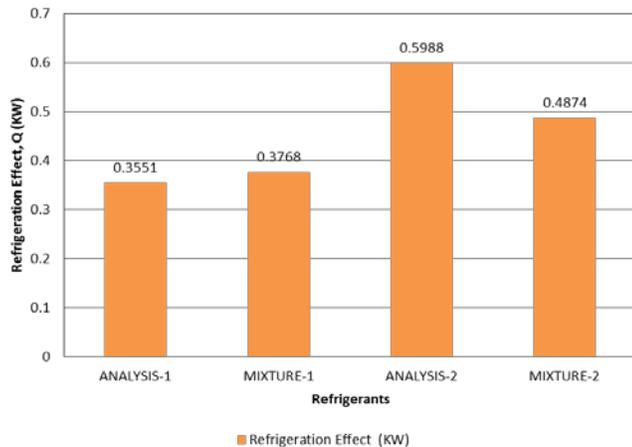
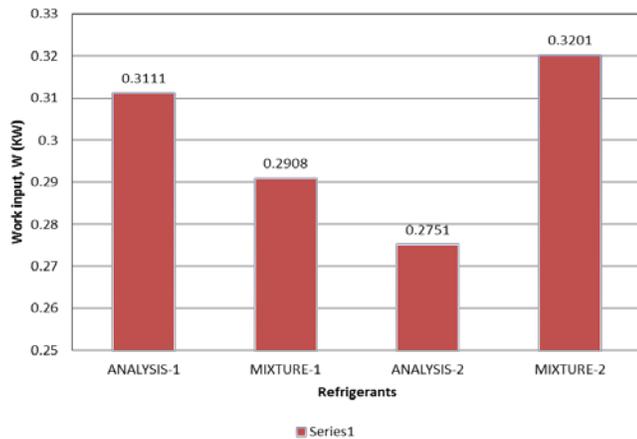
COP FOR ANALYSIS-1 :
 $Q = (15 * 4.187 * (30.2 - 4.6)) / 60 * 60$
 $Q = 0.2977 \text{ kW}$
 $W = ((1/3200) * (5 / 20.84) * 3600$
 $W = 0.2699 \text{ kW}$
 $COP = 0.2977 / 0.2699$
 $COP = 1.103$

COP OF MIXTURE 1:
 $Q = (15 * 4.187 * (29.5 - 1.4)) / 60 * 60$
 $Q = 0.3268 \text{ kW}$
 $W = ((1/3200) * (5 / 26.3) * 3600$

$W = 0.2138 \text{ kW}$
 $COP = 0.3268 / 0.2138$
 $COP = 1.528$
 5.3.1.3 COP OF ANALYSIS 2:
 $Q = (15 * 4.187 * (30.3 - 2.3)) / 60 * 60$
 $Q = 0.4849 \text{ kW}$
 $W = ((1/3200) * (5 / 20.7) * 3600$
 $W = 0.2477 \text{ kW}$
 $COP = 0.4849 / 0.2477 = 1.957$
 COP OF MIXTURE 2:
 $Q = (15 * 4.187 * (35.8 - 9.6)) / 60 * 60$
 $Q = 0.4874 \text{ KW}$
 $W = ((1/3200) * (5 / 29.51) * 3600$
 $W = 0.1907 \text{ KW}$
 $COP = 0.4874 / 0.1907$
 $COP = 2.49$

5) GRAPHS:





This study investigated the performance of different mixtures of refrigerants as the working fluid in a vapor compression refrigeration system. One refrigerant blend is used for this project using different components and proportions. Here R134a refrigerant is used as comparing parameter for the other refrigerant mixtures. By conducting the experimental analysis, we have found out that Mixture-2 R134a 80% and R290 20% (with L.S. Heat Exchanger) have given a maximum coefficient of performance and the Analysis-1 R134a have given a lowest coefficient of performance when compared to other mixtures.

The Mixture-2 R134a 80% and R290 20% (with L.S. Heat Exchanger) have shown a slight increase C.O.P by 24.5% when compared to the C.O.P of R134a in the same system. On analyzing the refrigeration effect, for a given time period mixture-2 shows better cooling effect than other mixtures. But while comparing the work input data, the system when charged with Mixture-2 has operated with low energy consumption than R134a refrigerant.

While considering the energy consumption parameter, it is understood that Mixture-2 R290 80% and R290 20% (with L.S. Heat Exchanger) can be used as an alternate refrigerant to R134a on a long term run. The results show that hydrocarbon mixtures

have lower energy consumption. The overall performance of the hydrocarbon mixtures showed that this could be the long term alternative to phase out R134a.

APPENDIX

- COP Coefficient of performance
- Qc Desired output
- Q Refrigeration Effect (KW)
- Ec Energy meter constant
- W Work input (KW)
- P1 Pressure at Evaporator outlet
- P2 Pressure at Compressor outlet
- P3 Pressure at Condenser outlet
- P4 Pressure at Expansion valve outlet
- T1 Temperature at Evaporator outlet
- T2 Temperature at Compressor outlet
- T3 Temperature at Condenser outlet
- T4 Temperature at Expansion valve outlet

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A step-wedge simple randomized trial to assess the use of Case Managers to Increase Linkage to HIV Care and Early retention of Newly Diagnosed HIV-positive Persons at a regional Referral Hospital in Western, Kenya

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Abstract- Linkage of newly diagnosed HIV positive individuals to HIV care and treatment services is essential to initiate lifesaving antiretroviral therapy and thereby reduce HIV transmission. However, program data has shown that only 38% of newly diagnosed HIV patients in Kenya are linked to care. Case management model, a model with proven efficacy, uses case managers to provide strength based counseling that enable individuals identify their internal strengths and assets needed to facilitate linkage and enhance retention. This evaluation seeks to test the efficacy of using case managers in increasing linkage and early retention to HIV care among newly diagnosed HIV positive individuals at a referral hospital in Western Kenya within one year and including a six month follow up period by comparing linkage and retention rates among HIV infected persons who receive case managers to those who did not. A step-wedged design will be employed at 12 of the 24 hospital departments. This will be done by introducing the intervention in a phased approach by testing site. A minimum of 672 HIV infected persons will be recruited. Linkage to care will be defined as a recorded encounter at the HIV clinic's enrolment registry. Participants will be considered retained in care after attending two or more visits over a six month period. Data on participant characteristics, linkage and retention proportions and their associated factors will be analyzed in the early and late intervention groups. Results from this evaluation will provide information on improving linkage and retention rates among HIV infected patients.

Index Terms- HIV, Phased-approach, engagement in HIV care

I. BACKGROUND

A. Introduction

In 2014, 36.9 million people were living with HIV globally; there were 2.0 million new infections and 1.2 million deaths [1]. In 2015, 2009 indicated that only around 49% of PLHIV in low and middle income countries who are in need of ART are actually on ART [2]. According to the Kenya Demographic and Health Survey of 2012, the national HIV prevalence among persons aged 15-64 years was 5.6%. In the same survey, Kisumu County of Kenya had a HIV prevalence of 18% [3].

In Africa, linkages rates among newly diagnosed HIV patients range from 23%-50% [4-6]. HIV treatment programs from Low and Middle Income Countries have an attrition rate of

21% six months after enrolment into HIV care [7]. In Kenya, 53% of HIV infected persons are not aware of their HIV infection. About 89% persons country-wide aged 15-64 years who were aware of their HIV infection were on care, 88% of those eligible for Antiretroviral Therapy (ART) were on ART; only 43% of those who initiated care remained in care [8]. At the Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH), a regional referral hospital in Western Kenya, only 38% of HIV infected persons are linked HIV care, and 83% of them are retained in care within 1-2 months, 76% within 3-4 months, and 61% within a one year period (L.Nguti, personal communication, October 22, 2014).

HIV test and treat strategies aim to mitigate the effects of HIV by increasing the coverage of HIV testing services, linking those tested to relevant HIV prevention, care and treatment services and ensure those linked to these services are managed appropriately [9]. This has been emphasized in UNAIDS' recent 90-90-90 treatment targets that aims to eliminate HIV by 2030 [10]. HIV testing is postulated to decrease HIV transmission by decreasing risky sexual behavior among all persons tested and decrease viral load among those who test HIV positive after ART initiation [11]. Delayed presentation or non-retention in HIV care places HIV-infected clients at risk for elevated morbidity and mortality [12] and reduces the long term benefits of ART as prevention [13].

Linkage to care has been defined as 'attending one or more clinic visits' [14], "documented CD4 T- cell counts results' or [15] or 'a scheduled visit with a health care provider who can manage ART' [16, 17] all within 6 months of HIV diagnosis. HIV biomarkers (CD4 count and plasma HIV viral load) are often evidence of a completed visit at a HIV clinic [18]. Other measures include, records of missed visits [17, 19], appointment adherence [20], visit constancy [19] and gaps in care [21].

Strength-based counseling, a strategy that includes building patient-provider relationships, improving family-patient relationships, identifying clients strengths, providing information and education, [22] and use of patient navigators [23], has been successfully used to improve linkage to HIV care after diagnoses [24]. JOOTRH which has low linkage and retention rates does not routinely use case managers. There is a need to test the efficacy of using case managers to improve linkage and early retention of newly diagnosed HIV-infected patients at JOOTRH.

B. Study Objectives

General objectives

To compare linkage and retention rates in care among newly diagnosed HIV-infected persons who have received case managers versus those who have not received case managers.

Specific objectives

1. To compare time from HIV diagnosis to first encounter (presentation at the HIV clinic registry) for newly diagnosed HIV-infected persons who have received case managers versus those who have not yet received case managers.
2. To compare proportion of patients enrolled to HIV care at the JOOTRH PSC among newly diagnosed HIV-infected persons who have received case managers versus those who have not yet received case managers.
3. To compare the attrition rates at enrolment, months two, four and six among newly diagnosed HIV-infected persons who have received case managers versus those who have not yet received case managers at the JOOTRH PSC.
4. To describe factors predictive of linkage among newly diagnosed HIV-infected patients and retention among newly diagnosed HIV-infected patients enrolled in care at JOOTRH PSC within the implementation period of the case manager’s intervention.
5. To describe barriers to enrolment into HIV care for newly diagnosed HIV-infected patients and barriers to retention among newly diagnosed HIV-infected patients enrolled in care at JOOTRH PSC within the implementation period of the case manager’s intervention.

II. METHODOLOGY

A. Study design and setting

A step-wedge design will be used to implement and evaluate the efficacy of using case manager’s to improve linkage and early retention to HIV care and treatment at JOOTRH. The intervention will be implemented sequentially to participants over a specified time period. By the end of the implementation period, all the participants will have received the intervention

[25]. The step-wedge design was chosen due to ethical, logistical and financial concerns. Since the intervention has been proven to work elsewhere, it would be unethical to deny some patients the intervention. Additionally, it was difficult to identify an alternative health facility to act as a control that would be comparable to JOOTRH in terms of support service package e.g. phone reminders on appointment dates, phone/home tracing of clients who fail to honour appointments, use of community health workers to monitor ART and to provide daily observed treatment for special populations (people of unsound mind), group therapy before and after enrolment,. Financial constrains also prevented the implementation of the intervention across all departments all at once. This thus justified the phased-approach to introducing the intervention at JOOTRH.

JOOTRH is a regional HIV referral facility accessible to Western Kenya and parts of Rift Valley regions. The hospital is located in the Southwest region of the country bordering Lake Victoria. It serves a population in excess of 5 million people and has a bed capacity of 457 with occupancy of approximately 95% [8]. Annually, it offers outpatient services to over 250,000 persons and inpatient services to approximately 21,000 persons. HTC services are offered to both patients and visitors at all service delivery points in the hospital. In 2011, approximately 6,000 persons were tested for HIV at the JOOTRH; 6.3% of persons never tested before they tested HIV positive [26].

JOOTRH has 24 departments where HIV testing is conducted. Only 12 of these departments will be used as evaluation sites, although all the 24 departments shall eventually implement the patient-linkage intervention. The 12 ‘evaluation-departments’ shall be matched according to whether they are ambulatory or inpatient, and also whether the majority of the clients are men or women (Table 1). We shall purposely select one member of each pair into an early intervention group while the other will be in the midterm intervention group. The remaining departments, which do not form part of the 12 evaluation sites, will comprise the late-intervention group; data from the late-intervention group shall not be used in this evaluation.

Table 1: Assignment of departments into intervention phases

	PHASE 1	PHASE 2	PHASE 3
OPD	Consultant clinic	Children OPD	TB/HIV
	ANC	Post natal clinic	Dental
	Clinical room 8	VCT	FP
			Clinical room 9
			GBVRC
			Mortuary
			ENT
IPD	Male Surgical	Male Medical	Gynecology ward
	Maternity	Eye Clinic	Female Surgical
	Children IPD	Casualty	Female Medical

			Eye Ward
			Oncology ward

The intervention will implemented every three months until full coverage of all hospital units is achieved over a nine month period. Implementation will start in six units while 18 units continue to provide routine services. After a three month period, the units will be increased to 12 units and the remaining 12 units will continue to provide routine services. Finally, the intervention will be scaled to the remaining 12 units over a three month

period. The intervention will continue to be implemented in the whole facility even after the end of the study period. All clients will be followed up for a period of 6 months. (Table 2).

Table 2: The step wedge design phases

		TIME IN MONTHS														
		Pre-implementation			Phase enrolment I			Phase enrolment II			Phase III enrolment (phase I & ii follow up)					
		Months 0-2			Months 3-6			Months 6-8			Months 9 onwards					
ARM	CLINIC	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Phase I Early arm 6 clinics	A	0	0	0	X	X	X	X	X	X	X	X	X	X	X	X
	B	0	0	0	X	X	X	X	X	X	X	X	X	X	X	X
	C	0	0	0	X	X	X	X	X	X	X	X	X	X	X	X
	D	0	0	0	X	X	X	X	X	X	X	X	X	X	X	X
	E	0	0	0	X	X	X	X	X	X	X	X	X	X	X	X
	F	0	0	0	X	X	X	X	X	X	X	X	X	X	X	X
Phase ii Middle arm 6 clinics	G	0	0	0	0	0	0	X	X	X	X	X	X	X	X	X
	H	0	0	0	0	0	0	X	X	X	X	X	X	X	X	X
	I	0	0	0	0	0	0	X	X	X	X	X	X	X	X	X
	J	0	0	0	0	0	0	X	X	X	X	X	X	X	X	X
	K	0	0	0	0	0	0	X	X	X	X	X	X	X	X	X
	L	0	0	0	0	0	0	X	X	X	X	X	X	X	X	X
Phase iii Late intervention 12 clinics	M	0	0	0	0	0	0	0	0	0	X	X	X	X	X	X
	N	0	0	0	0	0	0	0	0	0	X	X	X	X	X	X
	O	0	0	0	0	0	0	0	0	0	X	X	X	X	X	X
	P	0	0	0	0	0	0	0	0	0	X	X	X	X	X	X
	Q	0	0	0	0	0	0	0	0	0	X	X	X	X	X	X
	R	0	0	0	0	0	0	0	0	0	X	X	X	X	X	X
	S	0	0	0	0	0	0	0	0	0	X	X	X	X	X	X
	T	0	0	0	0	0	0	0	0	0	X	X	X	X	X	X
	U	0	0	0	0	0	0	0	0	0	X	X	X	X	X	X
	V	0	0	0	0	0	0	0	0	0	X	X	X	X	X	X
	W	0	0	0	0	0	0	0	0	0	X	X	X	X	X	X
	X	0	0	0	0	0	0	0	0	0	X	X	X	X	X	X

B. Study population

Participants will be;

- 1) Patients, visitors or persons accompanying patients who are drawn from the hospital's catchment area and opt to access HIV care and treatment services at JOOTRH.

i. Criteria for inclusion of subjects

Newly diagnosed HIV positive clients will be eligible for inclusion in the study if;

- Aged 18 years and above.
- Mature minors aged 15-17 years.
- Reside in the JOOTRH catchment area.
- Selected JOOTRH as their preferred referral hospital for HIV care.
- Able to speak English, Kiswahili, or Dholuo.
- Willing and able to provide informed consent for participation.
- Was attending the facility as an outpatient/visitor or had accompanied a patient to the facility.

ii. Criteria for exclusion of subjects

- Patients and persons who are unable to understand or provide informed consent.
- If it is observed that the person giving consent is possibly under the influence of alcohol and drugs, since participants' judgment and behavior may impair the validity of consent.
- Persons not drawn from the catchment area.
- Person who opts to access HIV care and treatment services elsewhere.
- In patients, some of whom may be drawn from outside Kisumu (and may prefer to access HIV care at other facilities) since JOOTRH is a referral hospital. The length of hospital stay may also be a hindrance to their inclusion.

C. Sample size determination

This was computed based on methods for sample size computation for stepped-wedge cluster randomized trials [27-30]. This entailed obtaining a standard sample size for an individual-randomized trial and multiplying it by the design effect to yield the required sample size.

The current linkage rate is 58% (control arm). The intervention is expected to increase the linkage rate by 20% (intervention arm). Using a power of 80%, a two-sided level of significance of 5% and a standard sample size equation for an individual-randomized trial on using STATA version 13.1, this yielded a sample size of 85 patients per arm.

From JOOTRH data, under standard care, the inter-department (inter-cluster) variation in rates (σ_b^2) , is 0.1042. The mean of linkage rates (\bar{P}) between the control (58%) and intervention (78%) groups is 68%. The intra-department variance (σ_w^2) , given as, $\bar{P}(1-\bar{P})$, is 0.2176.

The intra-cluster correlation coefficient (ICC) calculated using the formula below is 0.3239.

$$\rho = \frac{\sigma_b^2}{\sigma_b^2 + \sigma_w^2}$$

To obtain the desired sample size for our stepped-wedge cluster randomized trial, we multiply the standard sample size estimate by a design effect (*Deff*). Where *m* is the average number of individuals per departments (assuming all departments are of equal size) is 10 and ρ is the intra-cluster correlation coefficient.

$$Deff = 1 + (m - 1)\rho$$

The design effect is 3.9.

The design effect (3.9) will be multiplied by the standard sample size per arm (85) to yield a sample size of 331.5 per arm. A sample size of 331.5 implies a total of 27.6 patients per department per arm since the study will be conducted in 12 departments. This is rounded off to a minimum of 28 patients per department. We will then have 56 in each department (28 in the control/pre-implementation arm and 28 in the intervention arm/implementation arm) giving a minimum sample size of 672 patients.

D. Sampling techniques

In the intervention arm, in each department, the 28 patients will consecutively be recruited. In the control arm, the 28 patients per department will consecutively be recruited too. Approximately 2-5 patients will be recruited daily in each department depending on the patient-volume.

E. Study Procedures

Standard procedures for HIV management at JOOTRH for the control arm

Standard procedures for HIV diagnosis at the HTC point

At JOOTRH, patients who have sought outpatient services and hospital visitors are usually offered HTC services by individuals certified by the National AIDS and STI Control Programme (NAS COP) to offer HIV testing and counseling.

Newly diagnosed HIV positive persons (patients/ visitors/ or people accompanying patients to the hospital) then undergo the following procedures in order to facilitate their linkage to care;

1. Obtaining their contact details which indicate their residence and directions to their workplace and how the patient could be reached. Contact details also included a phone number.
2. An inquiry on where they wish to obtain HIV care and treatment services. If the person is drawn from JOOTRH's catchment area, he or she has an option to also attend the HIV clinic at JOOTRH.
3. HIV infected persons are then referred to the HIV clinics of their choice and are advised to go there within 2-4 weeks. Those who do not return for subsequent visits are called 'no show'.

4. A follow-up phone call and/or home visit is made for persons who opted to receive HIV care and treatment services at JOOTRH who fail to turn up at the HIV clinic for enrolment within 4 weeks of a positive HIV diagnosis. This is done by peer educators and Community Health Workers (CHWs) with a view to determine reasons for “no show” and to further encourage linkage to care.

Standard procedures for HIV care and treatment at the HIV clinic

1. Upon arrival at the JOOTRH clinic, newly diagnosed HIV-infected persons presents referral forms at the reception, their names are entered in the pre-enrolment register, and cards with a pre-enrolment identity (ID) numbers are issued. These cards are then used in subsequent appointments.
2. The newly-diagnosed HIV-infected persons are then asked to attend a group counseling session where they are briefed on the clinic procedures and HIV care and treatment.
3. HIV infected persons are then requested to return for a second group counseling session within seven days when an enrolment ID number is issued and baseline laboratory tests (including CD4 counts) are ordered; they are then asked to return to pick results within 3- 5 days.
4. When they return, they are seen by a clinician and results of the laboratory tests are reviewed. Subsequently, they are initiated on the appropriate treatment and appointments are scheduled for the next visit. Those who do not return for any subsequent visits after the initial visit are called ‘no return’.
5. If an appointment during the pre-enrolment phase is not honored, follow-up phone calls and/or home visits are made by peer educators and CHWs using the contacts provided at registration. This is done to determine the reasons for ‘no return’ and to further encourage ‘return to care’. Tracing outcomes are then documented and patient clinic records updated.
6. Client exit interviews and patient flow analysis are periodically carried out as quality assurance measures.

The intervention arm: Case Managers’ Intervention at the JOOTRH Patient Support Centre

Strength based case management uses of trained personnel to enable clients identify their internal strengths and barriers to successful linkage to HIV care [24]. Peer educators, who already have basic knowledge on HIV and trained in HIV counseling, will be recruited as case managers. They will receive refresher training on basic HIV counseling and on the study procedures. They will then be responsible for the following;

- Assisting newly diagnosed HIVinfected persons who select to attend the JOOTRH HIV clinic to navigate the hospital system.
- Providing strength-based counseling to identify and mitigate risk factors for non-enrolment/missed

appointments. These factors, which will be identified during the counseling sessions, include disbelief of HIV serostatus, discomfort or negative perceptions of health care system or health care provider [31], feeling of wellness [32] lack of transportation [33], limited social support [34], alcoholism [35] and HIV stigma [36].

- Escorting the patient to ensure enrolment at the PSC.
- Maintaining contact with the client from HIV diagnosis up to six months post enrolment to provide continuous education on HIV related issues such as the basics on HIV disease, HIV disease progression, HIV care/ART, adherence, nutrition, and address the client’s HIV and health related concerns such as disclosure and stigma.
- Conducting follow up for ‘no show’ to determine reasons for presenting at the HIV clinic, and ‘no return’ to determine reasons for not attending the next scheduled appointments. A maximum of 8 telephone attempts over a four week period will be made before concluding a ‘no return’. Up to three home follow up attempts will be made to conclude a home visit for persons who could not traced by phone.

Implementation of the Case Managers’ Intervention at the JOOTRH HIV Clinic

Patients enrolling in HIV care shortly after HIV diagnosis (within 4 weeks)

1. All newly diagnosed HIV positive persons will be assigned to a case manager who will be responsible for supporting them until enrolment at the HIV clinic and at months one, three and six after enrolment.
2. Immediately following HIV diagnosis, the case manager will assist newly diagnosed HIV positive persons who were referred to the JOOTRH HIV clinic, to navigate the hospital and to have the clinical issues that brought them addressed.
3. The Case manager will then provide strength based counseling to identify and mitigate risk factors for non-enrolment/missed appointments.
4. The Case manager will guide the newly diagnosed HIV infected person for pre-enrolment counseling (as described in the standard procedure) and ensure the patients is registered at the pre-enrolment registry
5. The Case manager is responsible for all tracking all subsequent follow up visits through telephone calls and home follow up (if necessary) until all scheduled visits within a 6 months period after enrolment have been honored.
6. The case manager will maintain contact with the newly diagnosed HIV infected person from time of HIV diagnosis up to six months post enrolment, provide continuous education on HIV related issues and address the client’s HIV and health related concerns.
7. The case manager will conduct phone follow up for clients who fail to return for appointments (‘no return’) after enrolment to determine reasons for no return. He will attempt to contact the participants on phone on eight different days over a four week period for a missed appointment. He will also conduct home visits to clients not traced by phone; up to three home follow up

attempts over a four week period will be made to conclude a home visit.

Patients who delay enrolling in HIV care after HIV diagnosis (after 4 weeks) 'no show'

1. The case manager assigned to a newly diagnosed HIV infected person will conduct phone follow up for clients who fail to enroll for HIV care within four weeks after HIV diagnosis ('no show') to determine reasons for not initiating care after enrolment. The case manager will attempt to contact him/her on eight different days over a four week period. Homevisits to will be carried out for persons not traced by phone; up to three home follow up attempts over a four week period will be made to conclude a home visit. Procedures 1-7 will be followed for persons who opt to enroll at the JOOTRH HIV clinic who are found on tracing.

F. Randomization

Upon diagnosis, newly diagnosed persons will be systematically randomized to either the 'standard of care' or 'Case managers' intervention'. The sampling interval will be two i.e. every second person diagnosed with HIV at each department is assigned to the intervention while the other gets the standard of care [37].

G. Outcome

The core-primary outcomes will be:

- 1) Documented linkage to HIV care. Linkage to HIV care will be defined as established encounter with the JOOTRH PSC at the pre-enrolment registry with the first initial CD4 result collected.
- 2) Documented retention to HIV care. Early retention in HIV care will be defined as attending two or more HIV clinic visits over a six month period.
- 3) Time-to-enrollment at PSC. Time-to-enrollment is defined as the difference between date of diagnosis and date of first presentation at the PSC.

H. Statistical methods

Data collection

Quantitative data

The study data will consist of the information present in the registers that health providers routinely collect at each patient encounter using a set of pre-existing standardized forms or other type of medical record. These forms and data are based on the Kenyan national guidelines on HIV testing and counseling (HTC) and HIV care and treatment.

Initially, data on linkage and retention rate within a two month period during which routine services are offered will provide baseline information on which to compare subsequent phases of the study. Evaluation of linkage and early retention will be made through a 6-months follow up period for patients enrolled during the early and mid-term intervention groups. This will be compared among patients in the case managers group and those receiving routine services.

Data will be collected from all the 12 evaluation departments for a period of 13 months. The month at which we will begin data collection, shall be considered month-one.

Information deemed relevant to the study's objectives that will be abstracted will include records of HIV diagnosis, HIV care/ART initiation. These will include patient demographics (e.g. name, date of birth, occupation, etc), data of HIV diagnosis, referral source, date of enrolment into HIV care or treatment, date of first CD4 count, date of subsequent care/ART visit, health services they are receiving (including ART, prophylaxis, diagnosis, treatment of opportunistic infections, etc), CD4 count values and data from patient satisfaction surveys and patient flow analysis. This information will be collected using either scannable forms or sourced directly from the EMR system.

Each participant will be assigned a unique identifier. Any time the participant shows up for a visit and is part of the study, his/her unique identifier will indicate that they are part of the study.

Additional data will be collected from 'no show/no return' study participants using structured questionnaires which will be administered by trained case managers.

Qualitative data

Study interviews will be conducted by case managers for;

- Persons who selected JOOTRH as their preferred referral HIV clinic but failed to show up within 4 weeks of testing at the intervention sites; also known as no-show clients
- Persons who initiated HIV care at JOOTRH and missed any appointment within six months of enrolment at the intervention sites; also known as no-return

Data analysis

Data will be exported into STATA 13.1/SAS 9.2 Software for analysis. The explanatory variables will include patients' age, gender, date of HIV diagnosis, CD4 count at enrolment, and location of residence amongst others. Socio-demographic and clinical characteristics of the study participants will be described using descriptive statistics. Categorical variables will be compared using chi-square test and, where appropriate, the Fisher exact test. Continuous variables will be compared using t-test and, where applicable, the Wilcoxon test. The primary analysis will be at the individual-level and the secondary analysis will be at the department-level.

We will employ data analysis methods for stepped-wedge cluster randomized design [38-40]. For the individual-level analysis in the "linkage to HIV care" outcome, we will compare proportion linked to HIV care between the two arms using Mixed Effects Regression Models. The departments and calendar-time will be considered as the random effects variables the other covariates will be fixed effects. This model, in essence, will account for clustering within departments and time effects. We will also explore potential interaction between department and calendar-time. Potential factors predictive of linkage to care will be assessed from the model. For the department-level analysis, weighted t-test will be employed. The t-test will be weighted by the number of patients per department since we anticipate the number of participants per departments will vary. The intention-to-treat analysis will be employed. Analysis of "retention to HIV care" outcome will be analogous to the "linkage to HIV care" outcome.

For the “time-to-enrollment” outcome, Kaplan Meier curves will be used to describe time-to-enrollment at the PSC. The Log rank test will be used to determine differences in time-to-enrollment between comparison groups. Cox proportional hazards regression model will be used to evaluate the association between time-to-enrollment at the PSC and covariates such as patients’ age, gender, date of HIV diagnosis, CD4 count at enrolment, and location of residence. Statistical analysis will be performed using STATA version 13.1 (StataCorp, College Station, Texas, USA) and p-value of less than 0.05 will be used to define statistical significance.

To evaluate factors influencing linkage to HIV care for the qualitative data, content analysis of the transcripts will be coded and thematically analyzed using NVIVO version 8 software. Deductive and inductive codes will be used. Ranking of identified factors will be performed using participants’ response density as well as the Delphi process of investigator assessment.

I. Ethical considerations

Informed Consent of Participants

After a HIV positive diagnosis and prior to recruitment to the study, the Counselor and participant will go through the informed consent process. An informed oral consent will be required for participation in the study. The informed consent process will be administered in the language the participant feels most comfortable, in English, Kiswahili or Dholuo. The participant will be informed of the new referral procedures as described in the intervention. A detailed description of all procedures including period of study will be explained.

Confidentiality of data

No personal identifiers will be collected for the data analysis. The study team will take measures to ensure that all the information collected remain private. All data collected will be kept secured, in locked storage spaces or in password-protected files and computers for the digital files. Furthermore, all staff will be trained in ethical procedures and measures to protect confidentiality; they will be required to sign confidentiality agreements.

Institutional Review Board oversight

Ethical approval for the conduct of this study will be sought and obtained from the KEMRI and JOOTRH ethical review committees. A request will be made to CDC for reliance as per the KEMRI-CDC blanket reliance agreement.

III. DISCUSSION

A. Potential risk to participants

Primarily, participants risk loss of privacy. This loss of privacy may result from disclosing personal information before and after HIV testing procedures or simply from being seen participating in the study. The choice of preferred referral site will not alter the services to be offered at during HIV testing.

B. Potential benefits to study participations

Participants will have the opportunity to access HTC services and to be referred to relevant HIV health services. All the participants who opt to initiate HIV care and treatment at

JOOTRH will be assigned a case manager to support them in navigating the health care system until care is initiated. This participant will also benefit from regular phone follow up to ensure he/she is retained in care.

The main benefit for participants in this study will be their contribution to informing, and improving HIV prevention, care, and treatment interventions among HIV-positive clients. In addition to the direct benefits from their participation, participants may indirectly benefit from the improvement of HIV prevention, care, and treatment services within their communities. As such, the potential risks of participating in this assessment are offset by the benefits to the individual participants and the wider community.

C. Study limitations and potential sources of bias

There is a probability of contamination between patients in the intervention arm (case managers) and patients in the control arm (standard care) during the conduct of the study when these patients meet at the HIV clinic, support group meetings and outside the hospital. We will attempt to mitigate this by a large sample size based on within and between cluster differences and the design effect.

The step wedge design is biased due to different lengths of duration allocated to the control and intervention arms of each unit/participant in the study. We will control for this by doing a contemporaneous analysis across clusters (see data analysis section).

There is a possibility of selection bias in the units that are selected for implementation of the intervention. We have attempted to reduce this via stratification of the units in order to have an equal representation of ambulatory and in patient units and both genders.

The data analysis method may overestimate or underestimate standard errors; to counteract this, analysis will be done at the individual level and the cluster level (departmental).

D. Expected application of results

The primary purpose of this intervention is to increase linkage and early retention in care of newly positive HIV persons. In addition, data concerning the barriers to accessing HIV care will enable improvement of service. Findings from the study will be presented to JOOTRH and personnel providing care to the population. Findings may also be disseminated through conference presentations, abstracts, and/or peer-reviewed journal publications. The data will be owned by KEMRI/CDC. Data will available to other organizations upon request. No identifying information will be collected; therefore, all of the disseminated results will be anonymous.

We anticipate demonstrating the efficacy of using case managers in improving linkage and retention in HIV care among newly diagnosed HIV- infected persons. The intervention will be scaled up to other departments within JOOTRH should it realize the desired results.

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Competing interests: None

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Single Axis Solar Tracking System using Microcontroller (ATmega328) and Servo Motor

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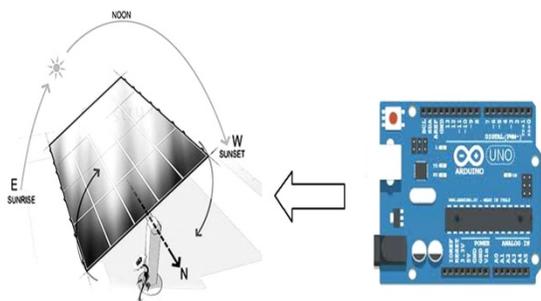
Abstract- As the energy demand and the environmental problems increase, the natural energy sources have become very important as an alternative to the conventional energy sources. The renewable energy sector is fast gaining ground as a new growth area for numerous countries with the vast potential it presents environmentally and economically. Solar energy plays an important role as a primary source of energy, especially for rural area. This project aims at the development of process to track the sun and attain maximum efficiency using Arduino Uno for real time monitoring. The project is divided into two stages, which are hardware and software development. In hardware development, two light dependent resistor (LDR) has been used for capturing maximum light source. Servo motor has been used to move the solar panel at maximum light source location sensing by LDR. The performance of the system has been tested and compared with static solar panel. This project describes the design of a low cost, solar tracking system.

Index Terms- Solar tracker, Arduino ATmega 328, LDR, Single Axis ,Energy storage system

I. INTRODUCTION

Tracker systems follow the sun throughout the day to maximize energy output. The Solar Tracker is a proven single-axis tracking technology that has been custom designed to integrate with solar modules and reduce system costs. The Solar Tracker generates up to 25% more energy than fixed mounting systems and provides a bankable energy production profile preferred by utilities.

2.1 BLOCK DIAGRAM:



Arduino UNO Basic Information:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6

can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

2.2 SPECIFICATIONS:

Microcontroller : ATmega328

Operating Voltage : 5V, Input Voltage (recommended) : 7-12V

Input Voltage (limits): 6-20V

Digital I/O Pins: 14 (of which 6 provide PWM output), Analog Input Pins :6, DC Current per I/O Pin:40 mA, DC Current for 3.3V Pin :50 mA

Flash Memory :32 KB of which 0.5 KB used by bootloader, SRAM:2 KB

EEPROM :1 KB Clock Speed:16 MHz



2.3 SERVO MOTOR:

Servo motors have been around for a long time and are used in many applications. They are small in size but pack a big punch and are very energy efficient. Because of these features, they can be used to operate remote-controlled or radio-controlled [toy cars](#), [robots](#) and airplanes. Servo motors are also used in industrial applications, robotics, in-line manufacturing, pharmaceuticals and food services.

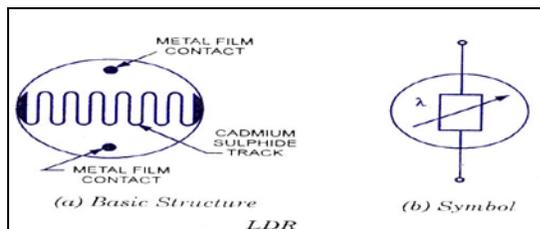
Servos are controlled by sending an electrical pulse of variable width, or pulse width modulation (PWM), through the control wire. There is a minimum pulse, a maximum pulse and a repetition rate. A servo motor can usually only turn 90° in either direction for a total of 180° movement. The motor's neutral position is defined as the position where the servo has the same amount of potential rotation in the both the clockwise or counter-clockwise direction. The PWM sent to the motor determines

position of the shaft, and based on the duration of the pulse sent via the control wire the [rotor](#) will turn to the desired position. The servo motor expects to see a pulse every 20 milliseconds (ms) and the length of the pulse will determine how far the motor turns. For example, a 1.5ms pulse will make the motor turn to the 90° position. Shorter than 1.5ms moves it to 0° and any longer than 1.5ms will turn the servo to 180°. When these servos are commanded to move, they will move to the position and hold that position. If an external force pushes against the servo while the servo is holding a position, the servo will resist from moving out of that position. The maximum amount of force the servo can exert is called the torque rating of the servo. Servos will not hold their position forever though; the position pulse must be repeated to instruct the servo to stay in position.

2.4 LDR-LIGHT DEPENDENT RESISTOR:

A Light Dependent Resistor (LDR) is also called a photo resistor or a cadmium sulfide (CdS) cell. It is also called a photoconductor. It is basically a photocell that works on the principle of photoconductivity. The passive component is basically a resistor whose resistance value decreases when the intensity of light decreases. This [optoelectronic device](#) is mostly used in light varying sensor circuit, and light and dark activated switching circuits. Some of its applications include camera light meters, street lights.

LDR Structure and Working:The basic structure of an LDR is shown below.



The snake like track shown below is the Cadmium Sulphide (CdS) film which also passes through the sides. On the top and bottom are metal films which are connected to the terminal leads. It is designed in such a way as to provide maximum possible contact area with the two metal films. The structure is housed in a clear plastic or resin case, to provide free access to external light. As explained above, the main component for the construction of LDR is cadmium sulphide (CdS), which is used as the photoconductor and contains no or very few electrons when not illuminated. In the absence of light it is designed to have a high resistance in the range of megaohms. As soon as light falls on the sensor, the electrons are liberated and the conductivity of the material increases. When the light intensity exceeds a certain frequency, the photons absorbed by the semiconductor give band electrons the energy required to jump into the conduction band. This causes the free electrons or holes to conduct electricity and thus dropping the resistance dramatically (< 1 Kiloohm).

2.5 GEAR:

A toothed wheel that works with others to alter the relation between the speed of a driving mechanism (such as the engine of a vehicle) and the speed of the driven parts (the wheels).

What do gears do... and how do they do it?Gears are used for transmitting power from one part of a machine to another. In a bicycle, for example, it's gears (with the help of a chain) that take power from the pedals to the back wheel. Similarly, in a car, gears transmit power from the [crankshaft](#) (the rotating axle that takes power from the [engine](#)) to the driveshaft running under the car that ultimately powers the wheels.

Increase speed: If we connect two gears together and the first one has more teeth than the second one (generally that means it's a bigger-sized wheel), the second one has to turn round much faster to keep up. So this arrangement means the second wheel turns faster than the first one but with less force.

Increase force: If the second wheel in a pair of gears has more teeth than the first one (that is, if it's a larger wheel), it turns slower than the first one but with more force.

Change direction: When two gears mesh together, the second one always turns in the opposite direction. So if the first one turns clockwise, the second one must turn counterclockwise. We can also use specially shaped gears to make the power of a machine turn through an angle. In a car, for example, the differential (a gearbox in the middle of the rear axle of a rear-wheel drive car) uses a cone-shaped bevel gear to turn the driveshaft's power through 90 degrees and turn the back wheels.

Four different ways to use gears:

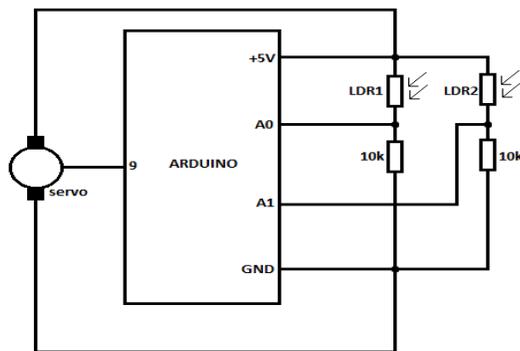
Gears for speed:In this simple gearbox, we got (from right to left) a large gear wheel with 40 teeth, a medium wheel with 20 teeth, and a small wheel with 10 teeth. When we turn the large wheel round once, the medium wheel has to turn twice to keep up. Similarly, when the medium wheel turns once, the small wheel has to turn twice to keep up. So, when we turn the large gear wheel on the right, the small wheel on the left turns four times faster but with one quarter as much turning force. This gearbox is designed for increasing speed.

Gears for force: If we power the same gearbox in the opposite direction, by turning the small wheel, I'll make the large wheel spin a quarter as fast but with four times as much force. That's useful if I need to make a heavy truck go up a hill, for example.

Worm gears: Here we use an electric motor (the gray box on the right) and a long screw-like gear to drive a large gear wheel. This arrangement is called a worm gear. It reduces the speed of the motor to make the large wheel turn with more force, but it's also useful for changing the direction of rotation in gear-driven machinery.

Rack and pinion gears: We've probably seen one of these in cliff- and hill-climbing [rack railroads](#), but they're also used in car steering systems, weighing, and many other kinds of machines as well. In a rack and pinion gear, a slowly spinning gear wheel (the pinion) meshes with a flat ridged bar (the rack). If the rack is fixed in place, the gear wheel is forced to move along it (as in a railroad). If the gear is fixed, the pinion shifts instead. That's what happens in car steering: we turn the steering wheel (connected to a pinion) and it makes a rack shift from side to side to swivel the car's front wheels to the left or the right. In simple weighing scales, when you load a weight on the pan at the top, it pushes a rack straight downward, causing a pinion to rotate. The pinion is attached to a pointer that rotates as well, showing the weight on the dial.

II. SCHEMATIC OF THE ARDUINO SOLAR TRACKER CIRCUIT



Methodology:

The main impulsion is to design a high quality solar tracker. This paper is divided into two parts; hardware and software. It consists of three main constituent which are the inputs, controller and the output as shown in Fig B photo resistor or Light-dependent resistor (LDR) or photocell is a light-controlled variable resistor. LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically. LDR's have low cost and simple structure. The Servo motor can turn either clockwise or anticlockwise direction depending upon the sequence of the logic signals. The sequence of the logic signals depends on the difference of light intensity of the LDR sensors. The principle of the solar tracking system is done by Light Dependant Resistor (LDR). Two LDR's are connected to Arduino analog pin AO to A1 that acts as the input for the system. The built-in Analog-to-Digital Converter will convert the analog value of LDR and convert it into digital. The inputs are from analog value of LDR, Arduino as the controller and the Servo motor will be the output. LDR1 and LDR2 are taken as pair .If one of the LDR gets more light intensity than the other, a difference will occur on node voltages sent to the respective Arduino channel to take necessary action. The Servo motor will move the solar panel to the position of the high intensity LDR that was in the programming.

III. ALGORITHM AND C CODE

- Step 1. Read all analog voltages from analog channels
- Step 2. If all voltages are equal then Servo motor will be in stop position.
- Step 3. If $LDR1 > LDR2$ Then the Servo motor will rotate clockwise.
- Step 4. If $LDR2 > LDR1$ Then the down motor will rotate anti clockwise.

Code:

```
#include <Servo.h>
Servo myservo;
int pos=0; // Variable to store the servo position .
int inputPhotoLeft=1; //Easier to read, instead of just 1 or 0.
int inputPhotoRight=0;
int Left=0; // Store reading from the photo resistors.
```

```
int Right=0; // Store reading from the photoresistors.
void set up ()
{
myservo.attach(9); //Attach servo to pin 9.
}
void loop()
{
//Read the values from the photoresistors to the Left and Right variables.
Left=analogRead(inputPhotoLeft);
Right=analogRead(inputPhotoRight);
// Checks if Right is greater than Left, if so move to right.
if (Left > (Right+20))
// +20 is the deadzone, so it would not jiggle back and forth.
{
if (pos < 55)
pos++;
myservo.write(pos);
}
// check if left is greater than right, if so move to left.
if (Right > (Left+20))
// +20 is the deadzone, so it wouldnot jiggle back and forth.
{
if (pos > 55)
pos--;
myservo.write(pos);
}
}
```

IV. CONCLUSION

Solar trackers generate more electricity than their stationary counterparts due to an increased direct exposure to solar rays. There are many different kinds of solar tracker, such as single-axis and dual-axis trackers, which can help us find the perfect fit for our unique jobsite. Installation size, local weather, degree of latitude, and electrical requirements are all important considerations that can influence the type of solar tracker that's best for us. Solar trackers generate more electricity in roughly the same amount of space needed for fixed tilt systems, making them ideal optimizing land usage. Solar trackers are slightly more expensive than their stationary counterparts, due to the more complex technology and moving parts necessary for their operation.

Some ongoing maintenance is generally required, though the quality of the solar tracker can play a role in how much and how often this maintenance is needed.

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Impact of Organizational Justice and Perceived Creative Performance Mediating role of Employee Innovative Behavior

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Abstract- In today's competitive environment organization in developing countries like Pakistan strive for sustainability. The employees are the backbone of the organization. In telecommunication sector of Pakistan increasing trend of technology advancement, organization should provide justice and innovate climate. In current study researcher investigate the impact of organizational justice on perceived creative performance mediating role of employee innovative behavior in telecommunication sector of Pakistan. Data was collected 480 employees of four companies of the telecommunication sector. Results are exploited through Statistical Package of Social Sciences and Analysis of Moment Structures. Results indicate that all the variables are correlated. The organizational justice has significant impact on perceived creative performance and employee innovate behavior. It also shows that employee innovative behavior mediates the relationship of organizational justice and perceived creative performance. Practical implication and future guidelines are also discussed.

Index Terms- Organizational Justice (OJ) Perceived Creative Performance (PCP), Employee Innovative Behavior (EIB)

I. INTRODUCTION

Organization in developing countries at crucial stage to compete and sustain competitive advantage to cope continuous challenges at workplace (Al-Swidi & Mahmood, 2011) explained that organization strive for gaining competitive advantage after upgrade the workplace environment. Perceived creative performance creates new procedures, ideas and unique products to implementing in organization (Amabile, 1996). Perceived creative performance is only applicable when the employee having innovate behavior (Sarros, Cooper, & Santora, 2008). The researcher exploited the results through structural equation model and describe the five dimension of employee innovative behavior. The dimension are generativity, championing, opportunity exploration, formative investigation and application (Kleysen & Street, 2001). (J. P. De Jong & Den Hartog, 2007) recommended that "one way for organizations to become more innovative is to capitalize on their employees' ability to be innovative". Therefore, it can be claimed that employees' innovative behavior is important for the existence of organizations, specifically in the present stormy global economic situation. In previous studies the findings shows that innovate climate has significant impact on employee innovative behavior (Lloréns Montes, Ruiz Moreno, & Miguel Molina Fernández,

2004; A. M. T. Suliman, 2001). In literature the team and groups innovation is more important (Amabile, 1983; Burningham & West, 1995; Nijhof, Krabbendam, & Looise, 2002; Michael A West & Anderson, 1996). Organization will grow to provide innovative climate in which employees feels no hesitation for sharing information (A. M. T. Suliman, 2001). The organizational justice has a significant impact on perceived creative performance (A. M. T. Suliman, 2001). A many studies are available to investigate the relationship between organizational justice and job satisfaction, job commitment and organization citizenship behavior but a fewer studies are available on organization justice and perceived creative performance in developing countries like Pakistan and in telecommunication sector. Employees are more creative and motivated in telecommunication sector. The researcher conduct this study to investigate the organizational justice effect on perceived creative performance. To identify the mediating role of employee innovate behavior between organizational justice and perceived creative performance. To examine the influence of organization justice on employee innovative behavior.

II. LITERATURE REVIEW

2.1. ORGANIZATIONAL JUSTICE

Organizational justice is define as the perception of employees at work place. This perception is has four categories including procedural, distributive, interactional and informational. Distributive defined as the fairness of outcome. Distributed theory was presented by Aristotle. In his book Aristotle explained that the distributed justice is something proportionate, equity of ratio (Adams, 1965), and social exchange theory (R Cropanzano et al., 2007). Distributed justice has main concerns about the outcome which they receive from organization (R. G. Folger & Cropanzano, 1998). The organization normally distributed resources equally and fairly among employees. The theory of relational model of justice to maintain the relationship (T. R. Tyler, 1994). Procedural explained as reflection of work to achieve these outcomes. Procedural justice is explained as the polices and procedure determine on fairness (R. G. Folger & Cropanzano, 1998; Thibaut & Walker, 1975) it also promote fair decision and has empowerment to give suggestion in decision making process (Lind & Tyler, 1992). The studies show that "people are not only concerned about the outcomes of decision making but also the fairness of decision making procedure" (McFarlin & Sweeney, 1992). Previous studies shows that the procedural justice has a

significant impact on job commitment, job satisfaction and performance behavior (McFarlin & Sweeney, 1992)(Russell Cropanzano & Greenberg, 1997; R. G. Folger & Cropanzano, 1998). Interactional means that interpersonal interaction among individuals, teams, and groups. Interactional justice is a supportive element for procedural justice (T. R. Tyler & Bies, 1990). "Interactional justice denotes to the interactive treatment or the level of perceived justice in how employees are treated in the organization (Bies & Moag, 1986)". Interactional justice focused toward the manager interaction (Masterson, Lewis, Goldman, & Taylor, 2000)". Interactional justice is related with motivation of supervisor, innovate climate and subordinate relation (Byrne, 2005; Masterson et al., 2000). At last informational justice means that to produce fair information for justice related work (Russell Cropanzano & Greenberg, 1997).

H1a: Organizational justice plays a significant role in influencing the employee innovative behavior.

H1b: Organizational justice plays a significant role in influencing the perceived creative performance.

2.2. EMPLOYEE INNOVATIVE BEHAVIOR

Employees' innovative behavior denotes to the introduction and improvement of valuable and unique ideas and applying these ideas into new and better products, services or methods of undertaking things (Scott & Bruce, 1994). Employee innovative behavior is one of the most important tools for obtaining competitive advantage in today's competition. Employees are more innovative due to provide creative climate and with different dimensions to perform the work (Birkinshaw, Hamel, & Mol, 2008). Employees are encouraged to take initiative and discover new ideas and innovative approaches (Martins & Terblanche, 2003). According to (Kesting & Parm Ulhøi, 2010) Innovative support means to provide time, resources, funding and management support to boost up the employees creative behavior. The research finding of suggest that the creative personalities have more creative and gives valuable idea without controlling by supervisor (Oldham & Cummings, 1996).

H2: Employee innovative behavior plays a significant role in influencing the perceived creative performance

2.3. PERCEIVED EMPLOYEE CREATIVE PERFORMANCE

Creative performance is explained as "the production of novel and useful ideas by an individual" (Woodman, Sawyer, & Griffin, 1993). Perceived employee creative performance means how the employees of the organization rate their creative performance. With the help of innovate climate the employees behavior is more thinking, and participative in decision making activities. Innovate climate bring change in the workplace, behavior, attitudes and feeling of the employees (Göran Ekvall, 1996). Supportive innovate climate endorses employee innovative behavior with positive emotional setting (Torokoff, 2015). Employee creative performance is more important for organization "creativity is related to thinking contrary to the conventional that results in uncommon contributory outputs for both the individual and the organization" (Perry-Smith & Shalley, 2003). It was recommended that the "socio emotional

support" and resources delivered by the organization helped employees to encounter challenges (Witt & Carlson, 2006).

H3: Employee innovative behavior mediates the relationship between organizational justice and perceived creative performance.

III. METHODOLOGY

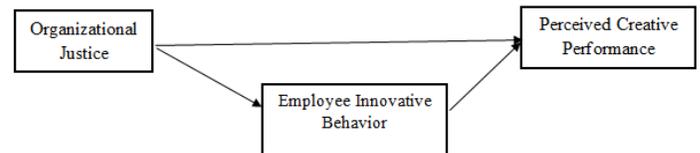


FIGURE.1 THEORETICAL FRAMEWORK

In above diagram the organizational justice is independent variable, perceived creative performance is dependent variable and employee innovate behavior is mediating variable.

3.1 RESEARCH DESIGN

Quantitative research method used in current study because a literature is available on this topic. Hypothesis are tested on ordinal scale. Current study is a descriptive because current situation is describe and explanatory because the current finding are compare with previous findings. Current study is a causal and effect. Non-contrived research is in natural environment with minimum interference of the researcher. Individual unit of analysis is used.

3.2 INSTRUMENT DEVELOPMENT

Organizational Justice was measured with three dimensions: distributive, procedural, and interactional justice. In this construct fifteen items are includes and five point Likert scale was used to collect the date (Niehoff & Moorman, 1993). Employee innovative behavior consist 5 items and Likert scale adapted from (Pierce & Delbecq, 1977). Perceived Creative Performance comprises 6 items Likert scale, adapted from (Pace, 2005).

3.3 SAMPLE SIZE & DATA COLLECTION INSTRUMENT

In current study a telecommunication sector is selected for target population. In this sector most of the tasks and work done on project and team basis. The questionnaire was distributed into four telecommunication companies namely (Warid, Zong, Mobilink, and Telenor). The Z formula is used to sample size. 480 questionnaires was distributed in above companies. The response rate is 80 percent.

3.4 PROCEDURE AND STATISTICAL METHODS

A cross sectional study is done with self-administrative questionnaire. Results are exploited with SPSS version 16 and Amos version 21. To describe the results a descriptive analysis is applied. To test the validity and reliability the Cronback, Alpha technique is applied. The correlation, Confirmatory analysis, and structural Equation model and Soble test is used.

IV. FINDING AND RESULTS

4.1 DESCRIPTIVE STATISTICS

In current study 280 participants are male and 108 participants are female. The 252 respondents are married and 135 are unmarried. The respondents are belong to Mobilink are 112, employee belong to warid are 59, Zong are 100, and respondents belongs to Telenor are 116. Majority of the respondents working experience is up to 2 years which is N=231, in current study 116

employee has working experience is 3 to 6 year and remaining are above 7 years.

TABLE.1 DESCRIPTIVE STATISTICS

Variables	Mean	Median	Std. Deviation	Skewness	Kurtosis
Organizational Justice	3.3	3.2	.78	-0.877	2.013
Employee Innovative Behavior	3.7	3.1	.66	-.765	1.023
Perceived Creative Performance	3.5	3.6	.69	-.942	2.138

In table 1 descriptive statistics are shown. Overall values of means, Skewness and kurtosis assert that data are normally distributed. Organizational justice has 3.3, 3.2, .78, -.0877, 2.013 values of mean, median, std. deviation, Skewness and kurtosis respectively. The values of Employee innovative behavior and perceived creative performance are shown normal values of data normality.

4.2 RELIABILITY AND PERSON CORRELATION ANALYSIS

In Table II the factor wise reliability and person correlation are shown. The organizational justices reliability is 0.792, employee innovate climate is 0.738, and employee perceived creative performance is 0.902. All the reliability values shows that the reliability of the scale is fine with hypothesized model.

TABLE.2 RELIABILITY AND PERSON CORRELATION

Table II also shown the correlational values of all the variables.

Variables	Reliability	Organizational Justice	Employee Innovate Climate	Perceived Creative Performance
Organizational Justice	0.792	1		
Employee Innovate Climate	0.738	.274**	1	
Perceived Creative Performance	0.902	.343 **	.179 **	1

OJ is strongly correlated with employee innovate climate .274**, Organizational justice is strongly associated with perceived behavior performance is .343**. Employee innovate climate is correlated with perceived behavior performance is .179**.

Confirmatory factory analysis is the statistical tool for testing the fitness of instrument. It consist of chi-Square/df, CMIND/DF, Goodness of fit index, Adjusted Goodness fit index, comparative Fitness Index, RMSEA. All these values are plotted in Table III shown below as model fit indices.

4.3 CONFIRMATORY FACTOR ANALYSIS

TABLE.3 MODEL FIT INDICES

Index of Fit	Chi-Square /(df)	CMIN/DF	GFI	AGFI	CFI	RMSEA
Value	382.234/ 156	2.62	0.89	0.878	0.90	0.0734

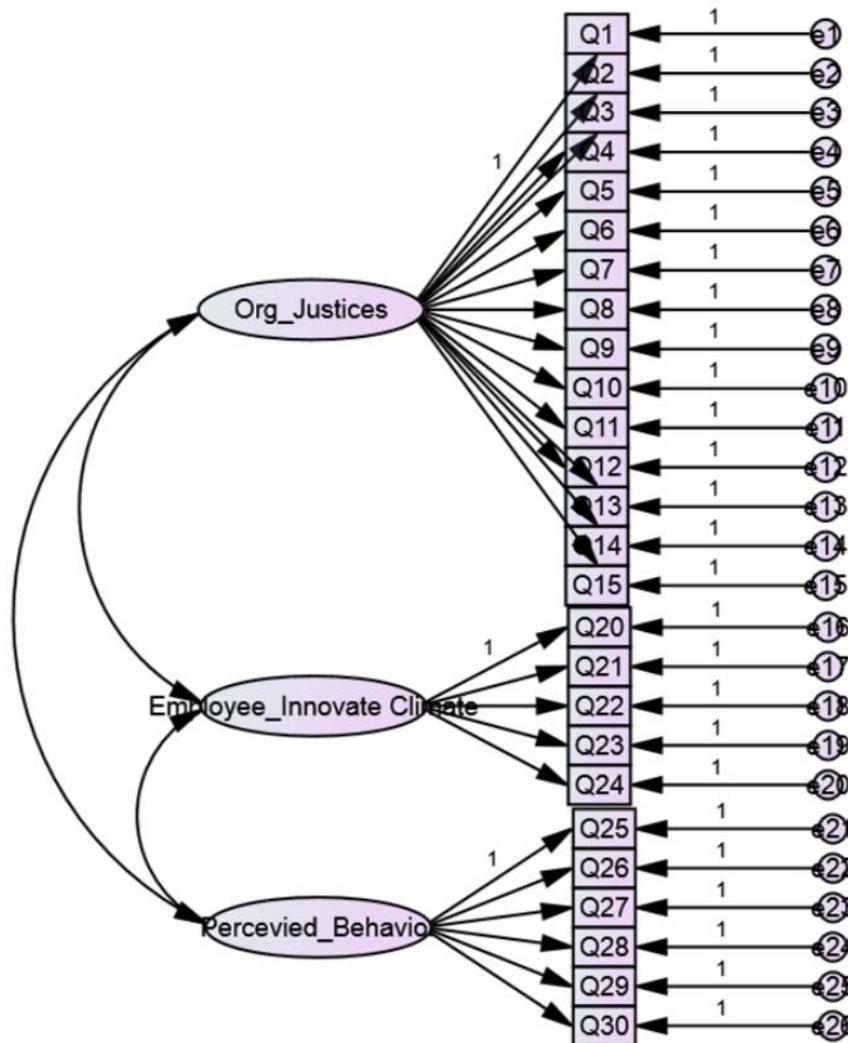


FIGURE.2 CONFIRMATORY FACTOR ANALYSIS

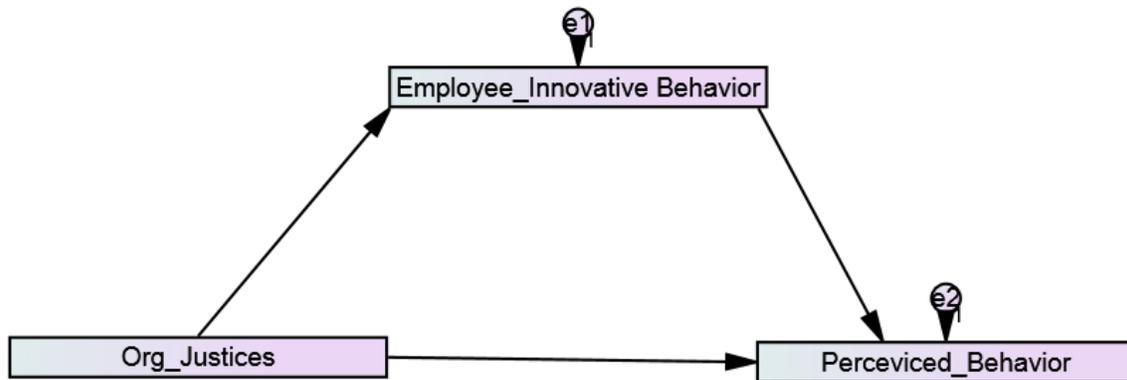
SEM is used to test the model fitness, regression analysis, correlation and covariance of the variable. The Table IV and Fig III shown the model fitness. Researcher conclude that the hypothesized model is good fit.

4.4 STRUCTURAL EQUATION MODEL

TABLE.4 STRUCTURAL EQUATION MODEL

Index of Fit	Chi-Square / (df)	CMIN/DF	GFI	AGFI	CFI	RMSEA
Value	372.284/ 168	2.51	0.90	0.88	0.86	0.0830

FIGURE.3 STRUCTURAL EQUATION MODEL



4.4 MEDIATING TESTING

In current study employee innovative behavior is a mediator between organizational justice and perceived creative performance. Mediation analysis are done through online Sobel Test Calculator. In first step organizational justice is regress on perceived creative performance and produce significant relationship between OJ and PCP. The beta value is 0.343 and standard error is .035. In second step Employee innovative behavior regress on perceived creative performance and results

shows significant relationship between EIB and PCP. The beta value is 0.179 and standard error is 0.028. Online Sobel Calculator indicate the t statistics = 5.35433667 and two tailed probability is p=0.00009. The results indicate that the employee innovate climate partially mediates the relationship of organizational justice and perceived creative performance.

4.5 SOBLE TEST STATISTICS

Variable	Sobel Test Value	Direct β	P-value Two Tailed	Observed Mediation
Employee Innovate Climate	5.35433667	0.99	0.00000009	Partially mediation

0.00009. Organization management should provide justice in procedures, pays, increment, polices and to promote employee creative performance.

V. CONCLUSION OF THE STUDY

In this study researcher investigate the impact of organizational justice on perceived creative performance with a mediating role of employee innovative behavior in telecommunication companies. All the variables are positive correlated. Hypothesis I is accepted and researcher fail to accept the null hypothesis, so researcher assert that organizational justice has significant relationship with employee innovate behavior and perceived creative performance just like the findings of (A. Suliman, 2013) also support this hypothesis. The Model fit indices of confirmatory analysis and structural equation model shows that the hypothesized model is good fit. The employees of telecommunication sector are motivated and encouraged after organizational justice. Hypothesis II indicate the Employee innovative behavior significant relationship with perceived creative performance. The finding suggest that P=0.000 level of significant the findings of (Jiun-Lan & Wang, 2015) and (A. Suliman, 2013). Hypothesis III assert that the employee innovative behavior partially mediate the relationship between organizational justice and perceived creative performance. The value of Online Sobel Calculator results indicate the t statistics= 5.3543367 and tow tailed probability is

VI. LIMITATION AND FUTURE RECOMMENDATIONS

This study is done through self-administrative questionnaire and due to time and money constrain the non-probability convenience sampling was used to collect the data. The future researcher will used mixed method and also conduct comparative study in industry.

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Rainfall variation on the windward and leeward side of the Central Highland of Sri Lanka

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Abstract

The mountains and highlands in the tropical areas receive more rainfall than the nearby lowlands, in highland areas at least on their windward sides. It is well known that a large part of the heavy rain received on the western side of Sri Lanka is induced by the topographic barriers known as the Central Highland (CH). The objective of this study was to examine whether these orographic rainfall profiles more or less agree with the global figures of the orographic rainfall in the tropical mountains. The orographic effect of the western side of the CH of Sri Lanka has been studied with reference to the annual average rainfall and Southwest Monsoon rainfall using data from 1959-2002. Monthly rainfall data were obtained from the Department of Meteorology in Colombo, Agro-Meteorology Unit, Department of Agriculture, Peradeniya and Nakagawa et. al, (1995). The study area consists of nine representative locations of both sides of the CH elevation ranging from 2 to 1667 meters. These locations are Colombo, Kalutara PWD, Ratnapura, Abergeldie Group, Annifield Estate and Sandirigama, which lie on the western sides and Badulla, Wewessa and Dyaaba lying on the leeward side of the CH. The precipitation is dependent on the altitude over the western side, which is on the windward side with respect to the southwest monsoon whereas it is independent of the altitude over the eastern side, which is on the leeward side. The analysis showed that, in the western slopes of the CH, the southwest monsoon rainfall increases from the coast to the foothills and then increases up to about 1000 meters from there and decreases above that level. The annual average rainfall also increases up to a height of about 1000 meters and then, decreases above that level. This characteristic may be due to strong differences in water vapor contents between the lower and upper layers of the troposphere. The steep lapse rate frequently present in tropical air masses also tends to reduce the capacity of the air to retain water vapor in the higher parts of the troposphere. Further, the study revealed that the rainfall has been decreasing at some of the locations since 1959-2002. The annual average rainfall has also been analyzed from 1944-1963 for some selected rainfall stations. According to this analysis, the rainfall has been increasing from Colombo (2487 mm) up to Watawala (5127 mm) but then again from Watawala to Nuwaraeliya (1895 m) the annual average rainfall has been decreased rapidly. It is also shown that the rainfall amount is changed in the Uva basin, especially the eastern part. Welimada in the Uva basin is situated in the lower part of the Uva basin and therefore the Welimada receive less rainfall (leeward) from both monsoons. These analyses clearly show that the orographic effect of the Central Highland of Sri Lanka shares similar patterns with the global figures of the orographic rainfall in the tropical mountains and highlands.

Index Terms- Rainfall, Orography, Elevation, Windward side, Leeward side

I. INTRODUCTION

The increase in precipitation with elevation on mountain slopes is a worldwide characteristic (Roger, et al 1992). But the actual profile of this pattern can be differed in regionally and seasonally. According to the global mean annual rainfall figures, mountains and highlands receive more rainfall than nearby lowlands at least on their windward sides. This is the result of orographic lifting process which increases rainfall in all climates. But the effects show a significant difference between the tropics and the extra-tropical latitudes or mid-latitudes. Extra-tropical latitudes the amount of precipitation increases with increasing elevation up to the highest levels of the mountains. In the tropics, the increase stops at a level of about 1000-1500 m and above this elevation precipitation generally decreases with height. This characteristic is due to two conditions which frequently prevail in the tropics but are the rather rare in the mid-latitudes. In the tropics and subtropics, the maximum rainfall occurs below the higher mountains summits from which levels it decreases upwards towards the crest (Roger, et al 1992). The first is a strong difference in water vapour content between the lower and upper layers of the troposphere. Tropical air masses are often very humid up to an elevation of about 800-1200 m, but above this level, they are usually rather dry. This may be due to the trade wind inversion but it can also be caused by extremely large water vapor production at the earth's surface in the tropics. The steep lapse rate frequently present in tropical air masses also tends to reduce the capacity of the air to retain water vapor in the higher parts of the troposphere. The second factor is the predominance of vertical air movements in the tropics, where horizontal advection of moisture is often limited. Most precipitation, therefore, originates from the atmosphere directly above the slopes, while in the mid-latitudes water vapor is often transported over large horizontal distance (Weischet, 1965, 1969). A global survey of the vertical profile of precipitation was carried out by Lauscher (1976) analyzing data from about 1300 stations. It is found that the tropical climate shows a clear maximum precipitation between 1000 and 1500 meters above mean sea level. Though this is the general pattern of the annual precipitation of the tropical regions of the globe many local or regional complications may occur (Barry, 1981).

Lauer (1975) has given generalized profiles of the mean annual precipitation against the altitude of various mountains in the tropics. The greatest annual totals of rainfall in the world occur

where mountain barriers lie across the paths of moisture-bearing winds. A famous example is *Cherrapunji* on the Southern margin of the *Khasi Hills* in Assam, India. This station receives averages 1144 cm of rainfall annually. In 1873 the total rainfall was only 719 cm, in 1861, when the annual total was a fantastic 2299 cm; 930 cm rainfall fell in the month of July alone. It is an important factor in triggering the precipitation process and intensifying rainfall on windward slopes, and it, therefore, affects the variations of the aerial distribution.

Thambiyahpillay (1952) has analyzed how annual average rainfall has been changing with increasing elevation taking a cross section from Colombo to *Pothuvil* in Sri Lanka. Domros (1974) also examined the relationship between rainfall and elevation. In this study, he identified that the highest rainfall is received to the western slope of the Central Highland and it is gradually increased from 300 to 1000 m and above this level the rainfall is decreased significantly. Compare to eastern side western side gets higher rainfall. Yoshino et al (1983) pointed out that the location of the Central Highland is one of the main physical structure which the control the climate of Sri Lanka. Horizontal and vertical structure of the physical setting of the Sri Lanka topography creates large diversity to change the rainfall distribution. The Western side of the Central Highland receives more rainfall than eastern side and especially when Southwest monsoon activates. Similarly, when northeast monsoon activate the rainfall is higher on the eastern side but compare to Southwest monsoon Northeast monsoon give less rainfall. Orographic effect of the Central Highlands of Sri Lanka has similar patterns with the global figures of the orographic rainfall in the tropical mountains and highlands (Rekha, 2005).

It is well known that a large part of the heavy rain that falls on the western side of Sri Lanka is induced by the topographic barriers known as the western slopes of the Central Highland. The relief of Sri Lanka characterized by the Central Highland is one of the major factors governing the climate of Sri Lanka. Considerable spatial differentiation of the climate is to be expected in the Southwest as well as in the Northeast monsoon season, as results of the effects of the Central Highlands, which form an orographic barrier across the path of the monsoonal air masses and winds. Thus, not only do the highlands take on the role of a climatic shed, but at the same time, there is also established the regional differentiation of the highlands into a windward side and a leeward side, including the flanking lowlands. Due to opposing wind direction of the Southwest and Northeast monsoon, the windward and leeward sides of the highlands keep changing their role according to the rhythm of the monsoon change: those parts of the highlands on the windward side during the other monsoon seasons and vice versa. The windward and leeward side effect of the Central Highlands on the monsoonal air masses will exercise the greatest effects on rainfall and wind, as also on the other climatic elements though to a lesser degree. So it is interesting to know how the orography of the western sides of the Central Highlands of Sri Lanka influences the monsoon rainfall. An attempt has also been made to find out how far these results agree with the global pattern.

II. MATERIALS AND METHODS

The Central Highland is generally defined as the region above 300 m contour of Sri Lanka. It is located in the South center of the Island with many peaks including the *Pidurutalagala* of 2524 m above the sea level, the highest peak in Sri Lanka. However, within this region, the topography is highly diverse with mountain ranges, valleys, plains and even escarpments and slopes. The study area consists of nine (09) representative locations of both sides of the Central Highland. This is to ensure that a good picture of altitude variation of rainfall over the Central Highland can be obtained with little contribution from latitudinal variation. These locations are *Colombo*, *Kalutara PWD*, *Ratnapura*, *Abergeldie Group*, *Annifield Estate* and *Sandirigama*, which lie on the western side, and *Badulla*, *Wewessa*, and *Dyraaba*, which lie on the eastern side of the Central highland.

Table 1: Selected rainfall stations

Stations	Altitude (m)	Monthly average rainfall in mm
(Western slope)		
<i>Colombo</i>	07	200
<i>Kalutara PWD</i>	17	213
<i>Ratnapura</i>	34	297
<i>Abergeldie Group</i>	1098	313
<i>Annifield Estate</i>	1311	225
<i>Sandirigama</i>	1601	183
(Eastern slope)		
<i>Dyraaba</i>	1220	128
<i>Wewessa</i>	914	168
<i>Badulla</i>	670	145

Most of these topographical areas cover both windward and leeward sides of the two monsoons. Monthly average rainfall data of the above locations were obtained from the Department of Meteorology in Colombo, Agro-Meteorology Unit, Department of Agriculture, Peradeniya and Nakagawa et.al, (1995), for the period of 1959-2002. These monthly data were converted to seasonal rainfall using the classification adopted in defining the rainfall year of Sri Lanka. The missing data of each rainfall data series were estimated using normal ratio methods. Annual average rainfall data for the period 1959 to 2002 have been averaged to obtain the mean annual rainfall values for above period. Rainfall is separately computed for the southwest monsoon, northeast monsoon, and annual average rainfall.

The second part of this study also considers another available data set to find out the differences of the orography rainfall of the Central Highland. For this analysis, a cross section is selected from the Western part to Eastern part of Sri Lanka. Along the cross section, the random rainfall stations were selected from *Colombo* to *Panawa tank* based on availability common data period. 16 rainfall stations have been selected from western side to eastern side of CH. Out of the 16 stations, 09 stations are situated on the western slope of the CH and 07 are situated on the eastern side. *Colombo*, *Awissawella*, *Eheliyagoda*, *Norton Bridge*, *Watawala*, *Abergeldie Group*, *Hatton Police Station*, *Nanu Oya*, *Nuwaraeliya*, are from western side and *Welimada Gropup*, *Strathden*, *Gourukella*, *Lowe Spring Valley*,

Mousagalla, Kumbukkan, and Panawa tank are from the eastern side have been selected for the study (Figure 1).

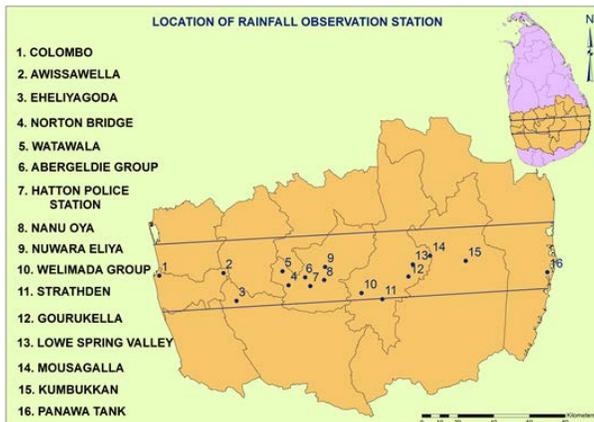


Figure 1: Locations of the rainfall stations on the windward and leeward side of the CH (cross sections of the CH)

iii RESULTS AND DISCUSSION

The southwest monsoon rainfall on the western slope increases from about a maximum around 1000 meters and then decreases above this level. In this season, leeward side of the mountain receives less rainfall due to the topographical structure of the Central Highland. On the other hand, the Northeast monsoon rainfall on the eastern sides also shows a similar pattern as above 1000 m the rainfall is decreasing with the elevation. Mountain barriers of the Central highlands of Sri Lanka by forcing ascent of moisture-bearing winds tend to concentrate precipitation on their windward slopes and produce a rain shadow to the leeward sides. It is clearly shown that the more rainfall is received on the western side than the eastern side. According to the results of the analysis, the southwest monsoon air has deposited most of its moisture on the windward side of the Central Highland; there will normally be a great deal less precipitation on the leeward side since on this side the air is much drier and the dew point consequently much lower. The leeward side of the mountain is thus said to be in the rain shadow.

Monthly average rainfall since 1959 to 2002 are shown with selected locations and their attitudes from the both sides of Central Highland (Table 1). Analysis revealed that the annual average rainfall is increasing about up to 1100 m and above that level the rainfall gradually decreases with the height (Figure 2). A similar pattern can be seen in the Southwest monsoon rainfall as well. The southwest monsoon rainfall on the western slope increases from the sea level to about 1000 meters and then the rainfall gradually decrease with the elevation.

Almost similar figures are seen in the northeast monsoon rainfall in the eastern sides. The northeast monsoon rainfall on the eastern slope increases from the sea level to about 1000 meters and then the rainfall decreases gradually with the elevation. Rainfall increases up to 1000 m and then starts to decrease with the height. The western side is on the windward side of the southwest monsoon and the effect of orography in enhancing

precipitation is clearly brought out. It is clearly seen that the leeward side receives less rainfall than windward side.

The study also revealed that the southwest monsoon has been decreasing significantly with regard to all the stations since 1959-2002 except *Colombo* and *Ratnapura*. However, southwest monsoon rainfall at *Kalutara PWD*, *Abergeldie Group*, *Annifield Estate* and *Sandirigama* has been also decreasing since 1959 to 2002.

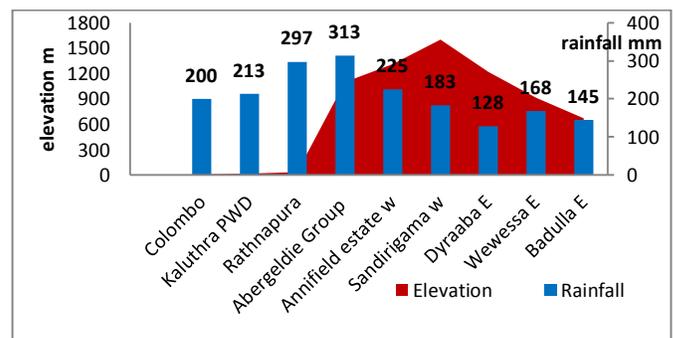


Figure 2: Relationship between monthly average rainfall and elevation

The study also revealed that the monthly average rainfall of the eastern side locations has been decreasing significantly in almost all the stations since 1959-2002 (Table 2). Table 3 shows monthly average rainfall of Northeast monsoon season of selected locations of the periods 1959-2002.

Table 2: Monthly Average Rainfall in mm: 1959-2002 (Eastern side of the Central Highland)

Years	Dyraaba (1220 m)	Wewessa (914 m)	Badulla (670 m)
1959-62	142	186	159
1969-72	148	184	162
1979-82	112	150	132
1989-92	140	132	143
1999-02:	96	187	128
average	128	168	145

Source: Calculated by the authors based on rainfall records of Department of Meteorology, Colombo

Table 3: Monthly Averages Rainfall in mm Northeast Monsoon Season: 1959-2002 (Eastern side of the Central Highland)

Years	Dyraaba (1220 m)	Wewessa (914 m)	Badulla (670 m)
1959-62	189	248	229
1969-72	193	287	250
1979-82	70	90	87
1989-92	149	217	191
1999-02:	116	248	155
average	144	218	182

Source: Calculated by the authors based on rainfall records of Department of Meteorology, Colombo

The study also revealed that the Northeast monsoon rainfall has been decreasing significantly in all the stations since 1959 to 2002. In general, the greater annual total of rainfall is received on the western slopes than the eastern slopes.

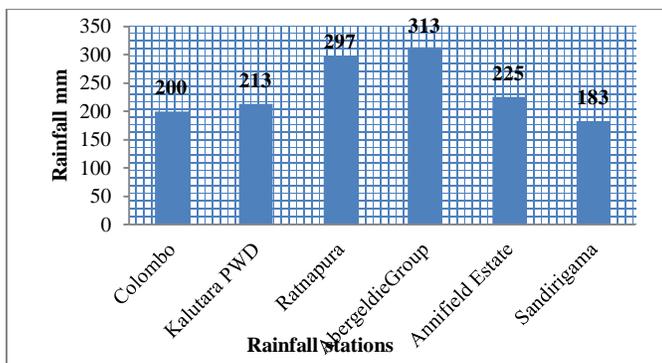


Figure 3: Monthly average rainfall distribution of rainfall stations along the western side

Figure 3 shows the monthly average rainfall distribution along the western slope of the CH. It is also confirmed that the rainfall is gradually increasing up to some certain elevation and above that height, the rainfall is decreased. *Abergeldie* station is situated at the elevation of 1098 m and the *Sandirigama* is situated at the elevation of 1601 m but the rainfall of *Sandirigama* is less compared to *Abergeldie*.

The annual rainfall totals over 5500 mm on the western but the eastern slopes, records less than 2500 mm. The reason for this remarkable difference is the amount and regional distribution of the southwest monsoonal rainfall. During the end-May and until the end of September, the heavily rain loaded southwest

monsoonal air masses result in ample orographic rains on the windward, western slopes of the Central Highlands, while on the eastern slopes the Southwest monsoon occurs as a dry, *Katabatic, foehn-like* wind which brings very little rain only.

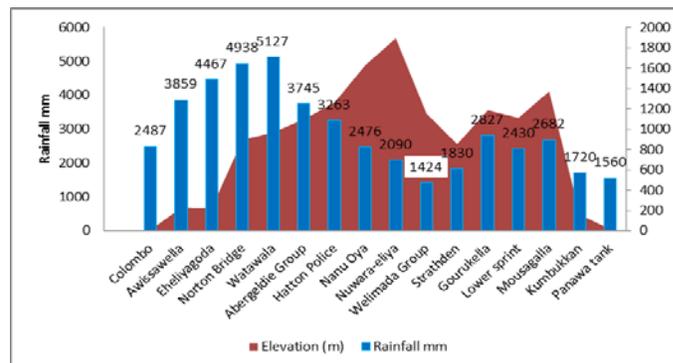


Figure 4: Relationship between elevation and rainfall (1944-1963)

The annual total average rainfall has been analyzed from 1944-1963 for the above stations (Figure 4). According to the analysis, the rainfall has been increasing from Colombo (2487 mm) up to *Watawala* (5127 mm) but then again from *Watawala* to *Nuwaraeliya* (2090 mm) the annual total average rainfall has been decreased rapidly. It is also shown that the rainfall amount is changed in the *Uva* basin, especially the eastern part. *Welimada* in the *Uva* basin is situated in the lower part of the *Uva* basin and therefore the *Welimada* (in leeward) receive less rainfall (1420 mm) from both monsoons (Southwest and Northeast).

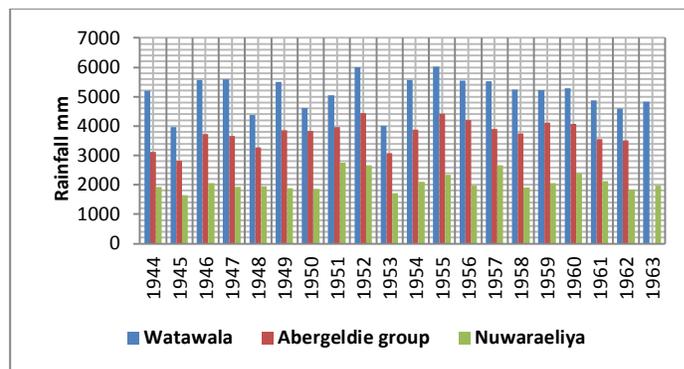


Figure 5: Rainfall difference in Watawala, Abergeldie group, and Nuwaraeliya (1944-1963)

Figure 5 shows the rainfall differences of *Watawala*, *Abergeldie* and *Nuwaraeliya* stations which are lies in the western side of the Central Highland. Annual total averages shows that *Abergeldie* and *Watawala* station have highest amount of rainfall than the highest elevation of *Nuwaraeliya*.

IV CONCLUSION

This study reveals that the amount of rainfall on the western slope of the Central Highland increases with the altitude to a maximum at a height of about 1000 meters and further up it decrease. A similar pattern can be seen in the southwest monsoon rainfall also. The southwest monsoon rainfall on the western slope increases from the sea level about to 1000 meters then the rainfall is decreasing gradually with the elevation. Almost in a similar manner on the eastern slope of the Central Highland, the rainfall increases to a maximum at about 1000 meters above mean sea level and thereafter decreases continuously. The northeast monsoon rainfall on the eastern slope increases from the sea level about to 1000 meters then the rainfall is decreasing gradually with increases the elevation. These analyses clearly show that the orographic effect of the Central Highland of Sri Lanka has similar patterns with the global figures of the orographic rainfall in the tropical mountains and highlands. However, further studies needed to generalize, that when the rainfall is decreasing an altitude is increased.

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The Teaching of Professional Education Subjects in University of Rizal System, Philippines

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Abstract- The study primarily aimed to determine the conditions of teaching Professional Education Subjects in University of Rizal System, Rizal, Philippines. The study made use of descriptive- evaluative method of research utilizing documentary analysis and questionnaire checklist. Findings revealed that the group-based college teaching modes are not often utilized compared to individual-based teaching modes which are often utilized as perceived by both faculty members and students. The instructional resource materials are very inadequate as perceived by the faculty members and inadequate as perceived by the students. The type of test administered during periodic are multiple-choice test and test items are unevenly distributed to the different domains of learning.

Index Terms- Professional education subjects, teaching, University of Rizal system

University of Rizal System, Antipolo City in the Licensure Examination for Teachers in areas of General Education, Professional Education and Specialization in year 2010 are 67.2 percent, 64.76 percent and 66.02 percent, respectively. It is clear in the result that Licensure Examination Takers have low average rating in Professional Education Subjects. The result is attributed to the preparations of the graduates as honed by the Professional Education faculty members. Hypothetically, two of the causes are the teacher and school factors. These factors must be taken into consideration in the administration of the College of Education.

In view of the need to contribute more effectively in the improvement of the teaching and learning process in Professional Education, this study on “The Teaching of Professional Education Subjects of the University of Rizal System, Philippines” was conducted.

I. INTRODUCTION

Education is the most important factor that contribute to the development of one's country. It is a tool in transmitting culture from one generation to another. This concept simply implies that the government must strengthen education at all levels. Article XIV, Section 1 of the 1987 Philippine Constitution states that “the state shall establish and support a complete, adequate, and integrated system of education relevant to the needs of the people and the society”. This provision illustrates that there is a necessity to support the teaching profession in our country.

Bilbao, Corpuz, Llagas, & Salandanan (2006) explained that teaching is a mission. They explained that a teacher must embrace the mission because he is sent to the world to accomplish a mission to teach. In other words, a teacher is accountable to the society.

Before a teacher can contribute to societal development, one should prepare for the profession. Lardizabal, Bustos, Bucu & Tangco (1991) categorized the pre-service preparation of teachers into three (3) major areas of subjects which are General Education, Professional Education and Specialization. These categories of preparations are evaluated when the graduates of any teacher education program would like to practice the teaching profession. Professional Education Subjects are classified into theory and concept courses and methods and strategies courses.

Generally, the competencies of the graduates in the area of Professional Education is low compared to General Education and Specialization as indicated in the result of the Licensure Examination for Teachers. The average rating of the graduates of

II. OBJECTIVES

The study aimed to determine the following:

1. frequency of the utilization of group-based and individual-based college teaching modes;
2. adequacy of learning resource materials used by the faculty members;
3. assessment tools used by faculty members in the prelim, mid-term and final periods; and
4. distributions of test items to the different domains of learning.

III. RESEARCH METHODOLOGY

The study made use of descriptive- evaluative method of research utilizing questionnaire checklist and documentary analysis.

The subjects of the study were the sixty three (63) faculty members who taught Professional Education Subjects, and selected ninety seven (97) students enrolled in Professional Education Subjects in eight (8) campuses of the University of Rizal System during the school year 2010-2011. These campuses are Angono, Antipolo, Cainta, Morong, Pililla, Rodriguez, Tanay and Taytay.

The instrument used in the study was a questionnaire checklist on Teaching Professional Education Subjects. The checklist is consist of items on aspects of frequency in the utilization of college teaching modes and adequacy of learning resources. Aside from the checklist, the study made use samples from compiled Prelim., Mid-Term and Final Examinations administered during the School Year 2010-2011.

IV. RESULTS

Frequency of Utilization and Effectiveness of Modes of College Teaching, Learning Resources, Syllabi used and Assessment Tools

Table 1. Mean on Frequency of Utilization of Faculty Members on College Teaching in Terms of the Group-Based and Individual-Based Teaching Modes

College Teaching Modes	Perception of Respondents			
	Faculty Members		Students	
A. Group-Based Teaching Modes	Mean	Verbal Interpretation	Mean	Verbal Interpretation
1. Large – group lecturing without media	2.03	Less Often	2.37	Less Often
2. Mediated large group lecturing	1.62	Least Often	1.51	Least Often
3. Symposium	1.57	Least Often	1.76	Least Often
4. Film showing	3.22	Often	3.12	Often
5. Team teaching	1.67	Least Often	1.60	Least Often
6. Round table conference	1.44	Less Often	1.99	Less Often
7. Case presentation	1.46	Least Often	1.65	Least Often
8. Informal lecturing	2.22	Not Often	2.49	Less Often
9. Pair-share	1.40	Least Often	1.26	Least Often
10. Panel discussion	1.90	Less Often	1.29	Least Often
11. Debate	1.70	Least Often	1.80	Least Often
12. Buzz group	1.90	Not Often	2.29	Less Often
13. Brainstorming	1.32	Least Often	1.91	Less Often
14. Role playing	1.54	Least Often	1.70	Least Often
15. Demonstration	1.83	Not Often	1.79	Least Often
16. Field Trip and community study	1.92	Not Often	1.86	Less Often
17. Lecture Discussion	3.68	Much Often	3.14	Often
18. Professional get-together	1.96	Less Often	2.29	Less Often
19. Seminar	1.51	Least Often	1.72	Less Often
20. Cooperative/Collaborative	3.90	Much Often	1.94	Less Often
21. Talk show	1.97	Less Often	1.77	Least Often
22. Case study	1.33	Least Often	1.92	Less Often
23. Concept mapping	2.22	Less Often	2.73	Least Often
24. Tutoring or mentoring	1.79	Least Often	2.23	Less Often
Over-all mean	1.96	Not Often	2.05	Not Often
B. Individualized Teaching Modes				
1. Assign reading	3.02	Often	3.36	Often
2. Programmed and Computerized instruction	1.30	Least Often	1.90	Less Often
3. Papers and written reporting	3.14	Often	3.44	Much Often
4. Individual self-inventory	1.98	Least Often	2.34	Less Often
5. Oral reporting	3.83	Much Often	4.24	Very Much Often
6. Created projects, work experiences, internship	2.98	Often	3.34	Often
7. Creative writing	2.32	Less Often	2.56	Less Often
8. Interview method	3.37	Much Often	2.54	Less Often
9. Internet surfing	2.27	Less Often	2.53	Less Often
10. Research	3.49	Much Often	3.67	Much Often
11. Problem Solving	2.32	Less Often	2.91	Often
12. Writing journal	1.90	less Often	2.64	Often
Average Mean	2.66	Often	2.95	Often

Adequacy of Learning Resources used by Faculty Members

Table 2. Computed Mean on the Adequacy of the Learning Resources Used by Faculty Members in Teaching Professional Education Subjects

Learning Resources	Faculty members		Students	
	Mean	Verbal Interpretation	Mean	Verbal Interpretation
1. Books	2.40	Inadequate	3.0	Adequate
2. Workbook	2.10	Inadequate	1.50	Very Inadequate
3. Worktexts	1.35	Very Inadequate	1.25	Very Inadequate
4. Instructional Modules	1.24	Very Inadequate	1.85	Inadequate
5. Magazines	2.10	Inadequate	2.50	Inadequate
6. Newspapers	1.18	Very Inadequate	1.45	Very Inadequate
7. Manuals	1.25	Very Inadequate	1.15	Very Inadequate
8. Laws	1.45	Very Inadequate	1.10	Very Inadequate
9. Learning Competencies Handbook	1.12	Very inadequate	1.0	Very Inadequate
10. Hand Outs/Pamphlets	3.4	Fairly Adequate	4.5	Very Much Adequate
11. Chalkboard	4.70	Very Adequate	4.85	Very Much Adequate
12. Still Picture (Non-Projected: photographs Illustrations)	1.10	Very Inadequate	1.05	Very Inadequate
13. Still Picture (Projected: Slides, Filmstrips, Opaque Projections, Overhead, Projections)	2.55	Fairly Adequate	1.0	Very Inadequate
14. Graphic Materials (Charts, Graphs, Maps, Globes, Posters)	3.70	Adequate	4.0	Much Adequate
15. Exhibits (School Made Displays, Bulletin Boards, Museum, sample works of teachers and students)	4.25	Very Adequate	4.5	Very Much Adequate
16. Flannel Board and Felt Board	1.36	Very Inadequate	1.26	Very Inadequate
17. Objects (Specimen, Realias, Models)	2.76	Inadequate	1.20	Very Inadequate
18. Tape Recorder	1.34	Very Inadequate	1.0	Very Inadequate
19. Film	1.25	Very Inadequate	1.0	Very Inadequate
20. Televisions	1.14	Very Inadequate	2.55	
21. Videotapes	1.10	Very Inadequate	1.30	Very Inadequate
22. Field Trips	1.2	Very Inadequate	1.50	Very Inadequate
23. Resource Persons	1.11	Very Inadequate	3.00	Adequate
24. Websites	1.0	Very Inadequate	2.5	Very Inadequate
25. Computer	1.0	Very Inadequate	1.05	Very Inadequate
Over-all Mean	1.89	Very Inadequate	2.0	Inadequate

Test Items in Various Periodical Examinations in Professional Education Subjects Constructed by Faculty Members

Table 3. Frequency, Percentage and Rank Distributions on the Type of Test in the Prelim, Mid-Term and Final Examinations in Professional Education Subjects

Type of Test	Frequency	Percent	Rank
1. Essay Type Test	15	6.38	8
2. Completion Type	28	11.92	6
3. Enumeration Type	35	14.89	3
4. Identification Type	33	14.04	4
5. True or False Test	31	13.19	5
6. Yes or No type Test	20	8.51	7
7. Multiple Response Test	37	15.75	1
8. Matching Type Test	36	15.32	2
Total	235	100	

Distribution of Test Items of the Periodical Examination to the Domains of Objectives

Table 4. Frequency, Percentage and Rank Distributions of Test Items of Achievement Tests According to Domains of Objectives

Domains	Frequency	Percent	Rank
1. Knowledge	1000	43.48	1
2. Comprehension	550	23.91	2
3. Application	300	13.04	3
4. Analysis	230	10.00	4
5. Synthesis	120	5.22	5
6. Evaluation	100	4.35	6
Total	2300	100	

V. DISCUSSIONS

As reflected in Table 1, the cooperative/collaborative group-based teaching mode has the highest mean rating of 3.90 verbally interpreted as “Much Often Utilized” as rated by the faculty members and lecture discussion has the highest rating of 3.14 interpreted as “Often Utilized” as perceived by students. However, brainstorming and pair-share have low mean ratings of 1.32 and 1.26 with a verbal interpretation of “Least Often Utilized” as rated by the faculty members and students, respectively. The result illustrates that group-based college teaching mode such as cooperative learning and lecture discussions are commonly used and other group-based college teaching mode are seldom used in teaching professional education subjects.

On individual-based college teaching modes, oral reporting has the highest mean ratings of 3.83 and 4.24 with a verbal interpretation of “Much Often Utilized” as rated by the faculty members and students, respectively. Programmed and computerized instruction has the lowest mean ratings of 1.30 interpreted as “Least Often Utilized” and 1.90 interpreted as “Less Often Utilized” as rated by the faculty members and students, respectively. Both respondents claimed that oral reporting can develop confidence and resourcefulness among students when used in proper perspective. However, it became worst when the students will be left alone discussing the subject matter without reinforcement from the faculty members. Other individual-based college teaching modes are also utilized in moderate level in the delivery of instruction. In general, individual-based college teaching modes were often used by faculty members than group-based teaching mode.

As shown in table 2, the chalkboard has the highest mean ratings of 4.70 and 4.85 both verbally interpreted as “Very Much Adequate” as rated by the faculty members and students, respectively. However, websites and computers have low mean ratings of 1.0 interpreted as “Very Inadequate”, and Learning Competencies Handbook, Still Picture (Projected: Slides, Filmstrips, Opaque Projections, Overhead, Projections), Tape Recorder and Films have low mean ratings of 1.0 interpreted as “Very Inadequate” as rated by the students. Other learning resource materials are rated as “Much Adequate”, “Adequate” and “Fairly Adequate”. Generally, the instructional learning resource materials are regarded by the faculty members and students as “Very Inadequate” and “Inadequate”, respectively.

Providing adequate instructional resource materials will enhance the delivery of instruction in Professional Education Subjects.

As shown in Table 3, majority, 37 or 15.75 percent of the type of tests administered to the students during the Prelim, Mid-term and Final examinations are multiple-choice test, and few, 15 or 68.38 percent is essay type test. Other type tests are in between the highest and lowest frequencies. The results indicates that the faculty members would like to accustomed the students with Licensure Examination for Teachers (LET).

Relative to the distribution of the test items to the domains of measurements, Table 4 revealed that most (1,000 or 43.48 percent) of the items in the Prelim, Mid-term and Final examinations belong to knowledge, and few (100 or 4.35 percent) belong to evaluation domain. The findings imply that the test items administered by the faculty members teaching Professional Education Subjects are not evenly distributed to the different domains learning. In order to remedy this unbalance distribution of test items, there should be a necessity to require the faculty members develop Table of Specifications (TOS) when constructing periodic tests.

VI. CONCLUSIONS

The group-based college teaching modes are not often utilized compared to individual-based teaching mode which are often utilized as perceived by both faculty members and students. The instructional resource materials are very inadequate as perceived by the faculty members and inadequate as perceived by the students. The periodic test administered by the faculty members are dominated with multiple-choice test and test items are unevenly distributed to the different domains of learning.

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A Study on Compliance with the Two-Thirds Gender Rule in Appointments and Promotions of Staff in Public Universities Elevated In 2012 And 2013

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Abstract- The study sought to analyze compliance with two-thirds gender rule in appointments and promotions of staff in new public universities chartered in 2012 and 2013. Specifically, the study determined the gender composition of staff appointed or promoted after the provision of the gender rule in the constitution. The study used the survey research design that had a population of 15 public universities elevated in 2012 and 2013 and a sample size of six. Interview schedules were used to collect data from the sampled universities. This data contained gender of staff per staff division and staff level in appointments and promotions made in 2011, 2012 and 2013 and were analyzed using percentages. The findings showed that in total, men largely dominated appointments at senior level (66% males to 34% females) but there was no big difference in appointments at the middle level (51.2% males to 48.8% females) and support staff level (56.6% males to 43.4% females). In the teaching staff, men were the majority (64.6% males and 35.4% females) while no major discrepancy was noted in the non teaching staff (56.8% males to 43.2% females). Overall, 59.8% males and 40.2% females were appointed in the five universities in 3 years. Just like in appointments, promotions of senior level staff were dominated by men (69.5% males to 30.5% females). Men equally featured in the promotions at the support staff level (76.5% males to 23.5% females). There were no major discrepancy in promotions at the middle level staff as 44.2% males and 55.8% females were promoted. Promotions in the teaching staff were skewed towards men at 70.9% males and 29.1% women while it was almost gender balanced in the non-teaching staff at 51% males and 49% females. Overall, 65.3% males and 34.7% females were promoted in the five universities in 3 years. In conclusion, the two-thirds gender rule is complied with in the consolidated appointments and promotions of staff in the five universities. However, when appointments and promotions are broken down into various units such as staff levels and divisions, non-adherence is observed. The study recommends that when appointing and promoting staff, the gender rule consideration should be done per section and units rather than for a whole unit.

Index Terms- Appointments, Promotions, Public Universities, Two-thirds gender rule

I. INTRODUCTION

Public universities are institutions of higher learning chartered by the Commission for University Education. They are usually funded by the government and ran by government appointed personnel. These personnel draw their remuneration from the public coffers and as such they are expected to adhere to government regulations regarding public service. This also requires them to comply with various guidelines and laws that have been put in place in order to foster the expectations of both the public and the government. The government has several roles of which it uses public organizations and institutions to implement. Some of these roles include and not limited to enhancing gender equity in serving its citizen.

Gender equality has been an issue in many public and private institutions. Many a time, one gender –mostly the feminine gender has always felt discriminated, under-represented and dominated by the other-often the masculine gender (Herbling, 2013). This has triggered a lot of protest and activism to challenge the vice. Many conferences have been held where women were informed of their rights and encouraged to rise against the vice. Indeed it is from such workshops; activism and campaigns that women get the spirit to show their ability and also challenge the status quo. As noted by Onsongo (2006), women activism in the world all over, has been successful in creating the legal framework and constitutional changes that have enabled women to attain positions of power and leadership. Subsequently, this activism has seen some women being elevated to positions that were initially assumed as ‘men’s only Club’ jobs. Onsongo (2006) further says that the ‘women jobs’ were mostly perceived to be inferior, less prestigious besides being lowly paid. She says that this happened despite the woman having the same qualifications, skills and experience required in carrying out the tasks of the job. This encouraged further activism and gender diversity campaign to the current situation we are in, where legislation has been enacted to ensure gender representation and equity in the work place.

The constitution of Kenya recognizes gender representation as one of the values and principles of public service. Paragraph (i) of article 232 states, “the values and principles of public service include affording adequate and equal opportunities for appointment, training and advancement at all levels of the public service, of- (i) Men and women, (ii) members of all ethnic

groups; (iii) and persons with disabilities” (Constitution of Kenya, 2010).

To this end, to satisfy part (i) above, all public organizations and institutions are expected to consider gender equality when making appointments and promotions among other personnel functions.

Gender representation is further enhanced by provision in the constitution of a gender diversity clause which states that no more than two-thirds of employees of any public organization should be of the same gender (Constitution of Kenya 2010, Article 27(8)). Although the two-thirds gender rule is silent on the beneficiaries of the clause, it is certain it benefits women most as they are the ones mainly underrepresented. The rule ensures their consideration in situations in which they would not have been considered was it not for the rule. This being part of the law; all appointing authorities in these organizations are expected to comply with the rule.

Nonetheless as noted by Onsongo (2006), it has been very difficult to achieve equity without direct intervention from the government, even where, as in the case of South Africa, the constitution and other regulations make provision for women to be given equal rights to job opportunities and positions of power. In other words, regulations and legislation does not imply direct implementation of gender equity. This means that despite the provision in our own constitution that no more than two-thirds of appointments shall be of the same gender, scrutiny of the public institutions may prove otherwise.

In closer look on implementation of the rule in some public sectors, non-compliance has greatly been noted. For example in elective positions where the rule was supposed to apply, it failed to work as was evidenced in the general elections held on 4th March 2013. Analysis from Independent Electoral and Boundaries Commission indicated that only 16 women were elected for the post of Member of The National Assembly compared to 274 men elected for the same positions. This put as a percentage, there was only 6% women elected as members of The National Assembly and 94% men elected to this position. The percentage is much below the two-thirds or 33% provision in the constitution. It is important to note that there was no woman elected for both the senatorial and the gubernatorial seats, (Esipisu, 2013). In the matter of the principle of Gender representation in the National Assembly and the Senate raised by the Attorney General (on behalf of the government of Kenya), to the Supreme Court for advisory the court observed that the two-thirds gender principle could not be immediately realized neither could it be enforceable in the two houses until August 2015 (Kenya Law Reports, 2012).

In the same vein, the County Representative contest displayed the same failure to meet the two-thirds gender threshold as only 77 women were elected (representing 6%) compared to 1,393 men (94%) elected to the same position (Esipisu, 2013). This means that despite the legislation, it is still difficult to ensure gender representation in public organizations.

Looking at other findings of other public sectors, the same failure in gender representation appeared. According to Herbling (2013), the boards of Kenyan listed companies were out of step with the constitution requirement on gender.

Worse still, the report indicated that more than a third of the companies listed at the Nairobi Stock Exchange did not have

women directors by March 2013. The report further showed that only 20% of seats in the state-owned companies enlisted in the bourse were occupied by women. In a study report done in February 2013 and titled ‘Bringing the other half to the board’ Muturi (2013) as cited by Herbling (2013) said that there was no deliberate effort in gender consideration and that the process of appointment seemed to be gender blind. This is despite the government’s legislation on two-thirds gender rule.

Moving on to appointments made by the government especially the cabinet Secretaries, all was not lost as report showed that the president ensured the two-thirds threshold was met. However the appointment of the Principal Secretaries did not meet the constitutional provision on two-thirds gender rule (Burrows, 2013) and that of the media team was faulted by the Gender and Equality Commission which said that its composition was biased towards men (“Uhuru faulted”, 2013).

A few years ago, the government elevated technical colleges and campuses of universities to University Colleges and finally to full –fledged Universities. There are currently fifteen new public Universities that were approved by Commission for University Education and awarded charters in 2012 and 2013 (CUE Brochure, 2013). As a result of change of status, the Universities made many appointments and promotions in various positions. Most of these appointments were made after the promulgation of the constitution of Kenya (2010) which provided for the implementation of the two-thirds gender rule. This study wanted to know whether the findings on gender noted in the public sectors mentioned above were consistent with public universities’ staffing. The study therefore analyzed compliance with the two-thirds gender rule in appointments and promotions of staff in public universities chartered in 2012 and 2013 and determined the challenges the institutions faced in trying to implement the rule.

Legislation of Gender Rules and their Implementation

Over the last several decades, a number of strategies have emerged and evolved to promote gender equity in development efforts (Bryan & Varat, 2008).

Due to the rampant gender imbalances existing in organizations as depicted above, many countries have come up with legislations and guidelines to help bring the underrepresented gender on board which many times as observed earlier is usually the feminine gender. Sometimes, resolutions, covenants and agreements on gender ratified by countries are the ones that give rise to formulation of these gender policies. Some of these measures have been made collectively by countries or by regions and others by individual countries.

One example of such law on gender is the two-thirds gender rule enshrined in Kenyan constitution. The constitution provides that “Not more than two-thirds of elective or appointive bodies shall be of the same gender in public sectors”, (Kenyan constitution Article 27(8), 2010). With this provision in place; it goes without saying that the law has been put so that no gender dominates the other in employment opportunities. The clause becomes strong when read together with Article 232(1) (i) of the constitution concerning the values and principles of public service. Part of the Article reads “The values and principles of public service include affording adequate and equal opportunities for appointment, training and advancement, at all levels of the

public service of-men and women;.....". These policies having been included in the constitution make it mandatory for all appointing and promoting bodies in public service to consider the rule in their future recruitments. The big challenge now rests on the government to enforce this gender rule.

Gender Policies have also been made in other countries. According to GMI ratings (2013), in 2011, Italy passed legislation requiring its public companies' boards to be one-third female by 2015. This saw the percentage of female directors increase from 4.6% points in December 2011 before legislation to 8.2% in 2013 after the legislation, an increase of 3.7%. (*Governance Metrics International (GMI) -An independent corporate governance research firm. It does research on environmental, social and economical factors/issues affecting public companies*).

Another example drawn from the GMI ratings (2013) indicate that in January 2011, France National Assembly passed a law requiring French company boards to be 20% female in three years and 40% female in six years. As a result, GMI reports that female representation on the boards began to accelerate in anticipation of the laws adoption and rose to 9.3% in 2012 and to 18.3% the standing for 2013. Indeed the report indicated that the legislation led to recruitment of women who were highly qualified professionals, many of who were new to public board service in France.

Many other countries which were under the coverage of GMI had legislation ongoing for gender representation. For example, in Brazil, legislation is currently under consideration that by 2022 would mandate 40% female directors at companies where the government has a major ownership stake. In Canada the same legislation is being worked on and as this is happening, individual companies in the country have put up their own measures to ensure gender diversity. A similar initiative was being taken by India where legislation on having at least one female director in public companies was awaiting approval (GMI, 2013).

Therefore it is clear from the examples given that legislation on gender laws can help bring gender diversity in organizations. If the same implementation of legislations could be replicated in Kenyan public organizations, the country would reap the benefits of gender balance in the workplace.

However, it is important to note that legislation does not always guarantee gender diversity in organizations. Giving an example with Spain, the percentage of female directors as at 2013 was 9.5%, a decrease from the December 2011 percentage of 10.2%. This was despite the country legislating a requirement in 2007 to have at least 40% female in board membership in public companies (GMI, 2013). The same observations were made in UK. It was noted that despite the country targeting to achieve 25 percent female board representation in the listed companies by 2015, the percentage of women executive directors in 2013 was down from 6.6 percent in 2012 to 5.8 percent in 2013 (Maclead & Coffey, 2013). Therefore it means that it is possible to have laws in place but then fail to implement them. Another example is given by Kiamba (2008) where in South Africa there was a requirement of 30% representation of women in public service positions through a presidential decree which was never implemented.

In Australia, there was Equal Opportunity and Affirmative Action legislation in 1986. In spite of this, 12 years later, McCall et al. (2000) found out that women were still under-represented and tended to earn less than their male counterparts.

According to GMI (2013), one possible reason to why legislative actions have been less effective in some countries noted above such as Spain is lack of penalty for non-compliance by making gender diversity to be merely taken into account when public subsidies and state contracts are awarded.

From this discussion, it is true that legislation and effective implementation is a catalyst to gender diversity in organizations. This possibly explains why it has been observed that nations are becoming signatories of major laws, resolutions, declarations and other instruments that foster and provide for gender balance in the workplace and institutions. However, Maclead & Coffey (2013) in a report on an enquiry on executive women in the workplace in UK suggests that for maximum gender consideration, gender diversity should be owned and led by organizations themselves rather than mandated by government. This is because if the need for gender diversity arose from the organizations, it would be easier to have gender represented than when an organization would just be doing it to meet the laws of the land. Indeed as portrayed by West (2007), if gender balancing did not come from the organization itself and probably the law on gender done away with as it happened in California State, women would be on the receiving end on discrimination. She notes a situation in that state where voters in 1995 passed a proposition that forbid any state actor from giving "preferences" based on sex, race or ethnicity in making employment decisions, issuing contracts or providing any other state benefits. As a result of this abolition of affirmative action, there was increased discrimination on women at that University. She reports that the number of women new hires in the faculty fell by 10 points from 36% before the abolition of the affirmative action to 26% after the abolition and continued to decrease further. The worrying observations were made at one of the university's campus-University of California Davis Campus, which had previously shown gender consideration in new hires at 52%. Nevertheless, the figure dropped to 13% with the eradication of the affirmative action. This underlines Maclead's and Coffey's findings that gender considerations are best implemented when the need arises from the concerned organization rather than when it is a requirement by the government.

In summary

Legislation of laws on gender such as Equal Employment Opportunity (EEO) and Affirmative Action (AA) are important towards gender representation in organizations. Nonetheless these laws and constitutional provisions are only helpful if proper mechanisms are put to ensure implementation. Proper guidelines on implementation and follow up and reporting systems need to go alongside legislation. Support is also necessary in terms of resources. In reality in many organizations that had gender mainstreaming programmes, it was noted that most of the coordinators of the programme complained of lack of support from the organization as a whole, starting from the top management, unwillingness of the management to implement gender measures and also being treated as a peripheral body that did not need much consideration and emphasis. The above

observation concurs with Braithwaite and Bush (1998) who as cited by Noble and Mears (2000) says “Five years after introduction of EEO/AA in Australia, staff in the universities appeared confused, ignorant and disinterested in the legislations; managers did not seem to understand the legislation and many did not recognize gender inequality as a problem. Consequently, these coordinators of the gender programmes felt isolated, marginalized and unable to participate in, or influence decision bodies (Noble & Mears, 2000).

If care is not taken, laws on gender can have negative impacts where one gender feels that the other is being given preferential treatment.

Gender diversity is best achieved when it comes from within the organization. But this can only happen if the organization understands and appreciates the importance and benefits of gender representation in the organization. The management of an organization is key to having a gender sensitive environment. It was noted that firms and institutions that had women as the top managers were easier to have gender represents in their organizations unlike organizations that the male dominated the management.

Other things that can effectively contribute to gender representation in the organization are providing an enabling environment for all genders. For example, each gender should feel embraced in the organization and be equally treated. Each gender should be given equal access to personal and career development and actions that may be interpreted as discriminatory should be vehemently condemned, discouraged and avoided.

II. METHODOLOGY

The study surveyed fully- fledged public universities formed after the enactment of the two-thirds gender law. This involved determining the gender composition of staff in these new universities to verify whether they had fully complied with the rule, partially complied or whether they were moving towards or away from compliance.

Population of the Study

The population of the study was the 15 new public universities that were approved and chartered in the year 2012 and 2013 (CUE, 2013). These institutions of higher education were chosen because being new establishments; they have had high need for recruitment and promotion to fill old and newly created vacancies, unlike the old public universities which were already stable in terms of need for employees. In other words, recruitment and promotions in these new universities was guaranteed hence offered a rich source of data and information for the research.

Sample and Sampling Procedures

The study used a sample size of six universities. The number represented the number of old public universities that gave rise to the new Universities.

The study identified the mother of each new university. Where a university had one constituent college, the new university was automatically included in the sample. However, if a university had several constituent colleges, simple random sampling method was used to select the sample. One university declined the researcher’s request to collect data from it hence the sample size ended up being five.

Data Collection Procedures

The researcher used interview schedules in collecting the data for the study. The interview schedules had tables where data collected was filled in. Data collection involved personal interviews with the key informants (senior human resource officers in charge of recruitment and promotion of staff). The interview involved asking questions that would help know the number of employees and their gender appointed or promoted in the university in the period 2011, 2012 and 2013 and the challenges they faced in trying to implement the gender rule. The answers to the question were then filled in the tables provided (see appendix IV). The answers were supported by the staff records maintained by the personnel office.

To help answer the question regarding the challenges recruiters faced in attempt to adhere to two-thirds gender rule, a senior officer in the human resource department who is actively involved in appointment and promotions of staff at each university under study was required to fill a one question questionnaire.

III. RESULTS AND DISCUSSION

The Study Components

The study investigated the composition of gender of appointments and promotions done in 2011, 2012 and 2013 in five universities namely; Pwani University, University of Kabianga, Multimedia University of Kenya, Karatina University and Laikipia University. The study had two components:

1. Appointments
2. Promotions

Each component had two sub-components namely;

1. Analysis for appointments and promotions in individual universities
2. Analysis for consolidated appointments and promotions for all universities under study.

The results of the investigations were put in percentages and presented in tables.

Table 1
Consolidated appointments for 5 universities by gender per staff level per year

Senior		Middle				Junior					
Males		Females		Males		Females		Males		Females	
F	%	F	%	F	%	F	%	F	%	F	%

2011	42	66.7	21	33.3	21	48.8	22	51.2	49	54.4	41	45.6
2012	78	66.1	40	33.9	18	52.9	16	47.1	28	63.6	16	36.4
2013	39	65	21	35	23	52.3	21	47.7	5	45.5	6	54.5
Totals	159	66	82	34	62	51.2	59	48.8	82	56.6	63	43.4

Source: Field data (2014)

The results of table 4.32 show that in 2011, the senior level positions had 63 appointments. Out of this, 42 (66.7%) were males while 21 (33.3%) were females. In the middle level appointments, a total of 43 appointments were made, where 21 (48.8%) were males and 22(51.2%) were females. The support staff level had 90 staff appointments with 49(54.4%) being males and 41 (45.6%) being females.

The 2012 appointments had 118 appointments in senior cadre of staff, of which 78 (66.1%) were males and 40(33.9%) were females. The middle level staff had 34 appointments, 18(52.9%) males and 16(47.1%) females. In the support staff level, 44 employees were appointed with 28(63.6%) being males and 16(36.4%) being females

In appointments of senior positions in 2013, there were 60 staff, 39(65%) males and 21(35%) females. The middle level staff had 44 appointees, 23(52.3%) males and 21(47.7%) females. The support level staff had 11 appointees of which 5(45.5 %) were males and 6(54.5%) were females.

The ratio of male to female appointments at the senior level was almost constant for the 3 years and averaged at 66% males to

34% females. Males always dominated the appointments and almost forming two-thirds of the total appointments. At the middle level, the total appointments for the 3 years were almost gender balanced and averaged at 51.2% males to 48.8% females. The average appointments at the support staff was at 56.6% male to 43.4% females. Comparing the 3 staff levels, gender bias was more pronounced at the senior staff level. In addition, men always dominated the appointments except the appointments in the middle level staff of 2011 and the support staff of 2013. The above findings are similar to finding by Onsongo (2006) that women are underrepresented in executive, management and technical positions. Women were found to be well represented in the middle and support cadre jobs, underlining findings by Onsongo (2006) and Kulis (1997) that women are locked out of jobs that are perceived to be prestigious and only given opportunities to the lowly valued, less prestigious and inferior jobs. Since decision making positions are found in the senior level jobs McCall et al (2000), it is true that women are underrepresented in the top management of the universities.

Table 2
Consolidated appointments for 5 universities by gender per staff division per year

		2011		2012		2013		Total F	Total %
		F	%	F	%	F	%		
Teaching Staff	Males	23	59	72	67.3	29	63	124	64.6
	Females	16	41	35	32.7	17	37	68	35.4
Non-teaching staff	Males	89	56.7	52	58.4	38	55.1%	179	56.8
	Females	68	43.3	37	41.6	31	44.9%	136	43.2

Source: Field data (2014)

Table 4.33 shows that in 2011, there were 23(59%) males and 16(41%) female appointments, while in the non-teaching staff 89 (56.7%) males and 68(43.3%) females were appointed. In 2012, there were 72(67.3 %) males and 35(32.7%) females appointed in the academic staff while the non academic staff was made of 52(58.4 %) males and 37(41.6 %) females.

In 2013, a total of 46 academic staff were appointed with 29(63%) being males and 17(37 %) females. In the non teaching

staff, 38 staff was appointed, 38(55.1%) males and 31(44.9%) females.

Gender disparity was highest in appointments of the teaching staff, at an average of 64.6% males to 35.4% females. In the non-teaching staff, the average percentage of male and female appointments over the 3 years was 56.8% and 43.2% respectively.

Table 3
Consolidated appointments for 5 universities by gender per year

Gender/year	2011		2012		2013		Totals	
	F	%	F	%	F	%	F	%
Males	112	57.1	124	63.3	67	58.3	303	59.8
Females	84	42.9	72	36.7	48	41.7	204	40.2
Totals	196	100	196	100	115	100	507	100

Source: Field data (2014)

From table 4.31, there were a total of 196 appointments made by the universities forming the research sample in 2011. Out of this, 112 (74.1 %) were males while 84 (42.9%) were females.

The total appointments made by the universities in 2012 were 196 composed of 124 (63.3%) and 72(36.7%) while those of 2013 were 115 made up of 67 (58.3%) males and 48(41.7%) females.

In total, over the 3 years under study 303(59.8%) males and 204(40.2%) females were appointed. The gender rule in overall appointments was complied with and males had the highest appointments. However, women were underrepresented in

overall appointments a confirmation that women are the ones usually affected by gender when it comes to employment. The findings concur with Kiamba (2008) as found in Gumbi (2006) that the leadership in higher education was still a man’s world. Trends in gender appointments across the 3 years shows that the percentage appointments of males to that of females was almost constant in each of the 3 years and averaged at 59.8% males and 40.2% females and though the gender rule is complied with, women are the minority. The findings on underrepresentation of women support Kiura (2010) that despite many efforts being made to promote gender equality, inequalities still exist.

Gender composition and state of compliance with the gender rule in promotions made in 2011, 2012 and 2013 in the newly chartered public universities

Table 4
Consolidated promotions for 5 universities by gender per staff level per year.

	Senior		Middle				Junior					
	Males		Females		Males		Females		Males		Females	
	F	%	F	%	F	%	F	%	F	%	F	%
2011	32	64	18	36	0	0	2	100	27	81.8	6	18.2
2012	43	72.9	16	27.1	15	51.7	14	48.3	8	57.1	6	42.9
2013	32	71.1	13	28.9	8	38.1	13	61.9	4	100	0	0
Totals	107	69.5	47	30.5	23	44.2	29	55.8	39	76.5	12	23.5

Source: Field data (2014)

The results of table 4.36 shows in 2011, the five universities under study promoted 50 staff in the senior staff cadre, of which 32 (64%) were males and 18 (36%) were females. There were 2 promotions made in the middle level which were all females. 33 staff were promoted in the support level, of which 27(81.8%) were males and 6(18.2%) were females.

In 2012, 59 promotions were done in the senior level category of staff, made up of 43(72.9%) males and 16(27.1%) females. In the middle staff level, the males were 15(51.7%) and the females 14(48.3%). The support staff had 8(57.1%) males and 6(42.9%) females.

In 2013, promotions in the senior staff category had 45 employees, 32 (71.1%) males and 13(28.9%) females. In the middle category, there were 8(38.1%) male s and 13(61.9) females promoted. In the support staff 4(100%) males were promoted.

The promotions in both the senior and support staff were significantly dominated by men with 69.5% males to 30.5% females and 76.5% males to 23.5% females. In both, the gender rule requirement was not met. Women held the majority in total promotions in middle level staff of the 3 years.

Table 5
Consolidated promotions for 5 universities by gender per staff division per year

		2011		2012		2013		Total F	Total %
		F	%	F	%	F	%		
Teaching Staff	Males	26	70.3	43	72.9	25	73.5	74	70.9
	Females	11	29.7	16	27.1	9	26.5	36	29.1
Non-teaching staff	Males	33	68.8	23	53.4	19	52.8	75	51.
	Females	15	31.2	20	46.6	17	41.2	72	49

Source: Field data (2014)

Table 4.35 shows that, there were a total of 37 promotions of teaching staff and 48 non-teaching staff done in the five universities under study in 2011. In the teaching staff, 26(70.3%) were males and 11(29.7%) were females. In the non-teaching staff, 33(68.8%) were males while 15(31.2%) were females.

In 2012, the five universities promoted 43(72.9%) males and 16(27.1%) females in the teaching staff division. In the non-academic staff, the males were 23(53.5%) while the females were 20(46.5%).

In 2013, 25(73.5%) males and 9(26.5%) females were promoted in the teaching staff while 19(52.8%) males and 17(47.2%) females were promoted in the non-teaching staff.

There was a significant bias in promotions done in the teaching staff, with the 3 years being dominated by men and

none of the years were women promotions more than 30% and the problems persists across the years. Though men dominate in the non-teaching promotions, the percentage women promoted improves progressively.

Table 6
Consolidated promotions for 5 universities by gender per year.

Gender/year	2011		2012		2013		Totals	
	F	%	F	%	F	%	F	%
Males	59	69.4	66	64.7	44	61.1	169	65.3
Females	26	34.9	36	35.3	28	38.9	90	34.7
Totals	85	100	102	100	26	100	139	100

Source: Field data (2014)

In table 4.34, the five universities made 85 promotions. Out of this 59 (69.4%) were males and 26(30.6%) were females in 2011.

In 2012 the universities made a total of 102 promotions, made up of 66 (64.7%) males and 36 (34.3%) females while 2013 total promotions had 72, 44(61.1%) males and 28(38.9%) females.

The table above shows that the percentage of male to female promotions were almost constant across the 3 years with slight improvement in gender representation in 2013. The percentage women promotions progressively increased from 2011(34.9%) to 2013(38.9%).

IV. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

This study was guided by the following objectives

1. To determine the gender composition and the status in compliance with the gender rule in appointments and promotions of staff in Public universities chartered in 2012 and 2013.
2. To determine the challenges which impede adherence of two-thirds gender rule in appointments and promotions of staff in public universities chartered in 2012 and 2013.

From the study the findings were as follows;

With regard to staff levels, males largely dominated the senior level in total appointments in the five universities and averaged at 66% males to 34% females. The appointments of the middle level staff were gender balanced and in some instances such as Pwani University, University of Kabianga and Multimedia University of Kenya, women were the majority in appointments. The findings confirm the views of one senior human resource manager at one of the universities who when reporting on challenges impeding the gender rule implementation noted that women usually have attractive presentation skills which give them an upper hand in the interview. In addition, at the middle level, men were said to be intimidated by the female gender, hence the tendency of women dominance in the level. There was no significant discrepancy in the total appointments at the support staff in the five universities.

Men noticeably dominated the total appointments of the teaching staff forming 64.6% of the total appointments in teaching staff. This amplifies findings by Kankakee (1997) as cited by Onsongo (2006) that women form a minority of university teachers. On the other side, there was no much discrepancy in total appointments in the non-teaching staff (56.8% males to 43.2% females). The overall percentage male to female appointments were almost constant across the three years and averaged at 59.8% males to 40.2% females. There was fair treatment of women at the middle level in both appointments and promotions at 48.8% and 55.8% respectively.

Just like in appointments, promotions in the senior and support staff failed to meet the two-thirds gender rule as 69.5% males to 30.5% females and 76.5% males to 23.5% females were promoted respectively. The middle level promotions met the gender rule requirements with 44.2% males and 55.5% females.

Conclusion

Most universities had complied with the gender rule in overall appointments and promotions. In addition, the two-thirds gender rule is complied with when the consolidated appointments and promotions for the five universities are considered. When broken down into various units such as staff levels and divisions, non-adherence to the rule is noted. In most cases, women are the ones underrepresented. It was difficult to know whether the gender rule in the constitution had an effect on appointments and promotions done after the law became into force.

Although the two-thirds gender rule had been met in most universities, women were still underrepresented in both appointments and promotions and gender balance is still far from realization. The inequalities exist despite the efforts by the government to promote gender equality through several ways such as enactment of laws, sensitization programmes and establishment of gender and equality agency.

Concerning the second objective, three major challenges identified were lack of adequate applicants from either gender, female gender particular with location and work environment and failure to meet the minimum requirements.

Recommendations

As non-compliance was found when appointments and promotions were broken into small units, appointing authorities should consider gender of employees per section and units rather than for a whole unit.

Suggestions for further study

It was difficult to determine whether the gender rule in the constitution had any impact on appointments and promotions made after the law came into force, as the scope of the study did not go into appointments and promotions done before 2010; and was limited to appointments and promotions done after the two-thirds gender law came into force. Research should be done to determine status in appointments and promotions before the promulgation of the constitution. This will enable comparison of the appointments and promotions of the two periods.

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Isolation and identification of antagonistic *Lactobacillus acidophilus* from curd

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Abstract- *Lactobacillus acidophilus* comes under the genus *Lactobacillus* which comprises of large group of beneficial bacteria that have similar properties and all produce lactic acid as an end product of the fermentation process. Previous studies shows that *L.acidophilus* has its own significant importance as it improves gastrointestinal function, boosts immune system, decreases the frequency of vaginal yeast infection and helps in reducing serum cholesterol levels. The present study is directed towards isolation and identification of antagonistic *L. acidophilus* from different regions of Allahabad. A total of 50 curd samples were collected from different regions of Allahabad. After careful examination of morphological and biochemical characteristics, all 74 isolates of different *Lactobacillus* species were found to be present in which 7 strains of *L. acidophilus* were found. Further these 7 strains were subjected to antagonistic test against selected bacterial pathogens and results revealed that all strains of *L.acidophilus* were found to be good antagonistic activity against selected bacterial pathogens. This study concluded that curds contain strains of *L.acidophilus* which shows good antagonistic property; thus revealing that it is safe and beneficial for consumption.

Index Terms- *Lactobacillus acidophilus*, curd, Antagonistic, Antibiotic sensitivity.

I. INTRODUCTION

Since the ancient times India has been traditionally rich when it comes to microbial diversity. Due to increasing population and food insecurity there has been rapid increase in the consumption of fermented food products. For ensuring the nutritional quality and safety of these fermented products a lot of research should be done.

The *Lactobacilli* comprises a large and diverse group of Gram (+ve), non sporulating, non motile rods or cocci that are associated to produce lactic acid as the major metabolic end products of carbohydrate fermentation (Pelnesco *et al.*, 2009). Lactic acid bacteria are divided into five genus, which are *Streptococcus*, *Lactobacillus*, *Leuconostoc*, *Bifidobacteria*, and *Pediococcus*. Out of which *Lactobacillus*, *Bifidobacteria* are the most common bacteria that are categorized under prebiotics (Espirito Santo *et al.*, 2003). Lactic acid bacteria and their metabolites play vital role in improving the quality and shelf life of many fermented food products and used for biopreservation (Zottola *et al.*, 1994), starter cultures for fermented food products and some of them are also component of intestinal micro flora (Fuller, 1992 and Holzapfel *et al.*, 2001). Various strains of

Lactobacilli provide additional health benefits by acting as bile tolerance (Walker and Gilliland, 1983), gastric juice tolerance (Kilara, 1982) and antibiotic resistance (Curragh and Collins, 1992)

Lactobacillus acidophilus gets its name from *lacto*-meaning milk, *-bacillus* meaning rod-like in shape, and *acidophilus* meaning acid-loving. This bacterium thrives in more acidic environments than most related microorganisms (pH-4-5 or lower) and grows best at 45°C celsius. *L. acidophilus* occurs naturally in the human and animal gastrointestinal tract, mouth, and vagina. *L.acidophilus* is a homofermentative microorganism which ferments lactose and produces only lactic acid. The traditional Indian fermented product is curd which is prepared by fermentation of the milk by lactic acid bacteria. Lactic acid bacteria convert milk sugar lactose into lactic acid and they suppress spoilage bacteria because of the production of antimicrobial substances. Consumption of curd has been reported to cure diarrhea (Agarwal and Bhasin, 2002); and reported to have anti-diabetic (Yadav *et al.*, 2007), anticarcinogenic (Arvind *et al.*, 2010) and few other benefits (Prajapati *et al.*, 2014). It also plays an important role in preserving milk and milk products (Mutlag *et al.*, 2013). In the present investigation the *L.acidophilus* bacteria has been isolated from curd from different localities of Allahabad (U.P). In a study similar as this one the lactic acid bacteria was isolated from vegetables and traditional fermented foods including dhokla batter, jalebi batter, idli, lassi, curd and cabbage (Patel *et al.*, 2012 and Neha *et al.*, 2014). In other study lactic acid bacteria was isolated from Appam batter and vegetable pickle (Vijai Pal *et al.*, 2005).

Therefore the present study was carried out to evaluate the therapeutic values of curd with respect to the presence of antagonistic *L.acidophilus*.

II. MATERIALS AND METHODS

1-Collection of curd samples: Curd samples were collected from the different localities of Allahabad city. The collection of curd samples was done in sterile, wide mouthed autoclavable sample bottles. After collection, the samples were immediately transported to the lab and were kept at 4°C until used.

2-Isolation and Maintenance of *L.acidophilus*: The initial isolation of *L.acidophilus* strains from different curd samples was done on de Mann, Rogosa, Sharpe (MRS) medium. Samples were directly streaked on MRS media and incubated aerobically at 37°C for 24 hrs. After complete incubation obtained colonies were subcultured and were subjected to various identification

parameters. The isolated and identified *L.acidophilus* strains were inoculated in MRS broth and after proper growth they were stored at 4°C for further study. Regular sub culturing of the isolates was done at every tenth day throughout the course of study.

3 Identification of *L.acidophilus*: Lactobacillus strains isolated in the study was identified on the basis of cultural, morphological and biochemical characteristics by the procedure described in Bergey's manual of systematic bacteriology (Holt *et al.*, 1994, Williams and Wilkins, 1945).

3.1 Cultural Characteristics: Various cultural characteristics were studied for the identification of the isolates viz. color, surface, size, shape, centre, optical feature and elevation. The colonies appeared on MRS plates were separate, creamish white, smooth, small, round, flat, opaque and convex with no pigmentation.

3.2 Morphological Characteristics: Morphological examination of the isolates was done with the help of Gram staining (Holt *et al.*, 1986). It was done for identifying and classifying bacteria as gram positive or gram negative. The bacteria, which retain primary stain (appear dark blue or violet) was named as gram-positive, whereas those that lose crystal violet and counter stain by safranin (appear red) were referred to as gram-negative (**Fig -1**).

3.3 Biochemical Characteristics: The following biochemical tests were performed to identify the isolates like Slide Catalase test, Oxidase test, Carbohydrates fermentation test, Nitrate reduction test, Starch hydrolysis test, Litmus milk test, Aesculin hydrolysis test, Growth at 45°C and 15°C as mentioned in (**Table -1**)

III. PROBIOTIC PATTERN OF *L.ACIDOPHILUS*

4.1 Antagonistic activity of *L.acidophilus* against selected bacterial pathogens: It was done by agar well diffusion method on nutrient agar medium (Tagg and Mcgiven, 1971). Overnight (18hrs) broth culture of test pathogens (**Table -2**) was swabbed uniformly on the surface of nutrient agar (N.A) plates using sterilized cotton swabs. One plate of N.A. was kept as media control. For pathogen control, 6 N.A. plates were swabbed with the 6 pathogens. For treatment control, 6 N.A. plates were swabbed with 6 pathogens, single well was cut in each plate and only broth of 0.1ml of supernatant inoculum of *L.acidophilus* was inoculated in it. Plates were incubated at 37°C for 24-48hrs. Zone of inhibition formed around the wells was observed and measured in millimeters and results were recorded (**Fig-2**).

4.2 Antibiotic sensitivity pattern of *L.acidophilus*: The antibiotic sensitivity pattern of *L.acidophilus* was done on MRS medium. Overnight (18hrs) broth cultures of *L.acidophilus* were swabbed uniformly on the surface of media using sterilized cotton swabs. The following antibiotic discs (Penicillin, Ampicillin, Neomycin, Erthromycin, Tetracycline and Nalidixic acid) were placed on media with the help of forceps and plates were incubated at 37°C for 24-48 hrs. Zone of inhibition formed around the antibiotic was observed and measured in millimeters and results were recorded (**Graph -1**).

5 Statistical analyses: The obtained data from the study was statistically analyzed using "Two way Anova" (Fisher and Yates, 1968).

IV. RESULTS

Isolation and Identification of *L.acidophilus* from curd:

A total of 74 bacterial strain of *Lactobacillus* were obtained from 50 curd samples of 4 different zones of Allahabad like Naini (n=13), Behraini (n=13), Kareli (n=12) and Civil lines (n=12). The incidence of *L.acidophilus* was 7 (5.18%), *L.amylovorovus* was 9 (6.66%), *L.yamanashensis* was 15(11.1%), *L.jensenii* was 3 (2.22%), *L.delburkii* was 9 (6.66%), *L.amylophilus* was 22 (16.28%), *L.salivaris* was 3 (2.22%), *L.bulgaricus* was 17 (12.58%), *L.helveticus* was 4 (2.96%), *L.vitulinus* was 8 (5.92%), *L.lactis* was 2(1.48%) and *L.crispatus* was 2(1.48%) as given in (**Fig-3**).

Antagonistic activity of *L.acidophilus*:

The antagonistic activity of isolated *L.acidophilus* strains were screened against 6 pathogenic bacteria viz. *B.cereus*, *B.subtilis*, *S.aureus*, *E.coli*, *S.typhi* and *S.dysenteriae* and showed different inhibitory spectrum (**Fig-2**). Among these *L.acidophilus* strains LA1 showed 12.5mm inhibition zone against *B.cereus*, 5.5mm against *B.subtilis*, 0.0mm against *S.aureus*, 7.5mm against *E.coli*, 5.5mm against *S.typhi* and 0.0mm against *S.dysenteriae*. LA2 showed 16.0mm against *B.cereus*, 15.0mm against *B.subtilis*, 10.0mm against *S.aureus*, 6.5mm against *E.coli*, 8.5mm against *S.typhi* and 16.0mm against *S.dysenteriae*. LA3 showed 6.5mm against *B.cereus*, 10.5mm against *B.subtilis*, 7.5mm against *S.aureus*, 6.5mm against *E.coli*, 17.0mm against *S.typhi* and 12.5mm against *S.dysenteriae*. LA4 showed 9.5mm against *B.cereus*, 0.0mm against *B.subtilis*, 5.0mm against *S.aureus*, 13.0mm against *E.coli*, 13.5mm against *S.typhi* and 8.5mm against *S.dysenteriae*. LA5 showed 17.0mm against *B.cereus*, 0.0mm against *B.subtilis*, 0.0mm against *S.aureus*, 12.5mm against *E.coli*, 5.0mm against *S.typhi* and 10.5mm against *S.dysenteriae*. LA6 showed 18.5mm against *B.cereus*, 17.0mm against *B.subtilis*, 12.0mm against *S.aureus*, 13.5 mm against *E.coli*, 14.5mm against *S.typhi* and 6.0mm against *S.dysenteriae*. LA7 showed 6.5mm against *B.cereus*, 0.0mm against *B.subtilis*, 6.0mm against *S.aureus*, 6.5mm against *E.coli*, 0.0mm against *S.typhi* and 5.5mm against *S.dysenteriae*. The study reveals that all the *L.acidophilus* showed inhibitory spectrum against the tested pathogens. Among studies *L.acidophilus* isolated LA6 was found to be most antagonistic strain. However, LA7 was found to be least antagonistic strain. Among the pathogens *B.cereus* was most inhibited strain followed by *E.coli*.

Antibiotic sensitivity pattern of *L.acidophilus*

The seven antagonistic strains of *L.acidophilus* was also screened against different antibiotics viz. Ampicillin (A), Neomycin (N), Erthromycin (E), Penicillin (P), Tetracycline (T), and Nalidixic acid (Na). The study reveals that some strains of *L.acidophilus* were found to be sensitive, some were resistant and some were found to be intermediate to these antibiotics. Among these 7 strains LA1 was found to be resistant to A, P, Na, and intermediate to N, E, T. LA2 was found to be resistant to A,

P, Na, T and intermediate to N, E. LA3 was found to be resistant to A, N, E, P, Na and intermediate to T, LA4 was found to be resistant to A, P, Na and intermediate to E and sensitive to T, LA5 was found to be found resistant to A, P, Na, and intermediate to N, E and sensitive to T, LA6 was found to be resistant to A, N, P, Na and sensitive to E, T. and LA7 was found to be resistant to A, P, Na, T and intermediate to N and sensitive to E (Graph -1)

Statistical analysis of Antagonistic activity of *L.acidophilus* strains

The obtained data from the study was statistically analyzed using “TWO way ANOVA” (Fisher and Yates, 1968).No significant values were found as presented in (Table -4).

V. CONCLUSION

In the present study 7 antagonistic strains of *L.acidophilus* was isolated from 50 curd samples, collected from different regions of Allahabad. Primary study reveals that 7 strains of *L.acidophilus* have good antagonistic activity against selected bacterial pathogens. It is thus concluded that strains of *L.acidophilus* can be used as biopreservative agents and for manufacturing of fermented milk products. But detailed study on their role in human body, bile tolerance, acid tolerance, resistance against proteolytic enzymes and gastric juices is needed to keep them in probiotic category. Last but not least, this study shows that Indian curd contains strains of *L.acidophilus* with good antagonistic property; hence it reveals that it is safe and beneficial for consumption.

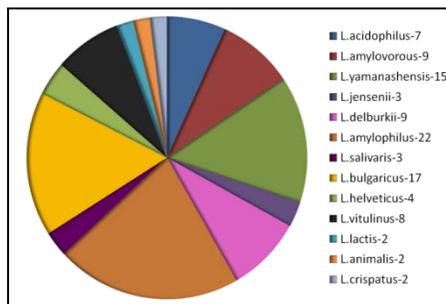
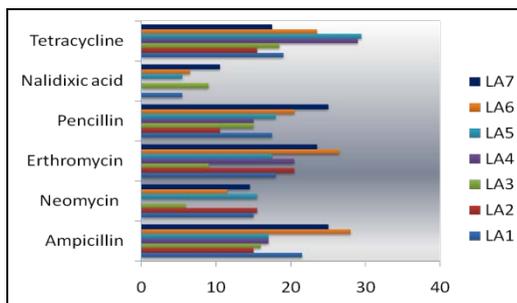


Fig 3- Incidence of *Lactobacillus* spp. in curd sample



Graph 1 - Antibiotic sensitivity pattern of isolated *L.acidophilus* (LA) strains.
 * values includes diameter of well i.e. 5mm

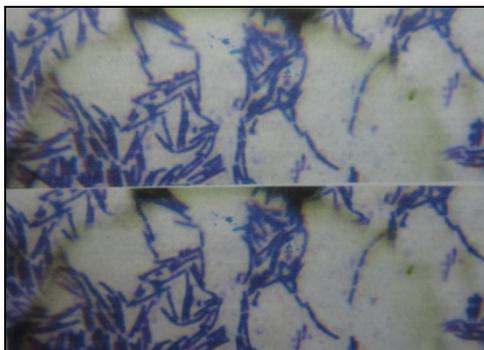


Fig 1:- Morphological characteristic of *L.acidophilus* (X100)

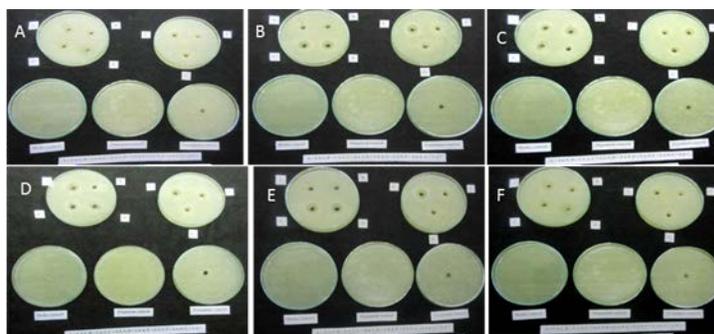


Fig 2- Antagonistic activity of *L.acidophilus* against selected pathogens.
A to *F - Antagonistic activity of *L. acidophilus* isolates against *B. subtilis*, *Bacillus cereus*, *Staphylococcus aureus*, *Escherichia coli*, *Salmonella typhi*, *Shigella dysenteriae

Table no-1:- Biochemical characteristics of isolated *Lactobacillus spp*

Lactobacillus spp.	No. of isolates	Catalase Test	Oxidase Test	Glucose	Glycerol	Lactose	Maltose	Mannitol	Sucrose	Nitrate reduction test	Starch Hydrolysis Test	Litmus Milk Test	Growth at 45°C	Growth at 15°C	Aesculin Hydrolysis
<i>L. acidophilus</i>	7	-ve	-ve	+ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve	+ve	+ve	-ve	+ve
<i>L. amylovorus</i>	9	-ve	-ve	+ve	-ve	-ve	+ve	-ve	+ve	-ve	+ve	+ve	+ve	-ve	+ve
<i>L. yamanashensis</i>	15	-ve	-ve	+ve	-ve	-ve	-ve	-ve	+ve	-ve	-ve	+ve	+ve	+ve	+ve
<i>L. jensii</i>	3	-ve	+ve	+ve	-ve	-ve	+ve	+ve	+ve	-ve	-ve	+ve	+ve	-ve	+ve
<i>L.delburkii</i>	9	+ve	+ve	+ve	-ve	-ve	+ve	-ve	+ve	-ve	-ve	+ve	+ve	-ve	-ve
<i>L. amylophilus</i>	22	+ve	-ve	+ve	-ve	-ve	+ve	-ve	-ve	-ve	-ve	+ve	-ve	+ve	-ve
<i>L. salivaris</i>	3	+ve	-ve	+ve	-ve	+ve	+ve	+ve	+ve	-ve	-ve	-ve	+ve	-ve	+ve
<i>L. bulgaricus</i>	17	-ve	+ve	+ve	-ve	+ve	-ve	-ve	-ve	-ve	-ve	-ve	+ve	-ve	-ve
<i>L. helveticus</i>	4	-ve	-ve	+ve	-ve	+ve	+ve	-ve	-ve	-ve	-ve	-ve	+ve	-ve	-ve
<i>L. vitulinus</i>	8	-ve	-ve	+ve	-ve	+ve	+ve	-ve	-ve	-ve	-ve	+ve	+ve	-ve	+ve
<i>L. lactis</i>	2	+ve	+ve	+ve	-ve	+ve	+ve	-ve	+ve	-ve	+ve	-ve	+ve	-ve	+ve
<i>L. animalis</i>	2	-ve	-ve	+ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve	+ve	+ve	-ve	+ve
<i>L. crispatus</i>	2	-ve	+ve	+ve	-ve	+ve	+ve	-ve	+ve	-ve	+ve	-ve	+ve	-ve	+ve

*+ve- presence, -ve-absence

Table no-2 Antagonistic activity of *L.acidophilus* against selected bacterial pathogens

Gram +ve	Catalogue No.	Gram -ve	Catalogue No.
<i>Bacillus subtilis</i>	MCCB-0064	<i>Escherichia coli</i>	MCCB-0017
<i>Bacillus cereus</i>	MCCB-0005	<i>Salmonella typhi</i>	MCCB-038
<i>Staphylococcus aureus</i>	MCCB-0046	<i>Shigella dysenteriae</i>	MCCB-0043

Table no-3 Antibiotic sensitivity pattern of isolated *L.acidophilus* strain

Strain	Ampicillin	Neomycin	Erythromycin	Penicillin	Nalidixic acid	Tetracycline
LA1	21.5 mm	15.0 mm	18.0 mm	17.5 mm	5.5 mm	19.0 mm
LA2	15.0 mm	15.5 mm	20.5 mm	10.5 mm	0.0 mm	15.5 mm
LA3	16.0 mm	6.0 mm	9.0 mm	15.0 mm	9.0 mm	18.5 mm
LA4	17.0 mm	0.0 mm	20.5 mm	15.0 mm	0.0 mm	29.0 mm
LA5	17.0 mm	15.5 mm	17.5 mm	18.0 mm	5.5 mm	29.5 mm
LA6	28.0 mm	11.5 mm	26.5 mm	20.5 mm	6.5 mm	23.5 mm
LA7	25.0 mm	14.5 mm	23.5 mm	25.0 mm	10.5 mm	17.5 mm

Table no 4 - Anova table of antagonistic activity of *Lactobacillus acidophilus* strains

Source of Variance	d.f	S.S	M.S.S	F (cal)	F (tab) 5%	Result
Due to pathogens	5	437.125	87.42	5.11	2.53	Non significant
Due to isolates	6	182.67	30.44	1.78	2.42	Significant
Due to error	30	513.20	17.10			
Total	41					

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Matrix Representations of Intuitionistic Fuzzy Graphs

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Abstract

Matrices play an important role in the broad area of science and engineering. However, the classical matrix theory sometimes fails to solve the problems involving uncertainties, occurring in an imprecise environment. Sometimes it seems to be more natural to describe imprecise and uncertain opinions not only by membership functions and also by non membership function. In this paper, it is proved that $(CONN_{\mu(G)}(v_i, v_j), CONN_{\nu(G)}(v_i, v_j)) = (i, j)^{th}$ entry of $A + A^2 + \dots + A^{n-1}$, $\forall v_i \neq v_j \in V$, where A is the index matrix of the intuitionistic fuzzy graph G and A^k is the k^{th} power of an intuitionistic fuzzy matrix A and $(CONN_{\mu(G)}(v_i, v_j), CONN_{\nu(G)}(v_i, v_j))$ is the strength of connectedness of v_i and v_j . Also, the properties of subdivision IFG, line IFG and power of an IFG are discussed.

2010 Mathematics Subject Classification: 05C72, 03E72, 03F55.

Index Terms: incidence intuitionistic fuzzy matrix, line intuitionistic fuzzy graph, Power of an intuitionistic fuzzy graph, subdivision intuitionistic fuzzy graph.

I Introduction

Graphs can be sometimes very complicated. So one needs to find more practical ways to represent them. Matrices are a very useful way of studying graphs, since they turn the picture into numbers. Networks can represent all sorts of systems in the real world. As computers are more adept at manipulating numbers than at recognizing pictures, it is standard practice to communicate the specification of a graph to a computer in matrix form. Matrices play an important role in the broad area of science and engineering. However, the classical matrix theory sometimes fails to solve the problems involving uncertainties, occurring in an imprecise environment. Sometimes it seems to be more natural to describe imprecise and uncertain opinions not only by membership functions and also by non membership function. So an Intuitionistic fuzzy matrix is the appropriate choice when exhibiting the membership degree and non-membership degree. In 1975, Rosenfeld [17] discussed the concept of fuzzy graphs whose basic idea was introduced by Kauffmann [12] in 1973. The fuzzy relations between fuzzy sets were also considered by Rosenfeld and he developed the structure of fuzzy graphs, obtaining analogs of several

graph theoretical concepts. The first definition of fuzzy graph was introduced by Kaufman[12] in 1973, based on Zadeh's fuzzy relations in 1971[20]. Atanassov[3][19] introduced the concept of intuitionistic fuzzy(IF) relations and intuitionistic fuzzy graphs(IFGs). M.G.Karunambigai and R.Parvathi[10][14] introduced the concept of IFG elaborately and analysed its components. Atanassov introduced the index matrix representation of intuitionistic fuzzy graphs and discussed its operations in [5][4][6]. Akram et al. discussed the properties of strong intuitionistic fuzzy graphs and also the properties of intuitionistic fuzzy cycle and intuitionistic fuzzy trees in [1][2]. R.Parvathi et al.[16] discussed operations on intuitionistic fuzzy graphs using index matrices. Intuitionistic fuzzy matrix are extensively used for decision making problems, cluster analysis, pattern recognition, medical diagnosis and network problems. Intuitionistic fuzzy matrices can be used whenever uncertainty occurs in a problem. These application motivated us to consider intuitionistic fuzzy matrices and discuss its properties. The paper is organized as follows. In section 2, we review the basic definitions of intuitionistic fuzzy graph. Section 3 deals with the properties of the power of an intuitionistic fuzzy graph and given the relationship between the index matrix of an intuitionistic fuzzy graph and power of an intuitionistic fuzzy graph and section 4 concludes the paper.

II Preliminaries

In this section, the basic definitions and Theorems which are used to prove the forthcoming results are given.

Definition 2.1 [8] *A crisp graph $G^* = (V, E)$ is an ordered triple $(V(G^*), E(G^*), \psi_{G^*})$ consisting of a non-empty $V(G^*)$ of vertices, a set $E(G^*)$, disjoint from $V(G^*)$, of edges and an incidence function ψ_{G^*} that associates with each edge of G^* an unordered pair of vertices of G^* .*

Definition 2.2 [8] *Let $G^* = (V, E)$ be a crisp graph. A walk is a sequence of vertices and edges, where the endpoints of each edge are the preceding and following vertices in the sequence. A path is a walk without repeated vertices. If a walk (resp. trail, path) begins at u and ends at v then it is an $u - v$ walk. A walk is closed if it begins and ends at the same vertex.*

Definition 2.3 [8] *Let $G^* = (V, E)$ be a crisp graph. The length of a path $P = v_1v_2...v_{n+1}$ in G is n .*

Definition 2.4 [8] *Let $G^* = (V, E)$ be a crisp graph. The distance between the two vertices v_i and v_j in G^* is denoted by $d_{G^*}(v_i, v_j)$ and is defined as the minimum length of the path connecting the vertices v_i and v_j .*

Definition 2.5 *A matrix is a rectangular array of numbers arranged in rows and columns. The number of rows and columns that a matrix has, called its dimension or its order. That is, the dimension or order of a matrix with m rows and n columns is $m \times n$. The individual items in a matrix are called its elements or entries.*

Definition 2.6 *Let $A = [a_{ij}]$ and $B = [b_{ij}]$ be two matrices. Then two matrices A and B are equal to each other, if they have the same dimensions $m \times n$ and the same elements $a_{ij} = b_{ij}$ for $i = 1, \dots, n$ and $j = 1, \dots, m$. It is denoted by $A = B$*

Definition 2.7 [10] *An Intuitionistic Fuzzy Graph (IFG) is of the form $G = (V, E)$ said to be a minmax IFG if*

- (1) $V = \{v_1, \dots, v_n\}$ such that $\mu_i : V \rightarrow [0, 1]$ and $\nu_i : V \rightarrow [0, 1]$, denotes the degree of membership and non-membership of an element $v_i \in V$ respectively and $0 \leq \mu_i + \nu_i \leq 1$, for every $v_i \in V$,
- (2) $E \subseteq V \times V$ where $\mu_{ij} : V \times V \rightarrow [0, 1]$ and $\nu_{ij} : V \times V \rightarrow [0, 1]$ are such that
- $$\mu_{ij} \leq \min(\mu_i, \mu_j)$$
- $$\nu_{ij} \leq \max(\nu_i, \nu_j),$$
- denotes the degree of membership and non-membership of an edge $e_{ij} = (v_i, v_j) \in E$ respectively, where, $0 \leq \mu_{ij} + \nu_{ij} \leq 1$, for every $e_{ij} = (v_i, v_j) \in E$. The degree of hesitance(hesitation degree) of the vertex $v_i \in V$ in G is $\Pi_i = 1 - \mu_i - \nu_i$ and the degree of hesitance(hesitation degree) of an edge $e_{ij} = (v_i, v_j) \in E$ in G is $\Pi_{ij} = 1 - \mu_{ij} - \nu_{ij}$.

Definition 2.8 [10] Let $G = (V, E)$ be an intuitionistic fuzzy graph. A walk is a sequence of vertices and edges, where the endpoints of each edge are the preceding and following vertices in the sequence, such that either one of the following conditions is satisfied.

- 1) $\mu_{ij} > 0$ & $\nu_{ij} = 0$ for some i & j . 2) $\mu_{ij} > 0$ & $\nu_{ij} > 0$ for some i & j . If a walk begins at v_i and ends at v_j then it is an $v_i - v_j$ walk. A walk is closed if it begins and ends at the same vertex.

Definition 2.9 [10] Let $G = (V, E)$ be an intuitionistic fuzzy graph. A path P in an intuitionistic fuzzy graph G is a sequence of distinct vertices v_1, v_2, \dots, v_n such that either one of the following conditions is satisfied.

- 1) $\mu_{ij} > 0$ & $\nu_{ij} = 0$ for some i & j . 2) $\mu_{ij} > 0$ & $\nu_{ij} > 0$ for some i & j .

Definition 2.10 [10] Let $G = (V, E)$ be an intuitionistic fuzzy graph. The length of a path $P = v_1 v_2 \dots v_{n+1}$ ($n > 0$) in G is n .

Definition 2.11 [10] An intuitionistic fuzzy graph $G = (V, E)$ is connected if any two vertices are joined by a path.

Definition 2.12 [10] Let $G = (V, E)$ be an intuitionistic fuzzy graph. The μ - strength of a path $P = v_1 v_2 \dots v_n$ in an intuitionistic fuzzy graph G is denoted by $S_{\mu(G)}(P)$ and is defined as $\min\{\mu_{ij}\}$, for all $i, j = 1, 2, \dots, n$

Definition 2.13 [10] Let $G = (V, E)$ be an intuitionistic fuzzy graph. The ν - strength of a path $P = v_1 v_2 \dots v_n$ in an intuitionistic fuzzy graph G is denoted by $S_{\nu(G)}(P)$ and is defined as $\max\{\nu_{ij}\}$, for all $i, j = 1, 2, \dots, n$

Definition 2.14 [10] If $v_i, v_j \in V \subseteq G$, the μ - strength of connectedness between the vertices v_i and v_j in G is $CONN_{\mu(G)}(v_i, v_j) = \max\{S_{\mu(G)}(P)\}$ and ν - strength of connectedness between the vertices v_i and v_j in G is $CONN_{\nu(G)}(v_i, v_j) = \min\{S_{\nu(G)}(P)\}$ for all possible paths between v_i and v_j .

Definition 2.15 [10] An intuitionistic fuzzy graph, $G = (V, E)$ is said to be a strong intuitionistic fuzzy graph if

$$\mu_{ij} = \min(\mu_i, \mu_j) \text{ and } \nu_{ij} = \max(\nu_i, \nu_j), \forall (v_i, v_j) \in E.$$

Definition 2.16 [10] An intuitionistic fuzzy graph, $G = (V, E)$ is said to be a complete intuitionistic fuzzy graph if

$$\mu_{ij} = \min(\mu_i, \mu_j) \text{ and } \nu_{ij} = \max(\nu_i, \nu_j), \forall v_i, v_j \in V.$$

Definition 2.17 [13] *The order of an intuitionistic fuzzy graph $G = (V, E)$ is defined as $O(G) = (O_\mu(G), O_\nu(G))$ where*

$$O_\mu(G) = \sum_{v_i \in V} \mu_i \text{ and } O_\nu(G) = \sum_{v_i \in V} \nu_i$$

Definition 2.18 [13] *The size of an intuitionistic fuzzy graph is defined as $S(G) = (S_\mu(G), S_\nu(G))$*

$$S_\mu(G) = \sum_{e_{ij} \in E} \mu_{ij} \text{ and } S_\nu(G) = \sum_{e_{ij} \in E} \nu_{ij}$$

Definition 2.19 [13] *Let $G = (V, E)$ be an intuitionistic fuzzy graph. The neighbourhood of a vertex $v_i \in V$ is denoted by $N_G(v_i)$ and is defined as $N_G(v_i) = \{v_j \in V | (v_i, v_j) \in E\}$.*

Definition 2.20 *The function $f : X \rightarrow Y$ is an one to one function if and only if for every element $y \in Y$ there is exactly one element $x \in X$. In Symbol, $f(x) = f(y) \Rightarrow x = y, \forall x, y \in X$.*

Definition 2.21 *The function $f : X \rightarrow Y$ is an onto function if and only if for every element $y \in Y$ there is at least one element $x \in X$. In Symbol, $f(x) = y, \forall y \in Y$.*

Definition 2.22 *A function $f : X \rightarrow Y$ is a bijection if the function is both one-one and onto mapping of a set X to a set Y .*

Definition 2.23 [11] *A homomorphism from a intuitionistic fuzzy graph $G_1 = (V_1, E_1)$ to a intuitionistic fuzzy graph $G_2 = (V_2, E_2)$, written $f : G_1 \rightarrow G_2$, is a mapping $f : V_1 \rightarrow V_2$ from the vertex set of G_1 to the vertex set of G_2 such that if any two vertices $v_i, v_j \in V_1$ are adjacent in G_1 , then $f(v_i), f(v_j) \in V_2$ are adjacent in G_2 and*

$$\mu(v_i) \leq \mu'(f(v_i)) \text{ and } \nu(v_i) \geq \nu'(f(v_i)), \forall v_i \in V_1$$

$$\mu(v_i, v_j) \leq \mu'(f(v_i), f(v_j)) \text{ and } \nu(v_i, v_j) \geq \nu'(f(v_i), f(v_j)), \forall v_i, v_j \in V_1.$$

Definition 2.24 [11] *Two intuitionistic fuzzy graphs $G_1 = (V_1, E_1)$ and $G_2 = (V_2, E_2)$ are said to be isomorphic if there is a bijections $f : V_1 \rightarrow V_2$ such that any two vertices $v_i, v_j \in V_1$ are adjacent in G_1 if and only if $f(v_i), f(v_j) \in V_2$ are adjacent in G_2 and*

$$\mu(v_i) = \mu'(f(v_i)) \text{ and } \nu(v_i) = \nu'(f(v_i)), \forall v_i \in V_1$$

$$\mu(v_i, v_j) = \mu'(f(v_i), f(v_j)) \text{ and } \nu(v_i, v_j) = \nu'(f(v_i), f(v_j)), \forall v_i, v_j \in V_1.$$

Definition 2.25 [11] *Two intuitionistic fuzzy graphs $G_1 = (V_1, E_1)$ and $G_2 = (V_2, E_2)$ are said to be co-weak isomorphic if there is a bijections $f : V_1 \rightarrow V_2$ such that any two vertices $v_i, v_j \in V_1$ are adjacent in G_1 if and only if $f(v_i), f(v_j) \in V_2$ are adjacent in G_2 and*

$$\mu(v_i) \leq \mu'(f(v_i)) \text{ and } \nu(v_i) \geq \nu'(f(v_i)), \forall v_i \in V_1$$

$$\mu(v_i, v_j) = \mu'(f(v_i), f(v_j)) \text{ and } \nu(v_i, v_j) = \nu'(f(v_i), f(v_j)), \forall v_i, v_j \in V_1$$

Definition 2.26 [9] Let $G_1 = (V_1, E_1)$ and $G_2 = (V_2, E_2)$ be two IFGs with $V_1 \cap V_2 \neq \phi$. Then the union of G_1 and G_2 is an IFG, denoted by $G_1 \cup G_2 = (V_1 \cup V_2, E_1 \cup E_2)$ and is defined as

$$((\mu \cup \mu')(v_i), (\nu \cup \nu')(v_i)) = \begin{cases} (\mu_i, \nu_i), & \text{if } v_i \in V_1 - V_2, \\ (\mu'_i, \nu'_i), & \text{if } v_i \in V_2 - V_1, \\ (\max(\mu_i, \mu'_i), \min(\nu_i, \nu'_i)) & \text{if } v_i \in V_1 \cap V_2. \end{cases}$$

$$(\mu \cup \mu')(v_i, v_j) = \begin{cases} \mu_{ij} & \text{if } e_{ij} \in E_1 - E_2, \\ \mu_{ij}' & \text{if } e_{ij} \in E_2 - E_1, \\ \max(\mu_{ij}, \mu'_{ij}) & \text{if } e_{ij} \in E_1 \cap E_2, \\ \min((\mu_i \cup \mu'_i), \max(\mu_j, \mu'_j)) & \text{if } v_i \in V_1 - V_2, \\ & v_j \in V_1 \cap V_2 \text{ and} \\ & e_{ij} \in E_1 - E_2 \\ & \text{or } e_{ij} \in E_2 - E_1, \\ (0, 1) & \text{otherwise.} \end{cases}$$

$$(\nu \cup \nu')(v_i, v_j) = \begin{cases} \nu_{ij} & \text{if } e_{ij} \in E_1 - E_2, \\ \nu_{ij}' & \text{if } e_{ij} \in E_2 - E_1, \\ \min((\nu_i \cup \nu'_i), (\nu_j \cup \nu'_j)) & \text{if } e_{ij} \in E_1 \cap E_2, \\ \max((\nu_i \cup \nu'_i), \min(\nu_j, \nu'_j)) & \text{if } v_i \in V_1 - V_2, \\ & v_j \in V_1 \cap V_2 \text{ and} \\ & e_{ij} \in E_1 - E_2 \\ & \text{or } e_{ij} \in E_2 - E_1, \\ (0, 1) & \text{otherwise.} \end{cases}$$

Definition 2.27 [15] An intuitionistic fuzzy matrix(IFM) is a matrix of order $m \times n$ and is defined as $A = \{ \langle a_{\mu_{ij}}, a_{\nu_{ij}} \rangle \}_{m \times n}$, where $a_{\mu_{ij}} \in [0, 1]$, $a_{\nu_{ij}} \in [0, 1]$ such that $0 \leq a_{\mu_{ij}} + a_{\nu_{ij}} \leq 1$, $1 \leq i \leq m$

and $1 \leq j \leq n$. It can also be represented in the matrix form,

$$A = \{ \langle a_{\mu_{ij}}, a_{\nu_{ij}} \rangle \}_{m \times n} = \begin{pmatrix} \langle a_{\mu_{11}}, a_{\nu_{11}} \rangle & \langle a_{\mu_{12}}, a_{\nu_{12}} \rangle & \dots & \langle a_{\mu_{1n}}, a_{\nu_{1n}} \rangle \\ \langle a_{\mu_{21}}, a_{\nu_{21}} \rangle & \langle a_{\mu_{22}}, a_{\nu_{22}} \rangle & \dots & \langle a_{\mu_{2n}}, a_{\nu_{2n}} \rangle \\ \dots & \dots & \dots & \dots \\ \langle a_{\mu_{m1}}, a_{\nu_{m1}} \rangle & \langle a_{\mu_{m2}}, a_{\nu_{m2}} \rangle & \dots & \langle a_{\mu_{mn}}, a_{\nu_{mn}} \rangle \end{pmatrix}$$

Definition 2.28 The number of rows and columns that IF matrix has called its dimension or its order. That is, the dimension or order of IF matrix with m rows and n columns is $m \times n$. The individual items in an IF matrix are called its elements or entries.

Definition 2.29 [15] Let $A = \{ \langle a_{\mu_{ij}}, a_{\nu_{ij}} \rangle \}_{m \times n}$ be a intuitionistic fuzzy matrix. The transpose of the matrix A is denoted by A^T and is defined as $A^T = \{ \langle a_{\mu_{ji}}, a_{\nu_{ji}} \rangle \}_{n \times m}$.

Definition 2.30 Let $A = \{ \langle a_{\mu_{ij}}, a_{\nu_{ij}} \rangle \}_{m \times n}$ and $B = \{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \}_{m \times n}$ be two intuitionistic fuzzy matrices. Then two IF matrices A and B are equal to each other, if they have the same dimensions $m \times n$ and the same elements $a_{\mu_{ij}} = b_{\mu_{ij}}, a_{\nu_{ij}} = b_{\nu_{ij}}$ for $i = 1, \dots, m$ and $j = 1, \dots, n$. It is denoted by $A = B$

Definition 2.31 Let $A = \{ \langle a_{\mu_{ij}}, a_{\nu_{ij}} \rangle \}_{m \times n}$ and $B = \{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \}_{m \times n}$ be two intuitionistic fuzzy matrices, then the sum of A and B is denoted by $A +_{\max - \min} B$, is defined as $A +_{\max - \min} B = \{ \langle c_{\mu_{ij}}, c_{\nu_{ij}} \rangle \}_{m \times n} = [\langle \max(a_{\mu_{ij}}, b_{\mu_{ij}}), \min(a_{\nu_{ij}}, b_{\nu_{ij}}) \rangle]$, $1 \leq i \leq m, 1 \leq j \leq n$.

Notation 2.1 Throughout this paper, we denote $''+''_{\max - \min}$ as $''+''$.

Theorem 2.2 [8] If a crisp graph G^* contains a $u - v$ walk of length l , then G^* contains a $u - v$ path of length l .

Theorem 2.3 [8] Let G^* be a crisp graph. Then G^* is connected if and only if every pair of vertices in G^* is connected.

III Matrix Representations of Intuitionistic Fuzzy Graphs

In this section, the properties of the power of an intuitionistic fuzzy graph and the relationship between the index matrix of an intuitionistic fuzzy graph and power of an intuitionistic fuzzy graph have been analysed.

Definition 3.32 Let $A = \{ \langle a_{\mu_{ij}}, a_{\nu_{ij}} \rangle \}_{m \times n}$ and $B = \{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \}_{n \times p}$ be two intuitionistic fuzzy matrices. Then the two types of product of A and B are defined as

1) $\max - \min$ product of IF matrices : $A \bullet_{\max - \min} B = \{ \langle c_{\mu_{ij}}, c_{\nu_{ij}} \rangle \}_{m \times p} = [\langle \max(\min(a_{\mu_{ij}}, b_{\mu_{jk}})), \min(\max(a_{\nu_{ij}}, b_{\nu_{jk}})) \rangle]$, $1 \leq i \leq m, 1 \leq j \leq p, 1 \leq k \leq n$ and

2) $\min - \max$ product of IF matrices: $A \bullet_{\min - \max} B = \{ \langle c_{\mu_{ij}}, c_{\nu_{ij}} \rangle \}_{m \times p} = [\langle \min(\max(a_{\mu_{ij}}, b_{\mu_{jk}})), \max(\min(a_{\nu_{ij}}, b_{\nu_{jk}})) \rangle]$, $1 \leq i \leq m, 1 \leq j \leq p, 1 \leq k \leq n$.

Definition 3.33 Let $A = \{ \langle a_{\mu_{ij}}, a_{\nu_{ij}} \rangle \}_{m \times n}$ be intuitionistic fuzzy matrix and k is a positive integer. Then the k^{th} power of an intuitionistic fuzzy matrix is denoted by A^k and is defined as max – min product of k –copies of an intuitionistic fuzzy matrix A .

Definition 3.34 [5] Let $G = (V, E)$ be an intuitionistic fuzzy graph. The index matrix representation of intuitionistic fuzzy graph(IMIFG) is of the form $[V, E \subset V \times V]$ where $V = \{v_1, v_2, \dots, v_n\}$ and

$$E = \{ \langle \mu_{ij}, \nu_{ij} \rangle \}_{m \times n} = \begin{matrix} & v_1 & v_2 & \dots & v_n \\ \begin{matrix} v_1 \\ v_2 \\ \vdots \\ v_n \end{matrix} & \left(\begin{array}{cccc} \langle \mu_{11}, \nu_{11} \rangle & \langle \mu_{12}, \nu_{12} \rangle & \dots & \langle \mu_{1n}, \nu_{1n} \rangle \\ \langle \mu_{21}, \nu_{21} \rangle & \langle \mu_{22}, \nu_{22} \rangle & \dots & \langle \mu_{2n}, \nu_{2n} \rangle \\ \dots & & & \\ \langle \mu_{n1}, \nu_{n1} \rangle & \langle \mu_{n2}, \nu_{n2} \rangle & \dots & \langle \mu_{nn}, \nu_{nn} \rangle \end{array} \right) \end{matrix}$$

where $\langle \mu_{ij}, \nu_{ij} \rangle \in [0, 1] \times [0, 1] (1 \leq i, j \leq n)$, the edge between two vertices v_i and v_j is indexed by $\langle \mu_{ij}, \nu_{ij} \rangle$.

Note 3.4 Index matrix representation of any intuitionistic fuzzy graph is an intuitionistic fuzzy matrix.

Definition 3.35 Let $G = (V, E)$ be an intuitionistic fuzzy graph where $V = \{v_1, v_2, \dots, v_n\}$. The incidence matrix of an intuitionistic fuzzy graph G is $B = \{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \}_{n \times m}$, where n and m represents the number of vertices and number of edges of G respectively, whose entries of B are as follows:

$$B = \{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \}_{n \times m} = \begin{cases} \langle \mu(e_j), \nu(e_j) \rangle, \text{ if an edge } e_j \text{ is incident on the vertex } v_i \\ \langle 0, 1 \rangle, \text{ otherwise} \end{cases}$$

It can also be represented in the matrix form,

$$B = \{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \}_{n \times m} = \begin{matrix} & e_1 & e_2 & \dots & e_n \\ \begin{matrix} v_1 \\ v_2 \\ \vdots \\ v_n \end{matrix} & \left(\begin{array}{cccc} \langle \mu(e_1), \nu(e_1) \rangle & \langle \mu(e_2), \nu(e_2) \rangle & \dots & \langle \mu(e_n), \nu(e_n) \rangle \\ \langle \mu(e_1), \nu(e_1) \rangle & \langle \mu(e_2), \nu(e_2) \rangle & \dots & \langle \mu(e_n), \nu(e_n) \rangle \\ \dots & & & \\ \langle \mu(e_1), \nu(e_1) \rangle & \langle \mu(e_2), \nu(e_2) \rangle & \dots & \langle \mu(e_n), \nu(e_n) \rangle \end{array} \right) \end{matrix}$$

where $\langle \mu(e_j), \nu(e_j) \rangle \in [0, 1] \times [0, 1]$.

Definition 3.36 Let $G = (V, E)$ be an intuitionistic fuzzy graph, where $V = \{v_1, v_2, \dots, v_n\}$ and $E = \{e_1, e_2, \dots, e_k\}$. Then the line intuitionistic fuzzy graph is denoted by $G_L = (V_L, E_L)$, where the vertices of G_L are in one-one correspondence with the edges of G and there exist an edge between the vertices of G_L if and only if the corresponding edges of G are adjacent. The membership and non-membership value of V_L and E_L are defined as follows:

$$\mu_L(v_i) = \mu(e_i) \text{ and } \nu_L(v_i) = \nu(e_i), \forall e_i \in E.$$

$$\mu_L(v_i, v_j) = \begin{cases} \min(\mu_L(v_i), \mu_L(v_j)), & \text{if } e_i \text{ and } e_j \text{ are adjacent in } G \\ (0, 1), & \text{otherwise} \end{cases}$$

$$\nu_L(v_i, v_j) = \begin{cases} \max(\nu_L(v_i), \nu_L(v_j)), & \text{if } e_i \text{ and } e_j \text{ are adjacent in } G \\ (0, 1), & \text{otherwise} \end{cases}$$

Example 3.1 Consider an intuitionistic fuzzy graph, $G = (V, E)$, such that $V = \{v_1, v_2, v_3, v_4\}$, $E = \{(v_1, v_2), (v_1, v_3), (v_2, v_3), (v_3, v_4), (v_4, v_1)\}$ and $V_L = \{v_{12}, v_{23}, v_{34}, v_{14}, v_{13}\}$ and $E_L = \{(v_{12}, v_{23}), (v_{23}, v_{34}), (v_{34}, v_{14}), (v_{14}, v_{12}), (v_{12}, v_{13}), (v_{14}, v_{13}), (v_{13}, v_{23}), (v_{13}, v_{34})\}$

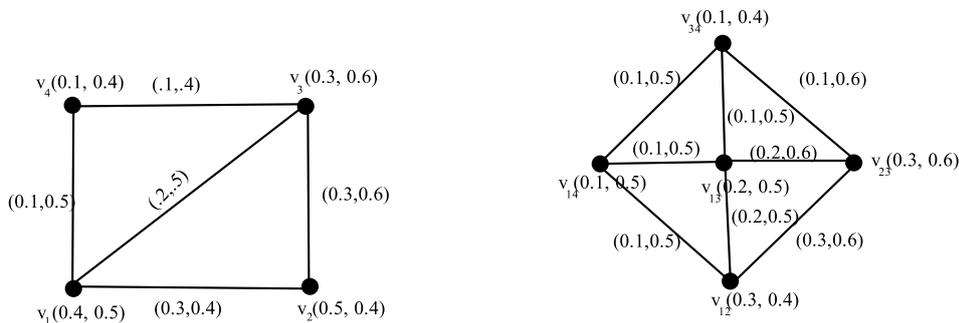


Figure 1: G and G_L

Definition 3.37 Let $G = (V, E)$ be an intuitionistic fuzzy graph with the underlying crisp graph $G^* = (V, E)$. Then the subdivision of an intuitionistic fuzzy graph G is denoted by $G_{sd} = (V_{sd}, E_{sd})$ and is obtained by adding a new vertex u_k into every edge $e_{ij} = (v_i, v_j) \in E$ of G such that the membership and the non-membership of the vertex v_k and the edges $v_i u_k$ and $u_k v_j$ are defined as follows:

$$\mu_{sd}(u_k) = \mu_{ij} \text{ and } \nu_{sd}(u_k) = \nu_{ij}, \forall u_k \in V_{sd}$$

$$\mu_{sd}(v_i, u_k) \leq \min(\mu_{sd}(v_i), \mu_{sd}(u_k)) \text{ and } \nu_{sd}(v_i, u_k) \leq \max(\nu_{sd}(v_i), \nu_{sd}(u_k))$$

$$\mu_{sd}(u_k, v_j) \leq \min(\mu_{sd}(u_k), \mu_{sd}(v_j)) \text{ and } \nu_{sd}(u_k, v_j) \leq \max(\nu_{sd}(u_k), \nu_{sd}(v_j)), \forall v_i, v_j, u_k \in V_{sd}.$$

Example 3.2 Consider an intuitionistic fuzzy graph, $G = (V, E)$, such that $V = \{v_1, v_2, v_3, v_4, v_5\}$, $E = \{(v_1, v_2), (v_1, v_5), (v_2, v_3), (v_2, v_4), (v_3, v_4), (v_4, v_5)\}$ and $V_{sd} = \{v_1, v_2, v_3, v_4, v_5, u_1, u_2, u_3, u_4, u_5\}$ and $E_{sd} = \{(v_1, u_1), (u_1, v_2), (v_2, u_2), (u_2, v_3), (v_3, u_3), (u_3, v_4), (v_4, u_4), (u_4, v_5), (v_5, u_5), (u_5, v_1)\}$

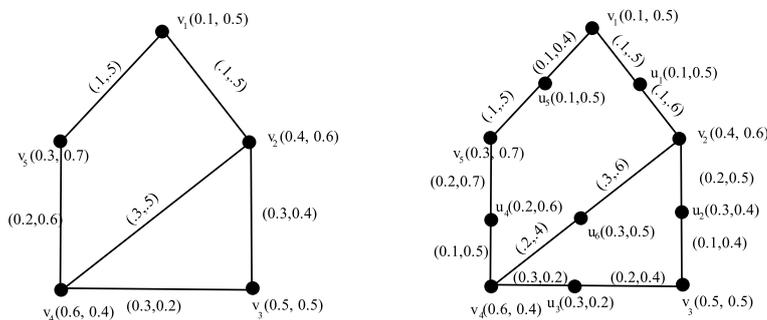


Figure 2: G and G_{sd}

Definition 3.38 Let $G = (V, E)$ be an intuitionistic fuzzy graph with the underlying crisp graph $G^* = (V, E)$ where $V = \{v_1, v_2, \dots, v_n\}$. Then the power of an intuitionistic fuzzy graph G is denoted by, $G^k = (V^k, E^k)$, where $V^k = V$ and the vertices v_i and v_j are adjacent in G^k if and only if $d_{G^*}(v_i, v_j) \leq k$ (Refer Definition 1.4). The membership and non-membership values of the edges of G^k are defined as follows:

$$(\mu^k(v_i, v_j), \nu^k(v_i, v_j)) = \begin{cases} (\min(\mu_i, \mu_j), \max(\nu_i, \nu_j)), & \text{if } d_{G^*}(v_i, v_j) \leq k \\ (0, 1), & \text{otherwise} \end{cases}$$

Example 3.3 Consider an intuitionistic fuzzy graph, $G = (V, E)$, such that $V = \{v_1, v_2, v_3, v_4, v_5\}$, $E = \{(v_1, v_2), (v_2, v_3), (v_3, v_4), (v_4, v_5)\}$, $E^2 = \{(v_1, v_2), (v_2, v_3), (v_3, v_4), (v_4, v_5), (v_1, v_3), (v_3, v_5), (v_2, v_4), (v_4, v_1)\}$, $E^3 = \{(v_1, v_2), (v_2, v_3), (v_3, v_4), (v_4, v_5), (v_1, v_3), (v_3, v_5), (v_2, v_4), (v_1, v_4), (v_2, v_5)\}$ and $E^4 = \{(v_1, v_2), (v_2, v_3), (v_3, v_4), (v_4, v_5), (v_1, v_3), (v_3, v_5), (v_2, v_4), (v_1, v_4), (v_2, v_5), (v_1, v_5)\}$

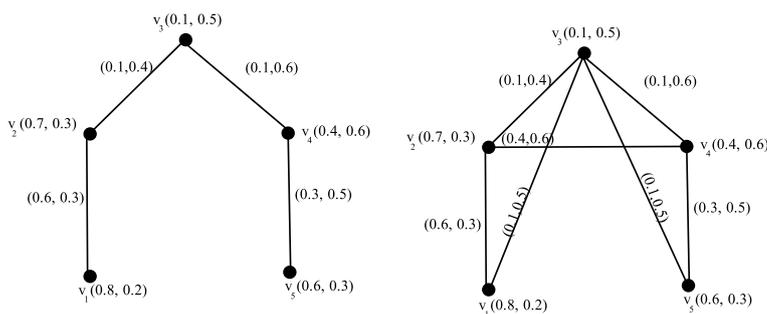


Figure 3: G and G^2

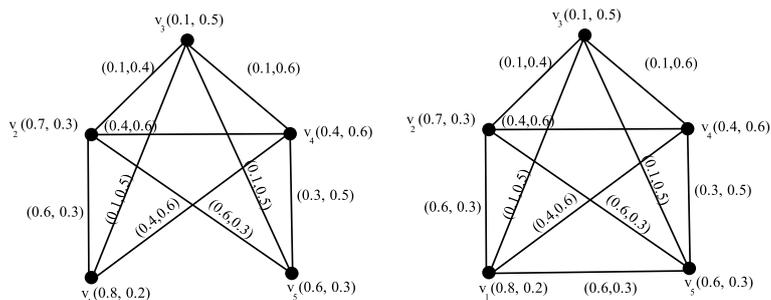


Figure 4: G^3 and G^4

It can also be represented in the matrix form,

$$(i, j)^{th} \text{ entry of } A = \begin{matrix} & v_1 & v_2 & v_3 & v_4 & v_5 \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \\ v_5 \end{matrix} & \begin{bmatrix} \langle 0, 1 \rangle & \langle .6, .3 \rangle & \langle 0, 1 \rangle & \langle 0, 1 \rangle & \langle 0, 1 \rangle \\ \langle .6, .3 \rangle & \langle 0, 1 \rangle & \langle .1, .4 \rangle & \langle 0, 1 \rangle & \langle 0, 1 \rangle \\ \langle 0, 1 \rangle & \langle .1, .4 \rangle & \langle 0, 1 \rangle & \langle .1, .6 \rangle & \langle 0, 1 \rangle \\ \langle 0, 1 \rangle & \langle 0, 1 \rangle & \langle .1, .6 \rangle & \langle 0, 1 \rangle & \langle .3, .5 \rangle \\ \langle 0, 1 \rangle & \langle 0, 1 \rangle & \langle 0, 1 \rangle & \langle .3, .5 \rangle & \langle 0, 1 \rangle \end{bmatrix} \end{matrix}$$

$$(i, j)^{th} \text{ entry of } A^2 = \begin{matrix} & v_1 & v_2 & v_3 & v_4 & v_5 \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \\ v_5 \end{matrix} & \begin{bmatrix} \langle .6, .3 \rangle & \langle 0, 1 \rangle & \langle .1, .4 \rangle & \langle 0, 1 \rangle & \langle 0, 1 \rangle \\ \langle 0, 1 \rangle & \langle .6, .3 \rangle & \langle 0, 1 \rangle & \langle .1, .6 \rangle & \langle 0, 1 \rangle \\ \langle .1, .4 \rangle & \langle 0, 1 \rangle & \langle .1, .4 \rangle & \langle 0, 1 \rangle & \langle .1, .6 \rangle \\ \langle 0, 1 \rangle & \langle .1, .6 \rangle & \langle 0, 1 \rangle & \langle .3, .5 \rangle & \langle 0, 1 \rangle \\ \langle 0, 1 \rangle & \langle 0, 1 \rangle & \langle .1, .6 \rangle & \langle 0, 1 \rangle & \langle .3, .5 \rangle \end{bmatrix} \end{matrix}$$

Theorem 3.5 Let $G = (V, E)$ be a intuitionistic fuzzy graph. If an intuitionistic fuzzy graph G contains a $u - v$ walk of length l , then G contains a $u - v$ path of length l .

Proof. Proof follows from the Definition 1.8 and Theorem 2.2. ■

Theorem 3.6 Let $G = (V, E)$ be a strong intuitionistic fuzzy graph and $G_{sd} = (V_{sd}, E_{sd})$ be the subdivision

of an intuitionistic fuzzy graph G . Then $S_\mu(G_{sd}) \leq 2S_\mu(G)$ and $S_\nu(G_{sd}) \leq 2S_\nu(G)$, where S_μ and S_ν are size of G .

Proof. Let $G = (V, E)$ be a strong intuitionistic fuzzy graph and $G_{sd} = (V_{sd}, E_{sd})$ be the subdivision of an intuitionistic fuzzy graph G . The size of G is $S(G) = (S_\mu(G), S_\nu(G))$, where Consider,

$$\begin{aligned} S_\mu(G_{sd}) &= \sum_{e_{ik}, e_{kj} \in E_{sd}} (\mu_{sd}(e_{ik}) + \mu_{sd}(e_{kj})), \\ &\leq \sum \mu_{sd}(v_k) + \sum \mu_{sd}(v_k), \text{ since } G \text{ is strong} \\ &\leq \sum \mu_{ij} + \sum \mu_{ij}, \text{ since by Definition 1.37} \\ &\leq 2 \sum \mu_{ij} \\ &\leq 2S_\mu(G). \end{aligned}$$

and

$$\begin{aligned} S_\nu(G_{sd}) &= \sum_{e_{ik}, e_{kj} \in E_{sd}} (\nu_{sd}(e_{ik}) + \nu_{sd}(e_{kj})) \\ &\leq \sum \nu_{sd}(v_k) + \sum \nu_{sd}(v_k), \text{ since } G \text{ is strong} \\ &\leq \sum \nu_{ij} + \sum \nu_{ij}, \text{ since by Definition 1.37} \\ &\leq 2 \sum \nu_{ij} \\ &\leq 2S_\nu(G). \end{aligned}$$

■

Theorem 3.7 Let $G_1 = (V_1, E_1)$ and $G_2 = (V_2, E_2)$ be two strong IFGs. Then $A(G_1 \cup G_2) = A(G_1) + A(G_2)$ if and only if $V_1 = V_2$.

Proof. Let us assume that $A(G_1 \cup G_2) = A(G_1) + A(G_2)$. Suppose that G_1 and G_2 are having different vertex set and let $V_1 = \{v_1, v_2, \dots, v_m\}$ and $V_2 = \{u_1, u_2, \dots, u_n\}$, where $v_i \neq u_j, i = 1, 2, \dots, m, j = 1, 2, \dots, n, \forall i$ and j

Case(i): Let $m \neq n$. Then $V(G_1 \cup G_2) = \{v_1, v_2, \dots, v_m, u_1, u_2, \dots, u_n\}$ and the order of the IF matrix $A(G_1 \cup G_2) = m + n \times m + n$. But the order of the IF matrix $A(G_1) = m \times m$ and the order of the IF matrix $A(G_2) = n \times n$. Therefore $A(G_1) + A(G_2)$ is not possible, since by Definition 1.31, the order of the matrices $A(G_1)$ and $A(G_2)$ are not equal. Hence by Definition 1.30, $A(G_1 \cup G_2) \neq A(G_1) + A(G_2)$, which is a contradiction to our assumption that $A(G_1 \cup G_2) = A(G_1) + A(G_2)$. Hence $V_1 = V_2$.

Case(ii): Let $m = n$. Then $V(G_1 \cup G_2) = V_1 \cup V_2 = \{v_1, v_2, \dots, v_m, u_1, u_2, \dots, u_m\}$ and the order of the matrix $A(G_1 \cup G_2) = 2m \times 2m$. But the order of the IF matrix $A(G_1) = m \times m, A(G_2) = m \times m$. Therefore the order of the IF matrix $A(G_1) + A(G_2) = m \times m \neq A(G_1 \cup G_2)$, which is contradiction to our assumption that $A(G_1 \cup G_2) = A(G_1) + A(G_2)$. Hence $V_1 = V_2$.

Conversely, Let us assume that $V_1 = V_2$. and let $V_1 = \{v_1, v_2, \dots, v_m\}$ and $V_2 = \{v_1, v_2, \dots, v_m\}$. Then the order of IF matrix $A(G_1 \cup G_2) = m \times m = A(G_1) + A(G_2)$. Next, in order to prove the entries of the IF matrix $A(G_1 \cup G_2) =$ the entries of the IF matrix $A(G_1) + A(G_2)$, we need to consider the following three subcases:

Subcase(i): Let $(v_i, v_j) \in E_1 \cap E_2$

By Definition 1.26 ,

$$\begin{aligned}
 (\mu \cup \mu')(v_i, v_j) &= \max(\mu_{ij}, \mu'_{ij}) \\
 (\nu \cup \nu')(v_i, v_j) &= \min((\nu_i \cup \nu'_i), (\nu_j \cup \nu'_j)) \\
 &= \min(\min(\nu_i, \nu'_i), \min(\nu_j, \nu'_j)) \\
 &= \min(\min(\nu_i, \nu'_i), \min(\nu'_i, \nu'_j)), \text{ Since } G_1 \text{ \& } G_2 \text{ are strong IFGs} \\
 (\nu \cup \nu')(v_i, v_j) &= \min(\nu_{ij}, \nu'_{ij})
 \end{aligned}$$

Therefore, $(i, j)^{th}$ entry of

$$A(G_1 \cup G_2) = (\max(\mu_{ij}, \mu'_{ij}), \min(\nu_{ij}, \nu'_{ij})) \tag{1}$$

By Definition 1.31 and 1.34, $(i, j)^{th}$ entry of

$$A(G_1) + A(G_2) = (\max(\mu_{ij}, \mu'_{ij}), \min(\nu_{ij}, \nu'_{ij})) \tag{2}$$

From Equation (1) and (2), $(i, j)^{th}$ entry of $A(G_1 \cup G_2) = (i, j)^{th}$ entry of $A(G_1) + A(G_2)$

Subcase(ii): Let $e_{ij} \in E_1 - E_2$. Then by Definition 1.26, $(\mu \cup \mu')(v_i, v_j) = \mu_{ij}$ and $(\nu \cup \nu')(v_i, v_j) = \nu_{ij}$. Therefore, $(i, j)^{th}$ entry of

$$A(G_1 \cup G_2) = (\mu_{ij}, \nu_{ij}) \tag{3}$$

If $e_{ij} \in E_1$, then $(\mu_{ij}, \nu_{ij}) \neq (0, 1)$ and if $e_{ij} \notin E_2$, then $(\mu'_{ij}, \nu'_{ij}) = (0, 1)$.

Therefore, $(i, j)^{th}$ entry of

$$A(G_1) + A(G_2) = (\max(\mu_{ij}, \mu'_{ij}), \min(\nu_{ij}, \nu'_{ij})) = (\mu_{ij}, \nu_{ij}) \tag{4}$$

From Equation (3) and (4), $(i, j)^{th}$ entry of $A(G_1 \cup G_2) = (i, j)^{th}$ entry of $A(G_1) + A(G_2)$.

Subcase(iii): Let $e_{ij} \in E_2 - E_1$. Then proof follows from the Subcase(ii) by replacing E_1 by E_2 and E_2 by E_1 . Hence, from the Subcases (i) – (iii), it follows that $(i, j)^{th}$ entry of $A(G_1 \cup G_2) = (i, j)^{th}$ entry of $A(G_1) + A(G_2)$.

Theorem 3.8 Let $G = (V, E)$ be an IFG and let $A = \{ \langle \mu_{ij}, \nu_{ij} \rangle \}$ be the index matrix of G . Then for each positive integer k , the

$$(i, j)^{th} \text{ entry of } A^k = \text{ strength of connectedness of } v_i - v_j \text{ walks of length } k. \tag{5}$$

Proof. Let $G = (V, E)$ be an IFG and let $A = \{ \langle \mu_{ij}, \nu_{ij} \rangle \}$ be the index matrix of G and the vertex set $V = \{v_1, v_2, \dots, v_n\}$. Let $A^k = \{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \}$ be the k^{th} power of the IF matrix A . Let us prove the Equation (1) by mathematical induction method on the power of A .

Initial Step: Let $k = 1$, then $A^k = A$. Then $A = \{ \langle \mu_{ij}, \nu_{ij} \rangle \}$, where μ_{ij} is μ - strength of connectedness of (v_i, v_j) walk of length 1 and ν_{ij} is ν - strength of connectedness of (v_i, v_j) walk of length 1 = $(CONN_{\mu(G)}(v_i, v_j), CONN_{\nu(G)}(v_i, v_j))$, where (v_i, v_j) is $v_i - v_j$ walk of length 1.

Inductive Step: Assume that the result is true for k . By the inductive hypothesis, $(i, j)^{th}$ entry of $A^k = (CONN_{\mu(G)}(v_i, v_j), CONN_{\nu(G)}(v_i, v_j))$, where (v_i, v_j) is $v_i - v_j$ walk of length k . Next we have to prove the result for $k + 1$.

$$(i, j)^{th} \text{ entry of } A^{k+1} = (i, j)^{th} \text{ entry}$$

of A^k $\bullet_{\max - \min}$ $(i, j)^{th}$ entry of $A = (\bigvee_{l=1}^n (a_{\mu_{il}} \wedge b_{\nu_{lj}}), \bigwedge_{l=1}^n (a_{\nu_{il}} \vee b_{\mu_{lj}})) = (\max(\min(\text{CONN}_{\mu(G)}(v_i, v_l), \text{CONN}_{\mu(G)}(v_l, v_j))), \min(\max(\text{CONN}_{\nu(G)}(v_i, v_l), \text{CONN}_{\nu(G)}(v_l, v_j))))$, where (v_i, v_l) is $v_i - v_l$ walk of length k and (v_l, v_j) is $v_l - v_j$ walk of length $1 = (\text{CONN}_{\mu(G)}(v_i, v_j), \text{CONN}_{\nu(G)}(v_i, v_j))$, where (v_i, v_j) is $v_i - v_j$ walks of length $k + 1, \forall v_l \in V$. Hence the result is true for every k . That is, $(i, j)^{th}$ entry of $A^k =$ strength of connectedness of $v_i - v_j$ walks of length k . ■

Theorem 3.9 Let $G = (V, E)$ be an intuitionistic fuzzy graph, where $V = \{v_1, v_2, \dots, v_n\}$ be the vertices of G . Let $A = \{< \mu_{ij}, \nu_{ij} >\}$ be the index matrix of G . Then $(\text{CONN}_{\mu(G)}(v_i, v_j), \text{CONN}_{\nu(G)}(v_i, v_j)) = (i, j)^{th}$ entry of $A + A^2 + \dots + A^{n-1}, \forall v_i \neq v_j \in V$ and $(\text{CONN}_{\mu(G)}(v_i, v_i), \text{CONN}_{\nu(G)}(v_i, v_i)) = (i, i)^{th}$ entry of $A + A^2 + \dots + A^n, \forall v_i \in V$

Proof. Let G be an IFG, where $V = \{v_1, v_2, \dots, v_n\}$ be the vertices of G . Let A be the index matrix of G and A^k be the power of IF matrix A . By Theorem 3.8, $(i, j)^{th}$ entry of $A^k = (\text{CONN}_{\mu(G)}(v_i, v_j), \text{CONN}_{\nu(G)}(v_i, v_j))$, where (v_i, v_j) is $v_i - v_j$ walks of length k .

Case(i): Let $v_i \neq v_j$. By Theorem 2.2, $v_i - v_j$ walk of length k contains $v_i - v_j$ path of length k . Since the vertex set V has $n-$ vertices, the $v_i - v_j$ path passes through at most $n-$ vertices. Therefore (v_i, v_j) is path of length less than or equal to $n - 1$

Hence,

$$\begin{aligned} (i, j)^{th} \text{ entry of } A + A^2 + \dots + A^{n-1} &= (\max(\text{CONN}_{\mu(G)}(v_i, v_j)), \min(\text{CONN}_{\nu(G)}(v_i, v_j))) \\ &= (\max(\max(S_{\mu(G)}(v_i, v_j)), \min(\min(S_{\nu(G)}(v_i, v_j)))) \\ &= (\text{CONN}_{\mu(G)}(v_i, v_j), \text{CONN}_{\nu(G)}(v_i, v_j)) \end{aligned}$$

where (v_i, v_j) is $v_i - v_j$ path of length less than or equal to $n - 1$

Therefore, $(\text{CONN}_{\mu(G)}(v_i, v_j), \text{CONN}_{\nu(G)}(v_i, v_j)) = (i, j)^{th}$ entry of $A + A^2 + \dots + A^{n-1}, \forall v_i \neq v_j \in V$.

Case(ii): Let $v_i = v_j \in V$. Since the vertex set V has $n-$ vertices, the closed $v_i - v_i$ path passes through at most $n-$ vertices. Therefore (v_i, v_i) is $v_i - v_i$ path of length less than or equal to n .

Hence,

$$\begin{aligned} (i, i)^{th} \text{ entry of } A + A^2 + \dots + A^n &= (\max(\text{CONN}_{\mu(G)}(v_i, v_i)), \min(\text{CONN}_{\nu(G)}(v_i, v_i))) \\ &= (\max(\max(S_{\mu(G)}(v_i, v_i)), \min(\min((S_{\nu(G)}(v_i, v_i)))))) \\ &= (\text{CONN}_{\mu(G)}(v_i, v_i), \text{CONN}_{\nu(G)}(v_i, v_i)) \end{aligned}$$

where (v_i, v_i) is $v_i - v_j$ paths of length less than or equal to n

$$(\text{CONN}_{\mu(G)}(v_i, v_i), \text{CONN}_{\nu(G)}(v_i, v_i)) = (i, i)^{th} \text{ entry of } A + A^2 + \dots + A^n, \forall v_i \in V. \quad \blacksquare$$

Theorem 3.10 Let $G = (V, E)$ be a strong intuitionistic fuzzy graph and A be the index matrix of G . Let $C_k = \{< c_{\mu_{ij}}, c_{\nu_{ij}} >\} = A + A^2 + \dots + A^k$ and $C_{k-1} = \{< c'_{\mu_{ij}}, c'_{\nu_{ij}} >\} = A + A^2 + \dots + A^{k-1}$. Then G is connected and G^k is complete if and only if

$$\left\{ \begin{array}{l} \{< c_{\mu_{ij}}, c_{\nu_{ij}} >\} \neq < 0, 1 >, \text{ for every } i \text{ and } j \\ \{< c'_{\mu_{ij}}, c'_{\nu_{ij}} >\} = < 0, 1 >, \text{ for some } i \text{ and } j \end{array} \right.$$

Proof. Let $G = (V, E)$ be a strong intuitionistic fuzzy graph and A be the index matrix of G . Let A^k be the k^{th} power of the IF matrix A . Let G^k be a complete intuitionistic fuzzy graph. Then by Theorem 3.8:

$$\begin{aligned}
 &(i, j)^{th} \text{ entry of } A = (CONN_{\mu(G)}(v_i, v_j), CONN_{\nu(G)}(v_i, v_j)), \text{ where } (v_i, v_j) \text{ is} \\
 &v_i - v_j \text{ walk of length } 1 \\
 &(i, j)^{th} \text{ entry of } A^2 = (CONN_{\mu(G)}(v_i, v_j), CONN_{\nu(G)}(v_i, v_j)), \text{ where } (v_i, v_j) \\
 &\text{is } v_i - v_j \text{ walk of length } 2 \\
 &\dots\dots \\
 &(i, j)^{th} \text{ entry of } A^{k-1} = (CONN_{\mu(G)}(v_i, v_j), CONN_{\nu(G)}(v_i, v_j)), \text{ where } (v_i, v_j) \\
 &\text{is } v_i - v_j \text{ walk of length } k - 1 \\
 &(i, j)^{th} \text{ entry of } A^k = (CONN_{\mu(G)}(v_i, v_j), CONN_{\nu(G)}(v_i, v_j)), \text{ where } (v_i, v_j) \\
 &\text{is } v_i - v_j \text{ walk of length } k
 \end{aligned}$$

Therefore,

$$(i, j)^{th} \text{ entry of } A + A^2 + \dots + A^{k-1} = (\max(CONN_{\mu(G)}(v_i, v_j)), \min(CONN_{\nu(G)}(v_i, v_j))),$$

$$(i, j)^{th} \text{ entry of } A + A^2 + \dots + A^{k-1} = (CONN_{\mu(G)}(v_i, v_j), CONN_{\nu(G)}(v_i, v_j)) \tag{6}$$

where (v_i, v_j) is $v_i - v_j$ walk of length less than or equal to $k - 1$ and

$$(i, j)^{th} \text{ entry of } A + A^2 + \dots + A^k = (\max(CONN_{\mu(G)}(v_i, v_j)), \min(CONN_{\nu(G)}(v_i, v_j))),$$

$$(i, j)^{th} \text{ entry of } A + A^2 + \dots + A^k = (CONN_{\mu(G)}(v_i, v_j), CONN_{\nu(G)}(v_i, v_j)) \tag{7}$$

where (v_i, v_j) is $v_i - v_j$ walk of length $\leq k$.

From Equation (2), $(i, j)^{th}$ entry of $A + A^2 + \dots + A^{k-1}$ is the strength of connectedness of (v_i, v_j) walk of length $1, 2, \dots, k - 1$ except k .

Therefore, $\{< c'_{\mu_{ij}}, c'_{\nu_{ij}} >\} =$

$$\begin{cases} (CONN_{\mu(G)}(v_i, v_j), CONN_{\nu(G)}(v_i, v_j)) \neq < 0, 1 >, (v_i, v_j) \text{ is walk of length } 1, 2, \dots, k - 1 \\ < 0, 1 >, (v_i, v_j) \text{ is walk of length } k \end{cases} \tag{8}$$

Since G^k is complete, the maximum shortest path of length in G^k is k . Then there exist at least one path of length k in G^k . Therefore from Equation (6), (7) and (8),

$$(i, j)^{th} \text{ entry of } A + A^2 + \dots + A^k = (CONN_{\mu(G)}(v_i, v_j), CONN_{\nu(G)}(v_i, v_j)) \neq < 0, 1 >, \tag{9}$$

where (v_i, v_j) is walk of length k , $\forall i, j$.

Hence from Equation (8) and (9),

$$\begin{cases} \{< c_{\mu_{ij}}, c_{\nu_{ij}} >\} \neq < 0, 1 >, \text{ for every } i \text{ and } j \\ \{< c'_{\mu_{ij}}, c'_{\nu_{ij}} >\} = < 0, 1 >, \text{ for some } i \text{ and } j \end{cases} \tag{10}$$

Conversely, suppose that Equation (10) is true, then for each distinct pair i, j we have $C_k \neq 0$. Therefore, there exist at least one walk of length less than n from v_i to v_j . This implies that v_i is connected to v_j , for every $v_i, v_j \in V$. Hence G is connected. Again, let us assume that Equation (10) is true, then there exists $v_i - v_j$ walk of length $\leq k$ and shortest path of length k in G . By the Definition 1.38 and Theorem 2.2,

$$\mu_{ij}^k = \min(\mu_i, \mu_j) \text{ and } \nu_{ij}^k = \max(\nu_i, \nu_j), (v_i, v_j) \notin E \text{ and } d_{G^*}(v_i, v_j) \leq k \quad (11)$$

Since G is strong intuitionistic fuzzy graph and from the Equation(11),

$$\mu_{ij}^k = \min(\mu_i, \mu_j) \text{ and } \nu_{ij}^k = \max(\nu_i, \nu_j), \forall v_i, v_j \in V$$

Hence G^k is complete. ■

Corollary 3.11 Let $G = (V, E)$ be an intuitionistic fuzzy graph and A be the index matrix of G . Let $C_k = \{ \langle c_{\mu_{ij}}, c_{\nu_{ij}} \rangle \} = A + A^2 + \dots + A^k$ and $C_{k-1} = \{ \langle c'_{\mu_{ij}}, c'_{\nu_{ij}} \rangle \} = A + A^2 + \dots + A^{k-1}$. Then G is connected and $(G^*)^k$ complete if and only if

$$\left\{ \begin{array}{l} \{ \langle c_{\mu_{ij}}, c_{\nu_{ij}} \rangle \} \neq \langle 0, 1 \rangle, \text{ for every } i \text{ and } j \\ \{ \langle c'_{\mu_{ij}}, c'_{\nu_{ij}} \rangle \} = \langle 0, 1 \rangle, \text{ for some } i \text{ and } j \end{array} \right.$$

Corollary 3.12 Let $G = (V, E)$ be a strong directed intuitionistic fuzzy graph and A be the index matrix of G . Let $C_k = \{ \langle c_{\mu_{ij}}, c_{\nu_{ij}} \rangle \} = A + A^2 + \dots + A^k$ and $C_{k-1} = \{ \langle c'_{\mu_{ij}}, c'_{\nu_{ij}} \rangle \} = A + A^2 + \dots + A^{k-1}$. Then G is connected and G^k is complete if and only if

$$\left\{ \begin{array}{l} \{ \langle c_{\mu_{ij}}, c_{\nu_{ij}} \rangle \} \neq \langle 0, 1 \rangle, \text{ for every } i \text{ and } j \\ \{ \langle c'_{\mu_{ij}}, c'_{\nu_{ij}} \rangle \} = \langle 0, 1 \rangle, \text{ for some } i \text{ and } j \end{array} \right.$$

Theorem 3.13 Let G and H be two intuitionistic fuzzy graphs. Then G is co-weak isomorphic with H then G^k is homomorphic with H^k .

Proof. Proof follows from the definition 1.23, 1.25 and 1.38 . ■

Theorem 3.14 Let $G = (V, E)$ be an intuitionistic fuzzy graph. Let $A = \{ \langle \mu_{ij}, \nu_{ij} \rangle \}_{m \times m}$ and $B = \{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \}_{m \times n}$ be the index matrix and incidence matrix of G respectively. Then the entries of $B \bullet_{\max - \min} B^T$ are

$$\{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \}_{m \times m} = \left\{ \begin{array}{l} (\mu_{ij}, \nu_{ij}), \text{ if } i \neq j \\ (\max(\mu_{ik}), \min(\nu_{ik})), \text{ if } i = j, \forall v_k \in N_G(v_i) \end{array} \right.$$

Proof. Let $G = (V, E)$ be an intuitionistic fuzzy graph. Let $A = \{ \langle \mu_{ij}, \nu_{ij} \rangle \}$ and $B = \{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \}$ be the index matrix and incidence matrix of G of order $m \times m$ and $m \times n$ respectively. Let $B^T = \{ \langle b'_{\mu_{ij}}, b'_{\nu_{ij}} \rangle \}_{n \times m}$ be the transpose of the matrix B . Then the order of $B \bullet_{\max - \min} B^T$ is $m \times m$.

Case(i): Let $e_k \in (v_i, v_j), i \neq j$. By the Definition 1.35, the entries in B are as follows:

$$\{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \} = \begin{cases} (\mu_{ij}, \nu_{ij}), \forall e_k \in (v_i, v_j) \\ (0, 1), \text{ otherwise} \end{cases}$$

The $(i, j)^{th}$ entries of $B \bullet_{\max - \min} B^T$ is given by

$$(B \bullet_{\max - \min} B^T)_{ij} = (\vee_k (b_{\mu_{ik}} \wedge b'_{\mu_{kj}}), \vee_k (b_{\nu_{ik}} \wedge b'_{\nu_{kj}}))$$

That is,

$$(B \bullet_{\max - \min} B^T)_{ij} = (\mu_{ij}, \nu_{ij}), \text{ since } e_k \in (v_i, v_j) \tag{12}$$

Case(ii): Let $(v_i, v_j) \notin E$ of G .

Subcase(i): Let $v_i \in V$ is incident on $e_k \in E$ and $v_j \in V$ is not incident on $e_k \in E$, then $(b_{\mu_{ik}}, b_{\nu_{ik}}) \neq (0, 1) = (\mu(e_k), \nu(e_k))$, $(b_{\mu_{jk}}, b_{\nu_{jk}}) = (0, 1)$ and $(b'_{\mu_{kj}}, b'_{\nu_{kj}}) = (0, 1)$. Therefore,

$$(B \bullet_{\max - \min} B^T)_{ij} = (\vee_k (b_{\mu_{ik}} \wedge b'_{\mu_{kj}}), \wedge_k (b_{\nu_{ik}} \vee b'_{\nu_{kj}})) = (0, 1) \tag{13}$$

Subcase (ii): Let $v_i \in V$ is not incident on $e_k \in E$ and $v_j \in V$ is incident on $e_k \in E$, then $(b_{\mu_{ik}}, b_{\nu_{ik}}) = (0, 1)$ and $(b_{\mu_{jk}}, b_{\nu_{jk}}) \neq (0, 1) = \mu(e_k)$ and $(b'_{\mu_{kj}}, b'_{\nu_{kj}}) \neq (0, 1) = \mu(e_k)$. Therefore,

$$(B \bullet_{\max - \min} B^T)_{ij} = (\vee_k (b_{\mu_{ik}} \wedge b'_{\mu_{kj}}), \wedge_k (b_{\nu_{ik}} \vee b'_{\nu_{kj}})) = (0, 1) \tag{14}$$

Subcase(iii): Let $v_i, v_j \in V$ is not incident on $e_k \in E$, then $(b_{\mu_{ik}}, b_{\nu_{ik}}) = (0, 1)$ and $(b_{\mu_{jk}}, b_{\nu_{jk}}) = (0, 1)$ and $(b'_{\mu_{kj}}, b'_{\nu_{kj}}) = (0, 1)$. Therefore, $(B \bullet_{\max - \min} B^T)_{ij} = (\vee_k (b_{\mu_{ik}} \wedge b'_{\mu_{kj}}), \wedge_k (b_{\nu_{ik}} \vee b'_{\nu_{kj}})) = (0, 1)$

Hence from the above three cases,

$$(B \bullet_{\max - \min} B^T)_{ij} = (\vee_k (b_{\mu_{ik}} \wedge b'_{\mu_{kj}}), \vee_k (b_{\nu_{ik}} \wedge b'_{\nu_{kj}})) = (0, 1), \forall (v_i, v_j) \notin E \tag{15}$$

Case(iii): Let $v_i = v_j \in V$ in G .

$$\begin{aligned} (B \bullet_{\max - \min} B^T)_{ij} &= (\vee_k (b_{\mu_{ik}} \wedge b'_{\mu_{ki}}), \wedge_k (b_{\nu_{ik}} \vee b'_{\nu_{ki}})) \\ &= (\vee_k (b_{\mu_{ik}}), \wedge_k (b_{\nu_{ik}})) \\ &= ((b_{\mu_{i1}} \vee b_{\mu_{i2}} \vee \dots \vee b_{\mu_{in}}), (b_{\nu_{i1}} \wedge b_{\nu_{i2}} \wedge \dots \wedge b_{\nu_{in}})) \\ &= (\vee_k \mu_{ik}, \wedge_k \nu_{ik}), \forall e_k \in E \text{ is incident on } v_i \in V \end{aligned}$$

Hence from Equation (8), (9) and (10) and Case (iii),

$$\{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \}_{m \times m} = \begin{cases} \{ \langle \mu_{ij}, \nu_{ij} \rangle \}, \text{ if } i \neq j \\ (\max(\mu_{ik}), \min(\nu_{ik})), \text{ if } i = j, \forall v_k \in N_G(v_i) \end{cases}$$

■

Theorem 3.15 Let $G = (V, E)$ be an intuitionistic fuzzy graph and $G_L = (V_L, E_L)$ be a line intuitionistic fuzzy graph. Let $A = \{ \langle \mu_{ij}, \nu_{ij} \rangle \}$ and $B = \{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \}$ be the index matrix and incidence matrix of G respectively. Then the entries of $B^T \bullet_{\max - \min} B$ are

$$\{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \}_{n \times n} \begin{cases} (\mu_L(v_i, v_j), \nu_L(v_i, v_j)), \text{ if } i \neq j \\ (\max(\mu_{ik}), \min(\nu_{ik})), \text{ if } i = j, \forall v_k \in N_G(v_i) \end{cases}$$

where $(\mu_L(v_i, v_j), \nu_L(v_i, v_j))$ is the membership and non membership value of an edge $e_{ij} \in E_L$.

Proof. Let $G = (V, E)$ be an intuitionistic fuzzy graph. Let $A = \{ \langle \mu_{ij}, \nu_{ij} \rangle \}$ and $B = \{ \langle b_{\mu_{ij}}, b_{\nu_{ij}} \rangle \}$ be the index matrix and incidence matrix of G of order $m \times m$ and $m \times n$ respectively. Let $B^T = \{ \langle b'_{\mu_{ij}}, b'_{\nu_{ij}} \rangle \}_{n \times m}$ be the transpose of the matrix B . Then the order of $B^T \bullet_{\max - \min} B$ is $n \times n$.

Case(i): Let $e_i \in E, e_j \in E$ are incident on $v_k \in V$. Then $((b_{\mu_{ki}}, b_{\nu_{ki}}) \neq (0, 1) = (\mu(e_i), \nu(e_i)) = (b'_{\mu_{ik}}, b'_{\nu_{ik}}), (b_{\mu_{kj}}, b_{\nu_{kj}}) \neq (0, 1) = (\mu(e_j), \nu(e_j)) = (b'_{\mu_{jk}}, b'_{\nu_{jk}})$. The $(i, j)^{th}$ entry of $B^T \bullet_{\max - \min} B$ are as follows:

$$\begin{aligned} (B \bullet_{\max - \min} B^T)_{ij} &= (\vee_k (b'_{\mu_{ik}} \wedge b_{\mu_{kj}}, \wedge_k (b'_{\nu_{ik}} \vee b_{\nu_{kj}})) \\ &= (\vee (\mu(e_i) \wedge \mu(e_j)), \wedge (\nu(e_i) \vee \nu(e_j))) \\ &= ((\mu(e_i) \wedge \mu(e_j)), (\nu(e_i) \vee \nu(e_j))) \\ &= ((\mu_L(v_i) \wedge \mu_L(v_j)), (\nu_L(v_i) \vee \nu_L(v_j))), \text{ since by Definition 1.36} \\ &= (\mu_L(v_i, v_j), \nu_L(v_i, v_j)), (v_i, v_j) \in E \end{aligned}$$

Case(ii): Let $e_i \in E, e_j \in E$ are not incident on $v_k \in V$ Then $((b_{\mu_{ki}}, b_{\nu_{ki}}) = (0, 1) = (b'_{\mu_{ik}}, b'_{\nu_{ik}}), (b_{\mu_{kj}}, b_{\nu_{kj}}) = (0, 1) = (b'_{\mu_{jk}}, b'_{\nu_{jk}})$. The $(i, j)^{th}$ entry of $B^T \bullet_{\max - \min} B$ are as follows:

$$\begin{aligned} (B^T \bullet_{\max - \min} B)_{ij} &= (\vee_k (b'_{\mu_{ik}} \wedge b_{\mu_{ki}}, \wedge_k (b'_{\nu_{ik}} \vee b_{\nu_{ki}})) \\ &= (0, 1) \end{aligned}$$

Case(iii): Let $v_i = v_j \in V$ in G .

$$\begin{aligned} (B^T \bullet_{\max - \min} B)_{ij} &= (\vee_k (b'_{\mu_{ik}} \wedge b_{\mu_{ki}}, \wedge_k (b'_{\nu_{ik}} \vee b_{\nu_{ki}})) \\ &= (\vee_k (b_{\mu_{ik}}, \wedge_k (b_{\nu_{ik}})) \\ &= ((b_{\mu_{i1}} \vee b_{\mu_{i2}} \vee \dots \vee b_{\mu_{in}}), (b_{\nu_{i1}} \wedge b_{\nu_{i2}} \wedge \dots \wedge b_{\nu_{in}})) \\ &= (\vee_k \mu_{ik}, \wedge_k \nu_{ik}), \forall e_k \in E \text{ is incident with } v_i \in V \end{aligned}$$

Hence from the Cases (i) and (ii) and by Definition 1.36, $(B^T \bullet_{\max - \min} B)_{ij} = (\mu_L(v_i, v_j), \nu_L(v_i, v_j))$, if $i \neq j$

Hence from the Case (iii), $(B^T \bullet_{\max - \min} B)_{ij} = (\max(\mu_{ik}), \min(\nu_{ik}))$, if $i = j, \forall v_k \in N_G(v_i)$. ■

IV Conclusion

In this paper, we discussed the properties of the power of an intuitionistic fuzzy graph, subdivision intuitionistic fuzzy graph and line intuitionistic fuzzy graph. Intuitionistic fuzzy graph effectively expresses the approximate and interpolative reasoning used by humans when they employ linguistic propositions for deductive reasoning. The authors further extend this work so it can have application in decision making and network analysis.

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Motivation, Satisfaction and Difficulty Encountered by Higher Education Institution in Manila Graduate Students in Pursuing Graduate Studies

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Abstract- This study aimed to determine the motivation, satisfaction and difficulty encountered by HEI in Manila graduate students in pursuing graduate studies. The study revealed that most of the respondents were female, single, belong to the 20 – 29 age brackets with only about 1-5 in the teaching / non-teaching profession. Many are still on the process of completing their master's and their doctorate degree. Most of the respondents are in the teaching profession. Moreover, upgrade qualifications and increase of self-esteem were perceived extremely influential by the respondents. Working and studying, pressure from additional work / assignments and too many were very difficult. And as to the level of satisfaction, they perceived improved professional competence as very satisfactory. The researchers recommend that NBC #461 final print out should be known to all concern in the shortest time and position reclassification/promotion be provided accordingly, likewise, those employed at either private / public institutions must be promoted too. The Institutions should allocate larger budget for the teaching and non- teaching staff for developments. The University should provide a program that will lessen faculty work load while attending on a graduate school.

Index Terms- Difficulties Encountered, Graduate Studies, Motivation, Satisfaction Level

I.

INTRODUCTION

One of the basic considerations in granting accreditation of specific program or university status is having faculty members with masters' and doctoral status, the reason why faculty development is really one of the major programs of different academic institutions, whether private or public. Aside from the budgetary allocations of the colleges and universities for the scholarships, there are other government agencies like DOST and CHED that provide support for further studies of teachers. Some of the graduate students cite their passion for their field as the main reason for attending graduate school. When you love a subject, the idea of contributing something worthwhile to it is very exciting. What could be more rewarding than making even a small discovery in the sciences, for example, that leads to larger discoveries and facilitates the research of others? And even without great breakthroughs, achieving mastery of a subject or discipline can be a great pleasure in and of itself. But the benefits of a graduate school education are not limited to personal growth. Some of the more tangible benefits may include: a raise in salary; a promotion; an entry into a new field that requires an advanced degree (e.g. college professor); more openings in the job market. Obtaining masters and/or doctorate degrees guaranteed us to be promoted. But, is it still practical? Or, it is only for those who have high career path interests? It is rightfully say that it is our way of life as educators.

However, because of the time and effort that goes into getting a graduate degree, there are still other faculty members who are hesitant and think twice on enrolling in the graduate school despite the perks of earning a master's/doctoral degree, and if ever started, they fail to finish it.

It is in this premise that this study will be conducted. The researchers would like to come up with the results which will provide broader understanding of the purpose in obtaining such degrees. With a better understanding of the motivations, difficulties and satisfaction of graduate students which can be useful as a reminder for completing their courses, as well as for keeping themselves driven in taking the difficult studies and research. The result of the research will enable university administrators to gain a better understanding of graduate students so that they can improve their marketing techniques to more effectively recruit and retain goal-oriented students who can successfully achieve their degrees.

Each one of us has our own stories to tell about graduate studies. "Okay na ako sa ganitong posisyon", "Kayo nalang na may ambisyon ang magtapos", "Gusto ko man, di naman kaya ng budget", "Ang tagal naman bago mo pakinabangan yang tinapos mo", "Mas maigi naman yung tapos, may assurance, malay mo" are just few words commonly heard. But what really are the reasons why some are truly motivated finishing masters/doctorates? What hinders those who struggling so hard to finish what they have started? Questions that the researchers also wanted to know the answers. The very reason they will attempt to enlighten the stakeholders by conducting this study The researchers, as graduate students themselves, would like to know if their motivations, level of satisfactions and difficulties encountered in the graduate school is also like that of the rest of the graduate students of Higher Education Institution in Manila Graduate School.

Teacher Education is a program offering different area of concentrations needed to deliver cognitive learning, develop skills and desirable values as required to learners to become a productive member of the society. It also pertains to training grounds for teachers in the preschool, elementary and secondary levels and even in the tertiary level. Consequently and as a matter of policies on verticalization of CHED, teacher education is a training arena in establishing a more qualified and competent teachers through obtaining masters'/doctorate degrees.

Graduate studies are programs that provide teachers, instructors, professors and even non-teaching personnel an opportunity to upgrade or acquire qualifications and enhance professional development. Wherein, the main purpose is the acquisition of expertise, authority and competency.

There are numerous reasons why an instructor, professor or even non-teaching personnel wanted to ascend high up in the educational ladder.

Newby regarded seeking a higher level of learning substantial to satisfy specific goals and objectives. According to him, motivations play important role that leads people to choose in entering certain careers influenced by some internal or external factors [1]. Moreover, Artino emphasized in his study the application of social-cognitive view of self-regulated learning to examine how several personal factors relate to academic success in an outline course. Service Academy undergraduates completed a survey that assessed their motivational beliefs, negative achievement emotions and several outcomes that included their use of self-regulated learning strategies, course satisfaction, and continuing motivation to enroll in future online courses. Results from several multiple regressions revealed that task value beliefs were strongest and most consistent positive predictors of elaboration, meta cognition, satisfaction and continuing motivations [2]. The present study has the same intention of providing facts and evidences on how motivation influences be of importance to CIT faculty to pursue graduate studies.

According to Stepich, the most prevalent factor that expedites employee's productivity is his level of satisfaction towards work condition, suitability of work place, benefits, salaries and wages. He also stressed that the proper management of human, financial and material resources that would satisfy the individual needs in a production line should be provided. However, high level of satisfaction may be achieved through an effective human relation [3].

Sum, et.al. further stated in their study that majority of the students were either satisfied or extremely satisfied with their department's master's degree considering many factors affecting their levels of satisfaction like increased competition, dynamic educational environment, high costs of obtaining graduate education, changing demographics in the population and the general physical for accountability[4].

The cited literatures are related to the present study because all uses level of satisfaction as factor in determining productivity. The researchers believed that conflicts in a workplace are unproductive but if the administrators are very much satisfied on how employee's work and the employee are satisfied working with the company, productivity is assured.

Oloya in his study "Difficulties Encountered by Working Students in PaLuMar" aimed to determine personal-related, family-related and school-related factors problems usually experienced by working students. He emphasized that financing his/her studies and managing the time are the prevailing reasons that made their studies difficult to cope up with [5].

According to Solano, high salary rate, job opportunities and fringe benefits are extremely influential in the selection of college courses by senior high school students in Mariano Ponce National High School. She expressed that students' choice were externally influenced rather than their interests and vocational/professional aptitude. Moreover, most of them were motivated by their parents, relatives, friends and teachers. Extensive and comprehensive career guidance was not made available [6].

The researchers used motivation influences and difficulties encountered as aspects in pursuing graduate studies and somewhat similar to the above mentioned studies.

II. OBJECTIVES OF THE STUDY

The purpose of the study is to determine the motivation, level of satisfaction and difficulties encountered by graduate students of Higher Education Institution in Manila Graduate School.

Specifically, the study sought answers to the following problems:

1. What is the demographic profile of the respondents in terms of:
 - a. gender,
 - b. civil status,
 - c. age,
 - d. length of service,
 - e. nature of work;
 - f. program?
2. What are the factors that motivate HEI in Manila graduate students to undergo further studies?
3. What is the extent of difficulty of HEI in Manila graduate students in pursuing graduate studies?

4. What is the level of satisfaction of HEI in Manila graduate students from the benefits derived from pursuing graduate studies?
5. Is there a significant difference the respondents' demographic profile and their responses in terms of motivation influences, difficulties encountered and levels of satisfaction?

Hypothesis:

There is no significant difference between profile variables and motivation influence, difficulties encountered and levels of satisfaction of respondents.

III. METHODOLOGY

This study used the descriptive method of research in analyzing the data gathered which will lead to realize the objectives. As stated by Best and Khan "Descriptive research simply seeks to describe particular phenomena which also include hypothesis of their relationship and testing. Also relevant variables for an independent analysis of their relationship and differences were selected"[7].

This study focused mainly on the assessment of motivation, level of satisfaction and difficulties encountered by the graduate students of Higher Education Institution in Manila during the second semester of school year 2013 – 2014.

The respondents involved in the study were graduate students who are currently enrolled in both master's and doctorate degree getting different specialization. One hundred percent of the total population was considered as respondents but only 85 questionnaire – checklists were retrieved after giving them more than enough time to respond and efforts were exerted. According to the formula as extracted from the statistician in authority the number of total respondents is workable for the research study.

A questionnaire – checklist was used as instrument in gathering the needed data. This is an exploratory study and qualitative method (in-depth interviews) was used to generate additional items to an adapted questionnaire-checklist of Naval in her study Satisfaction Level of PUP Graduate School Students[8]. The modified questionnaire was content validated by eight (8) professors who are all full pledge doctors. The questionnaire was pretested to thirty (30) professors/instructors from other colleges/universities who were instructed to provide additional comments.

The respondents were asked to evaluate using the given scales:

Scale	Motivation Influences	Difficulties Encountered	Level of Satisfaction
1	Not at All Influential	Not at All Difficult	Not at All Satisfied
2	Fairly Influential	Fairly Difficult	Fairly Satisfied
3	Influential	Difficult	Satisfied
4	Very Influential	Very Difficult	Very Satisfied
5	Extremely Influential	Extremely Difficult	Extremely Satisfied

The following statistical tools were utilized in the interpretation of gathered data: the frequency, percentage and rank distribution were used to determine the profile of the respondents; to determine the factors that motivate the HEI in Manila graduate students to undergo graduate studies, weighted mean was used; to determine the extent of difficulty encountered by HEI in Manila graduate students in pursuing graduate studies, weighted mean was used; weighted mean was likewise used to determine the levels of satisfaction of the HEI in Manila graduate students from the benefits derived from pursuing graduate studies; and, to find out the difference between the respondents' demographic profile and their responses in terms of motivation influences, difficulties encountered and levels of satisfaction, one-way analysis of variance (ANOVA) was used.

IV. RESULTS AND DISCUSSIONS

Profile of the Respondents

Table 1 presents the frequency, percentage and rank distribution of the HEI in Manila graduate students.

There were about 503 graduate students comprising the respondents and 85 responded to the questionnaire. The breakdown of the gender, civil status, age, nature of work, program, and length of service. can be found in Table 1.

As shown in the table in terms of gender out of 85 respondents, 56 or 65.88 percent are female and 29 or 34.12 percent are males. In terms of civil status, single got 44 or 51.76 percent, widow/widower have 2 or 2.35 percent and 38 or 44.71 percent are married. With regards to age, 32 or 37.65 percent are 20 – 29 years old, 28 or 32.94 percent have ages 30 – 39, 15 or 17.65 percent

Table 1. Demographic Profile of the Respondents

Demographics	Frequency	Percentage (%)	Rank
Gender: Male	29	34.12	2
Female	56	65.88	1
Civil status: Single	44	51.76	1
Married	38	44.71	2
Widow/er	2	2.35	3
others	1	1.18	4
Age: 20 – 29	32	37.65	1
30 – 39	28	32.94	2
40 – 49	15	17.65	3
50 – Above	10	11.76	4
Length of Service: 1 – 5	38	44.71	1
6 – 10	20	23.53	2
11 – 15	10	11.76	3
16 – 20	6	7.06	5
21 – 25	3	3.53	6
26 – Above	8	9.41	4
Nature of Work:			
Teaching	66	77.65	1
Non - teaching	19	22.35	2
Program :			
Non-Science	37	43.53	2
Science	48	56.47	1
Total no. of respondents	85		

40 – 49 and ages 50 and above have 10 or 11.76 percent of the total respondents. The data denote that majority of the respondents belong to the younger age of the middle aged graduate schools students.

In terms of length of service, of the total respondents, 38 or 44.71 percent is 1-5 years, 6-10 years has 20 or 23.53 percent, followed by 11- 15 years has 10 or 11.76 percent, next in rank is that belonging to 26 and above with 8 or 9.41 percent. The second to the last rank is 16-20 years in the service with 6 or 7.06 percent and 21 – 25 years in the last rank having 3 or 3.53 percent. It can be observed that the respondents mostly came from new members of the teaching and non-teaching whose services last for at least five years.

As revealed in the table, in terms of the nature of work, teaching with 66 or 77.65 percent got the first rank while non-teaching having 19 or 22.35 ranked second respectively. This implies that the highest percentage of the respondents as to the nature of work is the teaching personnel & thus this connotes that teachers are obliged to do so for them to be more competent enough in facing their students.

In terms of program, out of 85 respondents 48 or 56.47 percent is indulged in different sciences while 37 or 43.53 percent of the respondents is non- science programs. This may be due to the curricular offerings of the university. Since sciences at the Centro Escolar University are popular and the most pioneer among other programs.

The Factors that Motivates Graduate Students of HEI in Manila to Undergo Graduate Studies

Table 2 presents the computed weighted mean on the factors that motivates faculty to undergo graduate studies.

Table 2. Computed Weighted Mean on the Factors that Motivates Graduate Students of HEI in Manila to Undergo Graduate Studies

	Motivation Items	W x	R	Verbal Interpretation
1.	Scholarship Grants	3.73	16	Very Influential
2.	Professional Competence	4.41	6	Extremely Influential
3.	Obtain Qualification	4.49	4.5	Extremely Influential
4.	Promotion	4.39	7.5	Extremely Influential
5.	Influenced by Friends	3.48	17	Very Influential
6.	Status Consideration	4.29	10	Extremely Influential
7.	Use of Special Talents	4.02	15	Very Influential
8.	Job Security	4.39	7.5	Extremely Influential
9.	Apply Theory to work	4.25	12	Extremely Influential
10.	Proven Abilities	4.13	14	Very Influential
11.	Better Income	4.28	11	Extremely Influential
12.	Changes in Work Place	4.20	13	Extremely Influential
13.	Enjoy learning New Things	4.49	4.5	Extremely Influential
14.	Upgrade Qualifications	4.60	1	Extremely Influential
15.	Intellectual Stimulation	4.54	3	Extremely Influential
16.	Increase job Opportunities	4.35	9	Extremely Influential
17.	Increase of Self- Esteem	4.56	2	Extremely Influential
	Average Weighted Mean	4.27		Extremely Influential

The table depicts that item “Upgrade Qualifications” is the top rank with a weighted mean of 4.60 and verbally interpreted as “Extremely Influential”. Next in rank is “Increase of Self Esteem” with a weighted mean of 4.56 and interpreted as “Extremely Influential”. “Intellectual Stimulation” is the item in the third rank with a weighted mean of 4.54, verbally interpreted as “Extremely Influential”. Items 3 and 13 shared at 4.5 rank having both 4.49 weighted mean respectively and interpreted as “Extremely Influential.” Professional Competence” is in the 6th rank with a weighted mean of 4.41 and interpreted as “Extremely Influential”. Items, “Promotion “ and “Job Security “ joined at 7.5 rank with 4.39 weighted mean having verbal interpretation of “Extremely Influential “. While items, 16, 6, 11, 9, 12, 10, 7, 1 and 5 followed with computed weighted mean of 4.35, 4.29, 4.28, 4.25, 4.20, 4.13, 4.02, 3.73 and 3.48 respectively, having “Extremely Influential” and “Very Influential”, verbal interpretation correspondingly.

As a whole, respondents agree that various influential factors that stimulates the respondents to go through graduate studies with respect to motivation items.

The findings imply that graduate students despite of some concerns in pursuing graduate studies can still respond to the needs of the employer and the university for professional advancements.

The Extent of Difficulty the Graduate Students of HEI in Manila Encountered in Pursuing Graduate Studies

Table 3 presents the computed weighted mean on the extent of difficulty of respondents encountered on the specified difficulty items.

As gleaned from the table, with respect to the difficulty items encountered by the respondents in pursuing graduate studies, first in rank is “Working and studying “. With a weighted mean of 3.94 verbally interpreted as “Very Difficult”. “Pressure from additional work / assignments” ranked second with computed weighted mean of 3.90 and interpreted as “Very Difficult”, next in rank is “Too many school requirements.” Verbally interpreted as “Very Difficult” and obtained weighted mean of 3.89. Items 16, 13, 2 and 6 ranked 4th, 5th, 6th and 7th, all are interpreted as “very Difficult” with computed weighted mean of 3.84 and 3.51, 3.49 and 3.47 respectively. Last in rank is “Pressure from peers/supervisors” with weighted average of 3.0 and interpreted as “Difficult”.

Generally, as revealed by the average weighted mean of 3.43. the respondents are truly having difficulty attending graduate schools. This confirms the study of Naval and Narvaez that some of the problems encountered by the graduate students are financing their studies that leads to family concerns and voluminous requirements including thesis writing[8][9]. This means that various difficulty items are hindrance in pursuing/finishing graduate studies.

The result further implies that difficulties not resolved may lead to graduate students of becoming dormant and opportunities in different programs may also stagnate.

Table 3. Computed Weighted Mean on the Extent of Difficulty of the Respondents on the Specified Difficulty Items

	Difficulty Items	W x	R	VI
1.	Insufficient books and Instructional Materials.	3.35	9.5	D
2.	Study and family commitment.	3.49	6	VD
3.	Too many school requirements.	3.89	3	VD
4.	Anxieties related to studying at the graduate level.	3.46	8	VD
5.	Working and studying.	3.94	1	VD
6.	Social life and study.	3.47	7	VD
7.	Pressure from additional work/assignments.	3.90	2	VD
8.	Overcoming fear of failure.	3.34	11.5	D
9.	Developing study habits.	3.34	11.5	D
10.	Understanding concepts.	3.24	13.5	D
11.	Very slow of return of investment.	3.16	15	D
12.	Support of people from work place.	3.15	16	D
13.	Financing the studies.	3.51	5	VD
14.	Use of modern technology in education.	3.14	17	D
15.	Type and standard of graduate school enrolled in.	3.35	9.5	D
16.	Thesis/dissertation requirements.	3.84	4	VD
17.	Location of graduate school.	3.24	13.5	D
18.	Pressure from peers/superiors.	3.00	18	D
	Average Weighted Mean	3.43		VD

D – Difficult, VD – Very Difficult

The Levels of Satisfaction of the HEI in Manila Graduate Students from the Benefits Derived from Pursuing Graduate Studies

Table 4 presents the computed weighted mean on the level of satisfaction of the respondents derived from the benefits of graduate school works.

Table 4. Computed Weighted Mean on the Level of Satisfaction of the Respondents Derived from the Benefits of Graduate School Works

	Satisfaction Levels	W x	R	VI
1.	Obtained better employment.	4.27	13.5	ES
2.	Improved income / financial status.	4.20	16.5	ES
3.	Secured employment.	4.28	11.5	ES
4.	Developed one's talents.	4.20	11.5	ES
5.	Gained new friends.	3.84	16.5	ES
6.	Improved professional competence.	4.47	2	ES
7.	Fulfilled academic aspirations.	4.35	3.5	ES
8.	Enhanced career opportunities	3.96	6.5	ES
9.	Professional prospects.	4.32	10	ES
10.	Earned recognition.	4.18	18	VS
11.	Developed capacity for critical and creative thinking.	4.27	13.5	ES
12.	Extended help and support to others and society.	4.24	15	ES
13.	Applied of knowledge and skills acquired in job situation.	4.28	11.5	ES
14.	Enhanced growth and responsibility.	4.44	3.5	ES
15.	Professional advancement.	4.48	1	ES
16.	Feeling of achievement.	4.44	3.5	ES
17.	Improved leadership capabilities.	4.35	6.5	ES
18.	Inculcated initiative, discipline and adaptabilities.	4.35	6.5	ES
	Average Weighted Mean	4.32		ES

VS – Very Satisfied, ES- Extremely Satisfied

As reflected from the table, “Professional Advancement.” ranked first with a computed weighted mean of 4.48 followed by “Improved professional competence.” with weighted average of 4.47. Next in rank is shared by items 7, 14 and 16 which obtained 4.44 weighted mean each. “Improved income/financial status” and “Gained new friends” acquired the last rank with computed weighted mean of 4.20. All 17 items with their given weighted means are verbally interpreted as “Extremely Satisfied” except for item no.10 which was verbally interpreted as “very satisfied”.

The findings imply that all of the respondents have high level of satisfaction and are very satisfied from the benefits that they may derived from pursuing and earning a degree in a graduate school. It also implies that many of the graduate student respondents are positively looking forward that until such time all can graduate in their program with their selected field of specialization.

The Significant Difference Between the Respondents’ Demographic Profile and Their Responses in Terms of Motivation Influences, Difficulties Encountered and Levels of Satisfaction

Table 5 presents the computed F – value of the perceptions of the respondents in pursuing graduate studies with respect to gender.

Table 5. Computed F-values on the Difference Between the Perceptions of the Respondents in Pursuing Graduate Studies with Respect to Gender

	SS	df	MS	F-value	Ho	Interpretation
a.Between Groups	0.8511	3	0.2837	0.38	A	Not Significant
Within Groups	60.3855	81	0.7455			
Total	61.2366	84				
b.Between Groups	1.3335	3	0.4445	0.49	A	Not Significant
Within Groups	73.2726	81	0.9046			
Total	74.6061	84				
c.Between Groups	2.4525	3	0.8175	2.48	A	Not Significant
Within Groups	26.6976	81	0.3296			
Total	29.1501	84				

The table reflects that the gender is not significant on the motivation and difficulty items and level of satisfaction of faculty in pursuing graduate studies as perceived by the respondents since the computed F-values of 2.83, 1.49 and .234 respectively is less than the tabular value of 2.49 at 0.5 level of significance. Thus, rejected the null hypothesis. It implies that both male and female faculty could have the same motivational level and experiencing similar difficulties and level of satisfaction in pursuing graduate studies.

Table 6 presents the computed F – value of the perceptions of the respondents in pursuing graduate studies with respect to civil status.

Table 6. Computed F-values on the Difference Between the Perceptions of the Respondents in Pursuing Graduate Studies with Respect to Civil Status

	SS	df	MS	F-value	Ho	Interpretation
a.Between Groups	0.581723	3	0.193908	5.212564	R	Significant
Within Groups	25.944820	81	0.320306			
Total	26.526543	84				
b.Between Groups	2.253818	3	0.751273	0.911910	A	Not Significant
Within Groups	66.731470	81	0.823845			
Total	68.985288	84				
c.Between Groups	0.065591	3	0.021864	0.047594	A	Not Significant
Within Groups	37.209970	81	0.459882			
Total	37.275561	84				

The table reflects that the civil status is not significant on the difficulty items and level of satisfaction in pursuing graduate studies as perceived by the respondents since the computed F-values of 0.911910, and 0.047594 respectively is less than the tabular value of 2.49 at 0.5 level of significance. While responses of the HEI in Manila graduate students differ significantly in motivation items.

This implies that regardless of the present status of the respondents whether single, married or widow/er, they have the same satisfaction level and experienced difficulties but very much motivated in pursuing graduate studies.

According to Lorenzo she disclosed that civil status had no significant relation with performance ratings, but has significant relation with some variable[10]. Obviously, being single or married, widow or separated has nothing to do with higher performance rating.

Table 7 presents the computed F – value of the perceptions of the respondents in pursuing graduate studies with respect to age.

Table 7. Computed F-values on the Difference Between the Perceptions of the Respondents in Pursuing Graduate Studies with Respect to Age

	SS	df	MS	F-value	Ho	Interpretation
a.Between Groups	2.540368	3	0.846789	2.859561	R	Significant
Within Groups	23.986170	81	0.296126			
Total	23.526538	84				
b.Between Groups	1.129306	3	0.376435	0.449353	A	Not Significant
Within Groups	67.855980	81	0.837728			
Total	68.985286	84				
c.Between Groups	6.031847	3	2.010616	5.212564	R	Significant
Within Groups	31.243720	81	0.385725			
Total	37.275567	84				

The table reflects that the age is significant on the motivation and level of satisfaction of the HEI in Manila graduate students in pursuing graduate studies, but it is not significant in relations to difficulties encountered as perceived by the respondents since the computed F-values of 2.8595 and 5.2125, respectively are greater than the tabular value of 2.49 at 0.5 level of significance while the difficulties encountered by the graduate students is 0.4493 which is less than the tabular value at the same degrees of freedom.

The results imply that respondents with different age brackets do not have different perceptions in pursuing graduate studies maybe because striving for higher educational degree beyond baccalaureate course may possible secured at any particular time in one’s life. Hence, age is not a determining factor in pursuing graduate studies.

Table 8 presents the computed F – value of the perceptions of the respondents in pursuing graduate studies with respect to length of service.

Table 8. Computed F-values on the Difference Between the Perceptions of the Respondents in Pursuing Graduate Studies with Respect to Length of Service

	SS	df	MS	F-value	Ho	Interpretation
a.Between Groups	3.233054	3	0.646610	2.192961	A	Not Significant
Within Groups	23.293490	81	0.294854			
Total	26.526544	84				
b.Between Groups	1.915925	3	0.383185	2.192984	A	Not Significant
Within Groups	67.069360	81	0.848979			
Total	68.985285	84				
c.Between Groups	5.152674	3	1.030535	2.5344	R	Significant
Within Groups	32.122890	81	0.406619			
Total	37.275564	84				

The table reflects that the length of service is not significant on the motivation and difficulty items in pursuing graduate studies as perceived by the respondents since the computed F-values of 2.192961 and 2.192984 respectively is less than the tabular value of 2.49 at 0.5 level of significance. While the length of service is significant on the level of satisfaction, thus rejecting the null hypothesis.

The results imply that the perceptions of the respondents who are new in the service and those who have served in the institution for a couple of decades are motivated to attend and experienced difficulties at the same time but their satisfaction level differ. This may be due to the fact that respondents who are new in the service are more ambitious, assertive and goal oriented.

Table 9 presents the computed F – value of the perceptions of the respondents in pursuing graduate studies with respect to nature of work.

Table 9. Computed F-values on the Difference Between the Perceptions of the Respondents in Pursuing Graduate Studies with Respect to Nature of Work

	SS	df	MS	F-value	Ho	Interpretation
a. Between Groups	1.086	3	0.362	0.44	A	Not Significant
Within Groups	66.582	81	0.822			
Total	67.668	84				
b. Between Groups	0.0705	3	0.0235	0.05	A	Not Significant
Within Groups	37.3815	81	0.4615			
Total	37.4520	84				
c. Between Groups	0.216	3	0.072	0.10	A	Not Significant
Within Groups	57.996	81	0.716			
Total	58.212	84				

The table reflects that the nature of work is not significant on the motivation, difficulty items and level of satisfaction of faculty in pursuing graduate studies as perceived by the respondents since the computed F-values of 0.44, 0.05 and 0.10 respectively are less than the tabular value of 2.49 at 0.5 level of significance. Thus, rejected the null hypothesis. It implies that both teaching and non-teaching could have the same motivational level and experiencing similar difficulties and level of satisfaction in pursuing graduate studies.

Table 10 presents the computed F – value of the perceptions of the respondents in pursuing graduate studies with respect to program.

Table 10. Computed F-values on the Difference Between the Perceptions of the Respondents in Pursuing Graduate Studies with Respect to Program

	SS	df	MS	F-value	Ho	Interpretation
a. Between Groups	0.065592	3	0.021864	0.047542	A	Not Significant
Within Groups	37.250442	81	0.459882			
Total	37.316034	84				
b. Between Groups	0.000162	3	0.000554	0.002409	A	Not Significant
Within Groups	18.625221	81	0.229941			
Total	18.625383	84				
c. Between Groups	5.190	3	1.730	2.04	R	Significant
Within Groups	68.688	81	0.848			
Total	73.878	84				

The table reflects that the program is not significant on the motivation and difficulty items in pursuing graduate studies as perceived by the respondents since the computed F-values of 0.047542 and 0.002409 respectively is less than the tabular value of 2.49 at 0.5 level of significance. While the length of service is significant on the level of satisfaction, thus rejecting the null hypothesis.

The results imply that the perceptions of the respondents who are in the science program and those who are in the other programs other than Sciences are both motivated to attend and experienced difficulties at the same time in pursuing graduate studies but their satisfaction level differ.

V. CONCLUSION

Based on the summary of findings, the following conclusions were drawn: promotion and upgrading of qualifications are strong motivations for respondents to undergo graduate studies and opportunities to teach in the Higher Education Institution Programs or be employed on a company with high recognition; sustaining the studies and family financially and too much paperwork both in work and study hinder the respondents to pursue graduate studies; the respondent is satisfied from the benefits derived from graduate school works; the perceptions of the respondents in pursuing graduate studies are not dependent upon the aspects being perceived; and, the Higher Education Institution programs sustainability of delivering quality graduates require qualified faculty / employee equipped with appropriate educational qualifications of at least MA degree holders more so with doctorates.

VI. RECOMMENDATIONS

Based on the foregoing findings and conclusions, the following recommendations are offered: NBC #461 final print out in the case of SUCs should be published or be known to all concern in the shortest possible time so that position reclassification or promotion will be provided accordingly; respective schools/colleges/universities should allocate larger budget for faculty development especially those pursuing graduate studies and motivated faculty to handle regulated courses in general education, professional education and technology as major subjects; respective schools/colleges/universities should provide a program that will lessen faculty work load while attending on a graduate school; respective schools/colleges/universities should provide priorities to the needs of the Science Education and Science Related Programs particularly on faculty development and trainings; and, the result and findings of this study may serve as future reference for further studies in the problem or the same problem using different variables.

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Evaluation of Consumers' Satisfaction towards Rural Primary Health Care Services in Babylon Governorate

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Abstract- Study aims: To evaluate consumers' satisfaction towards rural primary health care services in Babylon Governorate, and to determine the relationship between Consumers' satisfaction towards rural primary health care services with consumers' demographic characteristics of age, gender, occupation, education and socioeconomic status.

Methodology: A descriptive study is conducted throughout the period of (October 18th 2015 to May 2nd 2016) in order to evaluate consumers' satisfaction towards rural primary health care services in Babylon Governorate. A systematic random sample of (240) consumers is selected through the use of probability sampling approach. This sample is distributed throughout three primary health care sectors according to Babylon Health Department. These sections are AL-Mahaweel, Hilla First and AL-Hashimya for primary health care sectors. A total of (12) rural primary health care centers is selected for the purpose of the study. The reliability of the questionnaire which is determined through a pilot study and the validity are achieved through a panel of (10) experts. The overall items, which are included in the questionnaire, are (48) items. These items are divided into (6) sections which include consumers' satisfaction, trust services, empathy, responsiveness, assurance and general building structure of the rural primary health care centers. Data are collected through the use of structured interview technique and the questionnaire as means for data collection. Data are analyzed through the application of descriptive statistical data analysis approach that includes, frequencies, percentages, mean of scores, and graphical presentation of data by pie-chare; and inferential statistical data analysis approach that include Chi-squared test.

Results: The study results indicate that consumers' are satisfied with the services provided at rural primary health care centers in a high proportion of satisfaction with the efficiency health services and low proportion of consumers is satisfied to certain limit with the services provided in term of general building structure of rural primary health care centers.

Conclusion: The study concludes that the consumers' are satisfied with the efficiency of health care services provided at rural primary health care centers, due to intensive monitoring and evaluation through the government policies. Also, consumers' socio-economic status and occupation have affected their satisfaction in comparison with others socio-demographic characteristic.

Recommendations: The study recommends that further studies can be conducted to involve a national level to evaluate the health care services and to compare the health care services provided at rural and urban primary health care centers. And decision makers should support the strength point in the health

care services provided at rural areas to insure that these services can meet the consumers' needs.

Index Terms- Consumers' Satisfaction, Rural Primary Health Care Services.

I. INTRODUCTION

Health services as primary care is the most frequently used in any health care system. The World Health Organization (WHO) defined that it is essential health care services made universal accessible to individuals and families in a community by means acceptable to all peoples⁽¹⁾. Health centers generally introduce health services in terms of primary care as preventive and curative services, mostly adapted to local needs. Dispensaries are aimed to be the system's first line of contact with consumers, but in some areas, health care centers or even hospitals are effectively the first points of contact with the consumers'. Dispensaries provide wider coverage for health preventive and health measures, which is a primary goal of the health policy⁽²⁾. Rural primary health care are distinct, and while countryside does provides a location disadvantage in terms of access to health care services, other social determinants of health such as socio-economic factors disadvantage are also entwined in a complex form with aspects of rural living⁽³⁾. Rural primary health services are very different to their urban counterparts. They are generally smaller and are more dependent on primary health care services including general health and community health care. In additions, these services have less infrastructure and provides support to a more populations in dispersed places⁽⁴⁾. The satisfaction of consumers for health services and, therefore, has become one of the importance in providing an acceptable quality of health care elements. So that the use of services is proof of the satisfaction with the health care services provided, it is also necessary if the clients to take advantage of the services, and compliance with treatments and maintain an ongoing relationship with practitioners⁽⁵⁾. Measuring consumers' satisfaction has become an integral part of strategies management of primary health care centers services, all over the world. Moreover, quality assurance and accreditation process in most countries to be measured consumers' satisfaction on a regular basis concerning health care needs⁽⁶⁾. Consumers' satisfaction is adopted where satisfaction is achieved when the client's or user's perception of quality of health care and services received in health care setting (in a facility and community) is positive, satisfying and meets their expectations are achieved⁽⁷⁾

Objectives

1. To evaluate consumers’ satisfaction towards rural primary health care services in Babylon Governorate.
2. To determine the relationship between consumers’ satisfaction towards rural primary health care services with consumers’ demographic characteristics of age, gender, occupation, education and socioeconomic status.

II. METHODOLOGY

Design of Study: A descriptive study, using evaluation approach, is carried out the present study. That is conducted on rural primary health care centers in Babylon Governorate for the period of October 18th 2015 to May 2nd 2016.

Setting of the Study: The study is carried out at rural primary health care centers in Babylon Governorate. These centers are distributed throughout three sectors. These sectors are AL-Mahaweel Primary Health Care Sector in North Babylon Governorate, Hilla First Primary Health Care Sector in the Middle of Babylon Governorate, and AL-Hashimya Primary Health Care Sector in the South of Babylon Governorate according to Babylon Health Department.

Sample of the Study: A systematic random sample of (240) consumer is selected throughout the use of probability sampling approach. The study sample is distributed throughout rural primary health care centers.

Study Instrument: In order to evaluate consumers satisfaction towards rural primary health care services in Babylon Governorate. A constructed questionnaire is prepared by the researcher which composed of the following:

Part I: This part contains demographical data and general information which include (primary health care sector, primary

health care center, age, gender, level of education, monthly income, occupation, and the type of services obtained by the consumers in the primary health care center.

Part II: This part is composed of (48) item and divided into (6) sections. They include: Client's Satisfaction, Trust Services, Responsiveness, Assurance, Empathy, and General Building Structure of Primary Health Care Center. These sections are composed of different numbers of items, such as (A) Client's Satisfaction which composed of (11) item, (B) Trust Services which composed of (9) item, (C) Responsiveness which composed of (6) item, (D) Assurance which composed of (6) item, (E) Empathy which composed of (5) item, and (F) General Building structure of Primary Health Care Center which composed of (11) item. These items are measured on 3-level type Liker Scale as 3 for satisfied, 2 for satisfied to certain limit, and 1 for unsatisfied.

III. STATISTICAL ANALYSIS

The statistical data analysis approach by using (SPSS-ver.20) is used in order to analyze and evaluate the data of the study. A **descriptive** statistical data analysis approach used to describe the study variables : Frequencies and Percentages.

Inferential statistical data analysis approach: used by application of the Chi-square test this test is used for determining the association between socio-demographic data and consumers' satisfaction in rural primary health care centers. Testing the significant association. For this study the significant P-value ≤ 0.05.

Results of the Study

Table (1): Distribution of Consumers by their Socio- demographic Characteristics

Socio-demographic data	Rating	Frequency	Percent
Age / years	19 - 26	65	27.1
	27 - 34	55	22.9
	35 - 42	51	21.2
	43 - 50	32	13.3
	51 -58	22	9.2
	59+	15	6.2
Gender	Male	120	50
	Female	120	50
Education	Illiterate	52	21.7
	Primary school	39	16.2
	Middle school	49	20.4
	Secondary school	27	11.2
	Diploma graduate	28	11.7
	Graduate or post-graduate	43	17.9

	Profession or honors	2	0.8
Occupation	Profession	4	1.66
	Semi-profession	10	4.17
	Shop-owner, farmer (self-employed)	103	42.92
	Skilled worker	27	11.25
	Semi-skilled worker	13	5.42
	Unskilled worker (household)	56	23.33
	Unemployed	27	11.25
Socioeconomic Status	High (26-29)	40	16.8
	Moderate (11-25)	45	18.7
	Low ($\leq 5-10$)	155	64.5
Type of services that obtained by the consumers	Pregnant Mother Care	39	16.2
	Child Care	28	11.7
	Health Promotion	26	10.8
	Immunization	41	17.1
	Family Planning	3	1.2
	Examination and Treatment	94	39.2
	Dental Care	5	2.1
	School Health	4	1.7
	Total	240	100

This table reveals that the (27.1%) of the study sample are within the second age group (19-26) years old. Regarding gender, the majority of them (50%) of the study sample is male and the remaining is female. Concerning their education, the study results indicate that (21.7%) of the study sample are illiterate. In addition to the study sample occupation, the study

results indicate that (42.9%) are shop-owner, farmer (self-employed). Regarding socioeconomic status, the study indicates that (64.5%) are low socio-economic status ($\leq 5-10$). Finally, the study results indicate that (39.2%) of the consumers visits the primary health care centers for examination and treatment.

Table (2): Distribution of Consumers by their Overall Responses to the Health Care Services Provided at Rural Primary Health Care Centers

	Rating	Frequency	Percent	M.S.	Evaluation
Consumers overall responses to the health care services	Unsatisfied	4	1.7	2.58	Satisfied
	Satisfied to certain limit	45	18.8		
	Satisfied	191	79.5		
	Total	240	100		

M.S.= Mean of score, Cut off point (0.66), unsatisfied (mean of score 1-1.66), satisfied to what limit (mean of score 1.67-2.33), satisfied (mean of score 2.34 and more).

This table depicts that the majority of the consumers are satisfied with the health care services provided at rural primary health care centers (79.5 %).

Table (3): Statistical Association between the Consumers Overall Responses to the Health Care Services Provided at the Rural Primary Health Care Centers and their Socio-demographic Data

Demographic data	Scale	Overall satisfied			χ^2	d. f	P-value
		Unsatisfied	Satisfied to certain limit	Satisfied			
Age (years)	19 - 26	5	10	50	17.100	12	0.146 NS
	27 - 34	1	3	51			
	35 - 42	5	1	45			
	43 - 50	3	1	28			
	51 -58	2	1	19			
	59+	0	0	15			
Gender	Male	9	8	103	0.269	2	0.874 NS
	Female	7	8	105			
Education	Illiterate	4	5	43	10.491	10	0.399 NS
	Primary school	0	0	39			
	Middle school	5	4	40			
	Secondary school	1	1	25			
	Diploma graduate	3	3	22			
	Graduate or post-graduate	3	3	39			
	Profession or honors	0	0	0			
Socioeconomic Status	High (26-29)	5	10	20	25.45	4	0.045 S
	Moderate (11-25)	4	43	13			
	Low (less than 5-10)	34	46	55			
Occupation	Profession	3	3	45	27.751	12	0.006 HS
	Semi-profession	9	4	90			
	Shop-owner, farmer (self-employed)	2	2	12			
	Skilled worker	0	1	26			
	Semi-skilled worker	1	0	12			
	Unskilled worker (household)	0	2	1			
	Profession	1	4	22			

Continues...
To be continued

Type of services	Pregnant Mother Care	1	5	33	15.861	14	0.322 NS
	Child Care	3	1	24			
	Health Promotion	0	2	24			
	Immunization	0	3	38			
	family planning	0	0	3			
	Examination and Treatment	11	5	78			
	dental Care	1	0	4			
	School Health	0	0	4			

χ^2 = Chi-square, D.f.= Degree of freedom, P-value= Probability value

This table presents that there is a non-significant association between the consumers' satisfaction with health care services and their demographic data at p-value more than 0.05, except with their socioeconomic status, which has a significant association with consumers' satisfaction at p. value less than 0.05. Also the study results indicate that occupation has a high-significant association consumers' satisfaction at p-value less than 0.01.

IV. DISCUSSION OF THE STUDY RESULTS

Part I: Discussion of the Socio Demographic Characteristics for the Consumers of Health Care Services.

The study results indicate that the majority of the study sample is within the second age group (19-26) years old. Regarding the socioeconomic status, the study results indicate that most of the study sample have low socioeconomic status. The present study is concurrent with Jiang and others (2009) who have studied the consumers satisfaction with public health care services in China. They find that most of the consumers are (19-25) years old, and low socio-economic status⁽⁸⁾. The study results indicate that the (50%) of the study sample is male and the remaining is female. In a study of Gadalla and others (2003) the results indicates that the majority of those reviewing to primary health care centers is female (61%)⁽⁹⁾. In another study of Almoajel and others (2014) who have studied patients satisfaction with primary health care in Jubail City, Saudi Arabia. Their findings indicates that the two-third of the study sample is male (73.5%) and the remaining is female⁽¹⁰⁾. Regarding to the study sample occupation, the study results indicate that more of them are shop-owner and farmer (self-employed). A study of Ganguly and Sharma (2014) who have studied the clients' satisfaction with quality of health care services in rural areas, their findings indicate that the majority of the study sample are within (19-26) years old, and the majority of them are free workers⁽¹¹⁾. Concerning their education, the study results indicate that most of the study sample is illiterates. In a study of Salem (2010) who has studied patient satisfaction with primary health care services in Qassim Province, Saudia Arabia. A cross-sectional study design which are conducted on (1360) subject who have attended primary health care centers in Qassim province. They are selected randomly using systematic random sample, and the data collected by well trained investigators. Their findings indicate that most of the sample are illiterates (not able to read and write)⁽¹²⁾. Among the study sample, results

indicate that most of the consumers have visited the primary health care centers for examination and treatment, because inexpensive health care services. These results come consistent with the study of Rasheed and others (2012) who have studied consumers' satisfaction and perception about quality of health care at primary health care centers in India. A cross-sectional study is conducted on (400) participants with interview technique, for the period of May to November 2010. Their results indicate that (89%) of the respondents are reviewed for examination and treatment services provided at primary health care centers in comparison to other health care facilities⁽¹³⁾.

Part II: Discussion of the Consumers Satisfaction with Efficiency of the Services

Based on the statistical cut off point, the study results indicate that the (79.5%) overall consumers' responses are satisfied with the efficiency of the health care services provided at rural primary health care centers in Babylon Governorate. In a study of Nketiah-Amponsah and Hiemenz (2009) have studied the overall level of satisfaction associated with the choice of a health care providers. They find that the consumers are satisfied with the health care services provided at the health care centers⁽¹⁴⁾. In a study of Mohanraj (2015) has assessed primary health centers services and client's satisfaction. A cross-sectional study is conducted throughout (10) primary health care centers which are selected randomly. The sample includes (300) subject who are interviewed by the use of constructed questionnaire that is used as tool for collecting participants data. Their results indicate that most of the clients are satisfied with the health care services and various facilities introduced by the primary health centers.⁽¹⁵⁾

Part III: Discussion of the Relationship between the Demographic Data and the Consumers Overall Evaluation the Health Care Services Provided at the Health Care Centers

The findings depict that there is a non-significant association between the consumers' satisfaction with health care services and their demographic data at p-value more than (0.05) except with their socioeconomic status and occupation. A study of [Xesfingi](#) and [Vozikis](#) (2016) have studied the patient satisfaction with the healthcare system: Assessing the impact of socio-economic and health care provision factors. Their empirical analysis covers (31) countries for the years 2007, 2008,

2009 and 2012. The dependent variable, the satisfaction index, is defined as the patient satisfaction of their country's health system. They first construct an index of patients' satisfaction and then, at a second stage, this index related to socio-economic and healthcare provision variables. Their findings indicate that socio-economic variables are related to patients' satisfaction ⁽¹⁶⁾. Abodunrin and others (2014) have studied the satisfaction with quality of health care received among mothers attending infant welfare clinics in a semi-urban community in Southwestern Nigeria. Their findings indicate that there is statistically significant associations between the level of satisfaction of the respondents and their occupations ($p = 0.044$) ⁽¹⁷⁾. Furthermore Jiang and others (2009) who have studied the consumers' satisfaction with public health care services in China. They find that most socio-demographic characteristic, including age, gender, income, education, residency and health status are insignificant in explaining the respondents' probability of being satisfied with public health care services ⁽⁸⁾.

V. CONCLUSIONS

The study concluded that the overall health care services provided at rural primary health care centers is efficient due to intensive monitoring and evaluation through the government policies of Babylon Health Directorate. Also, consumers' socio-economic status and occupation have affected their satisfaction.

VI. RECOMMENDATIONS

The study recommends further studies that can be conducted to involve a national level to evaluate the health care services and to compare the health care services provided at rural and urban primary health care centers. Also, decision makers should support the strength point in the health care services provided at rural areas to insure that these services can meet the consumers'

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A Theoretical Framework for Enhanced Forecasting of Electrical Loads

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Abstract- Forecasting of electrical load is vital in electrical sector; it helps in the process of planning periodical operations and facility expansion. In the deregulated economy, it has many applications which include energy purchasing, and generation, load switching, contract evaluation and infrastructure development. Therefore finding the most appropriate forecasting method for a specific electricity network is not an easy task. Although many forecasting methods were developed none can be generalized for all load patterns. This paper presents a framework of various approaches to optimize the forecasting of electrical loads.

Index Terms- Forecasting, Electrical load, long term forecast, medium term forecast, short term forecast.

I. INTRODUCTION

Electrical load forecasting is the prediction and projection of peak load demand levels and over all energy consumption patterns that supports an electric utility future system and business operation [1]. It estimates what the load will be throughout the day, week, year, and next year or even in a decade. Electrical load forecasting provides a projection of electric energy peak, customer counts and energy demand within an area covering a period into the future to provide a good lead time for planning so that the utility company can arrange additions of equipment in a timely and efficient manner.

Optimization of forecasting of electrical loads is one which requires an alternative with the most cost effective or highest achievable performance under given constraints by maximizing desired factors and minimizing undersized ones. Electrical load forecasting can be divided into three categories: short-term forecasts which are usually from one hour to one week, medium forecasts, usually from a week to a year, and long term forecasts which are longer than a year [2]. Long-term local forecasts are very important during national development plan that can be as long as 25 years. Short-term forecasts are used to schedule the generation and transmission of electricity. Medium-term forecasts are used to schedule the fuel purchases. Long-term forecasts are used to develop the power supply and delivery system (generation units, transmission system, and distribution system) [3].

Most forecasting methods use statistical techniques or artificial intelligence algorithms such as regression, neural networks, fuzzy logic, and expert systems. Two of the methods, so-called end-use and econometric approach are broadly used for medium- and long-term forecasting. A variety of methods, which

include the so-called similar day approach, various regression models, time series, neural networks, statistical learning algorithms, fuzzy logic, and expert systems, have been developed for short-term forecasting. As we see, a large variety of mathematical methods and ideas have been used for load forecasting [2].

II. IMPORTANT FACTORS FOR FORECASTING OF ELECTRICAL LOAD

For short-term load forecasting several factors should be considered, such as time factors, weather data, and possible customers' classes. The medium- and long-term forecasts take into account the historical load and weather data, the number of customers in different categories, the appliances in the area and their characteristics including age, the economic and demographic data and their forecasts, the appliance sales data, and other factors. The time factors include the time of the year, the day of the week, and the hour of the day. The load on different weekdays also can behave differently. For example, Mondays and Fridays being adjacent to weekends, may have structurally different loads than Tuesday through Thursday. This is particularly true during the summer time. Holidays are more difficult to forecast than non-holidays because of their relative infrequent occurrence.

Weather conditions influence the load. In fact, forecasted weather parameters are the most important factors in short-term load forecasts. Various weather variables could be considered for load forecasting. Temperature and humidity are the most commonly used load predictors.

Most electric utilities serve customers of different types such as residential, commercial, and industrial. The electric usage pattern is different for customers that belong to different classes but is somewhat alike for customers within each class. Therefore, most utilities distinguish load behavior on a class-by-class basis [4].

III. VARIOUS METHODS OF ELECTRICAL LOAD FORECASTING.

The categories of load forecasting includes short-term, medium-term and long-term covering an hour to one week, a week to a year and from one year to 3 years or even 10 years or more; respectively.

3.1 Methods Developed for Short-Term Load Forecast :-
This approach is based on searching the historical data for days with similar characteristics such as weather, day of the

week and the date. In daily forecast in a week, the electricity consumption in normal working days is expected to be of high demand between 7.00pm to 11.00pm and lowest between mid-nights and 3.00am the next morning. The lowest electrical power demand is recorded between February to May because of dry season but demand appreciated from June and got to apex by August to September when the raining season and cold are at highest [2].

3.1.1 Regression Load Forecasting Method:- This is one of the most widely used statistical techniques employed in electric load forecasting to model the relationship of load consumption in relation to weather, type of day and customer class.

In [5], we see several regression models for the next day peak forecasting; incorporating deterministic influences such as holidays, stochastic influences like average loads and exogenous influences such as weather.

3.1.2 Time Series Load Forecasting Method:- This method is based on the assumption that the data have an internal structure, such as autocorrelation, trend, or seasonal variation; which it detects and explores. Load generally depends on the weather and time of day; therefore autoregressive integrated moving average of time series method is the most natural tool for load forecasting among the classical time series models [6].

3.1.3 Neural Network Short-Term Load Forecasting (NNSTLF) Method:-This method can also be called artificial neural networks and are essentially non-linear circuits that have the ability to do non-linear curve fitting. The outputs of an artificial neural network are some linear or non-linear mathematical function of its inputs. The most popular Artificial Neural Network architecture for electric load forecasting is back propagation. Back propagation neural networks use continuously valued functions and supervised learning [7]. Further, a multi-layered feed forward Artificial Neural Networks for Short-Time Load Forecasting system was developed and implemented by [8]. In the model, three types of variables are used as inputs to the neural network: season related inputs, weather related inputs, and historical loads.

3.1.4 Expert System Load Forecasting Method:-This load forecasting method incorporates rules and procedures used by human experts in the field of interest into software that is then able to automatically make forecasts without human assistance [7]. Rule based forecasting makes use of rules, which often heuristic in nature, to do accurate forecasting. This rule base is complemented by a parameter database that varies from site to site but with low forecasting errors.

3.1.5 Fuzzy Logic Short-Term Forecasting Method:-Fuzzy logic is a generalization of the usual Boolean logic used for digital circuit design. An input under Boolean logic takes on a truth value of “0” or “1”. Fuzzy logic is basically a multi valued logic that allows intermediate values to be defined between conventional evaluations like “yes” and no”, “true” and “false” to

include a more human-like way of thinking in the programming of computer. [9].

3.1.6 Statistical Learning Algorithms for Short-term Forecasting:- Statistical approaches usually require a mathematical model that represents load as function of different factors such as time, weather, and customer class. The development, improvements, and investigation of the appropriate mathematical tools led to the development of more accurate load forecasting techniques that was lacking in the other entire short-term load forecasting methods [10] discussed above.

Two important categories of mathematical models are: additive models and multiplication models. The former is when the forecast load is the sum of a number of components and the latter represents the product of a number of factors [11]. In their work [11] presented an additive model that takes the form of predicting load as the function of four components:

$$L = L_n + L_w + L_s + L_r \text{ ----- (2.1)}$$

Where, L is the total load, L_n represents the “normal” part of the load, which is a set of standardized load shapes for each “type” of day that has been identified as occurring throughout the year (Similar day Approach), L_w represents the weather sensitive part of the load, L_s is a special event component that creates a substandard deviation from the usual load pattern and L_r is a random noise component. They also suggested electricity pricing as additional term that can be included in the model. Therefore giving

$$L = L_n + L_w + L_s + L_r + L_p \text{ ----- (2.2)}$$

Where, L_p represents electricity price

Naturally, price fluctuation affects electricity consumption. It was reported that accurate estimates were achieved more quickly with the inclusion of price data.

The second category is the multiplication model of the form [12]

$$L = L_n \cdot F_w \cdot F_s \cdot F_r \text{ ---- (2.3)}$$

Where, L_n is the normal (base) load and the correction factors, F_w , F_s and F_r are positive numbers that can increase or decrease the overall load, F_w represents current weather, F_s represents special events, and F_r represents random fluctuation, F_p for electricity pricing and F_g for load growth can also be included to have;

$$\therefore L = L_n \cdot F_w \cdot F_s \cdot F_r \cdot F_p \cdot F_g \text{ ----- (2.4)}$$

3.1.7 Support Vector Machines (SVMs):- Support vector Machines are a more recent powerful technique for solving classification and regression problems. It was originated from Vapnik’s statistical learning theory [10]. The SVMs use simple linear functions to create linear decision boundaries in the new space. It has the advantages of performing a non linear mapping of the input data into a high dimensional space employing kernel function [13].

3.2 Medium – Term Load Forecasting (MTLF) Methods

3.2.1 End-Use Method of Load Forecasting:- This model involve direct estimates of energy consumption considering using extensive information on end-use appliances, their age, sizes of houses, end-use customers, customer behavior, population dynamics and technological changes.

The end-use models focus on the various uses of electricity in the residential, commercial, and industrial sector. These models are based on the principle that electricity demand is derived from customer’s demand for high cooling, heating, refrigeration, etc. In effects, end-use models explain energy demand as a function of the number of appliances in the market [14].

Ideally, this end-use approach is very accurate but has the disadvantage of being sensitive to the amount and quality of end-use data.

3.2.2 Econometric method of load forecasting

This approach combines both economic theory and statistical techniques for forecasting electricity demand. It estimates the relationships between energy consumptions (dependent variables) and factors influencing consumption. The relationship of these two factors is estimated by the least squares method or time series methods. Historical energy and peak demand models were classified by methodology (statistical econometric end-use analysis) and demand class (residential, commercial, and industrial).. The other factors to be considered that influence consumption are weather, economic and other variables [15].

This approach is accurate since estimates are assembled using recent historical data. However, integration of the econometric approach into the end-use approach introduces behavioural components into the end-use equations and this is its disadvantage.

3.2.3 Statistical Model-based Learning

The end use and econometric methods above require a large amount of information relevant to appliances, customers, econometrics, etc making the application very complicated and requires human participation. In addition such information is often not available regarding particular customers, resulting in the use of an “average” customer or average customers for different type of customers. Therefore, the characteristics for particular area may be different from the utility which may not be available resulting in average value use [16] [17].

$$L(t) = F(d(t), h(t)) \cdot f(w(t)) + R(t) \text{ ----- (2.5)}$$

Where, $L(t)$ is the actual load of time t , $d(t)$ is the day of the week, $h(t)$ is the hour of the day, $f(d, h)$ is the daily and hourly component, $w(t)$ is the weather data that include the temperature and humidity, $f(w)$ is the weather factor and $R(t)$ is the random error.

The $w(t)$ is a vector that consists of the current and lagged weather variables which reflects not only the current weather conditions but also on the weather during previous hours and days.

To estimate the weather factor $f(w)$, the regression model is used.
 $f(w) = \beta_0 + \sum \beta_i x_i \text{ ----- (2.6)}$

Where, β_0, β_i are the regression coefficients and x_i are explanatory variables which are non linear functions of current and past weather parameters.

3.3 Long – Term Load Forecasting (LTLF) Method

Long term electric load demand forecasting spans from one year through three years to fifteen years and presents the first step in planning and developing future generation, transmission and distribution facilities in a power system [18].

Accurate long-term demand forecasting plays an essential role for electric power system planning. It ensures load demand forecasting to have enough time to plan for long-term maintenance, construction scheduling for developing new generation facilities, purchasing of generating units, developing transmission and distribution systems.

Unfortunately, it is difficult to forecast load demand accurately over a long planning period of several years [19] [20].

3.3.1 Trend Analysis in Long Term Load Forecasting:-

This method extends past rates of electricity demand to the future. It focuses on past changes or movements in electricity demand and uses them to predict future changes in electricity demand. The advantage of trend analysis is that, it is simple, quick and inexpensive to perform but have the disadvantage of producing only one result, the future electricity demand [21].

3.3.2 End-Use Models in Long-Term Load Forecasting:-

This method has been explained earlier in the medium term load forecasting methods. End-use forecasting method predicts the energy consumptions and the load factor could be calculated thus:

$$\begin{aligned} \text{Load factor} &= \frac{\text{Average – Load Demand}}{\text{Peak – Load}} \\ \text{Demand} &= \frac{\text{Annual Kwh Energy}}{\text{Peak – Load Demand} \times 8760 \text{ hrs/years} \text{----}} \end{aligned} \text{ (2.7)}$$

The long-term end use forecasting method has the disadvantage that most end-use models assume a constant relationship between electricity and end-use (electricity per appliance).

3.3.3 Econometric Model of Long-Term Forecasting:-

This method has been explained earlier in the medium term load forecasting methods. The advantage is that it provides detailed information on future electricity demand increases, and also on how electricity demand is affected by all the various factors [2], [22] and [23].

3.3.4 Artificial Intelligence Based Methods:

Artificial Neural Networks (ANNs), have succeeded in several power system problems, such as planning, control, analysis, protection, design, load forecasting, security analysis,

and fault diagnosis. The ANNs ability in mapping complex non-linear relationships is responsible for the growing number of its application to load forecasting [24] [25].

The design of neural network architecture involves decision making on type, size, and number of neural networks being used [26].

The result of output ANNs is

$$Y_i = \sum_{i=1}^n W_i X_i \dots \dots \dots (2.7)$$

Where $i = 1, 2, \dots, n$, X_i is input, W_i is weight of network, and Y_i is one of the ANNs output

3.3.5 Wavelet Networks:- This wavelet theory provides powerful and flexible tool to decompose load data into different frequency components, making it possible to analyze the characteristics of each component and improve forecasting accuracy. Wavelet packet analysis is the extension of wavelet analysis and it has better frequency resolution [27], it utilizes the periodicities of past load demand data.

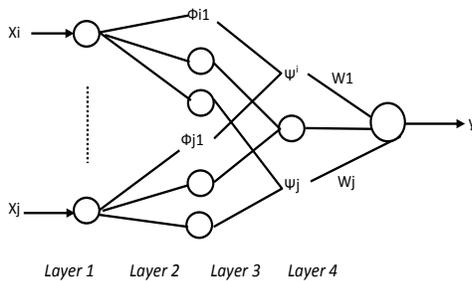


Fig. 1: Schematic diagram of Wavelet Network

For accurate forecast to be in place, the wavelet network must:

1. Select proper wavelet function for load forecasting.
2. Avoid border distortion during wavelet transform.

It has the advantage of not spanning inputs and has better accuracy of model than multilayer neural networks. It overcomes the shortcoming of single train set of fuzzy rules and therefore improves effectively the forecast accuracy and speed [28]. Also it overcomes the shortcoming of single train set of ANNs and hence improves effectively the forecast accuracy and speed [28].

3.3.6 Genetic Algorithms: Long-Term Load Forecasting

Genetic Algorithms (GAS) as robust stochastic search algorithm have been successfully applied in various areas such as, load flow problems, fault detection, stability analysis, economic dispatch, power system control and Successful load demand forecasting with a low error rate [29] [30].

Some of the attractive features of GAs are, learning, generic code structure, optimality of the solutions and advanced operators. The GAs approach presented is employed to find the optimum values of the state vector that minimizes the absolute summation of the forecasting error $r(t)$. in order to emphasize the

“best” string and speed up convergence of the iteration procedure, fitness is normalized into range between Q and I. The fitness function (ff) adopted is [30]

$$ff = \frac{1}{1 + k \sum_{k=1}^m |r(t)|} \dots \dots \dots (2.9)$$

Where, k is a scaling constant (for example, $k = 0.0001$) others to be selected are site of population, probability of cross over and probability of mutation.

$r(t)$ is the error vector associated with, With $r(t)$, we can calculate the load demand forecasting by the following equation;

$$P(t) = a_0 + \sum_{i=1}^n a_i t^i + r(t) \dots \dots \dots (2.10)$$

Where $P(t)$ is the Peak load demand of time t , a_0, a_i are regression coefficients relating the load demand $P(t)$ to the time t , $r(t)$ is the residual load at year (t)

3.3.7 Support Vector Machine (SVM) Long-Term Load Forecasting Method:-

it is a useful technique for data classification in load forecasting. it has a challenging task because of the complex relationships between load and factors affecting load[31]. SVMs have been extended to solve non linear regression estimation problems [32].

The support vector machine (SVM) through the superior performance of Recurrent support vector Machine with genetic algorithms model has non-linear mapping capabilities and can more easily capture electricity load data patterns than can the ANN and regression models and improves the generalization performance compared to the ANN and regression models.

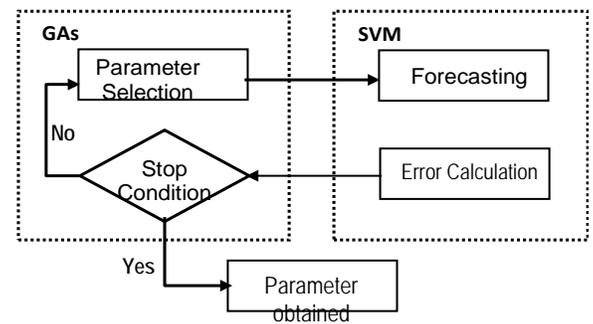


Fig. 2: Architecture of SVMG.

3.3.8 Fuzzy Logic Model of Long-Term Load Forecasting Method:-

is a rule based systems in which a set of fuzzy rules represents a control decision mechanism to adjust the effects of certain stimulus such as load data. [33]. The fuzzy logic model provides an algorithm, which can convert the linguistic strategy based on expert knowledge into an automatic strategy. The fuzzy rule base is composed of some rules generated from the analysis of the historical load data [32].

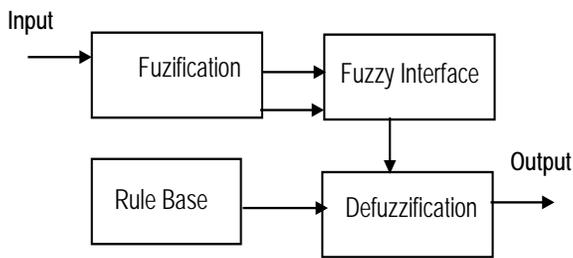


Fig. 3: Block diagram of the Fuzzy logic system

One of the applications of the fuzzy rules is an approach based on a hybrid fuzzy – neural technique which combines artificial neural network (ANN) and Fuzzy logic modeling for long-term industrial load forecasting in electrical power system. The strength of this hybrid technique lies in its ability to reduce appreciably computational time and its comparable accuracy with other modern methods[32].

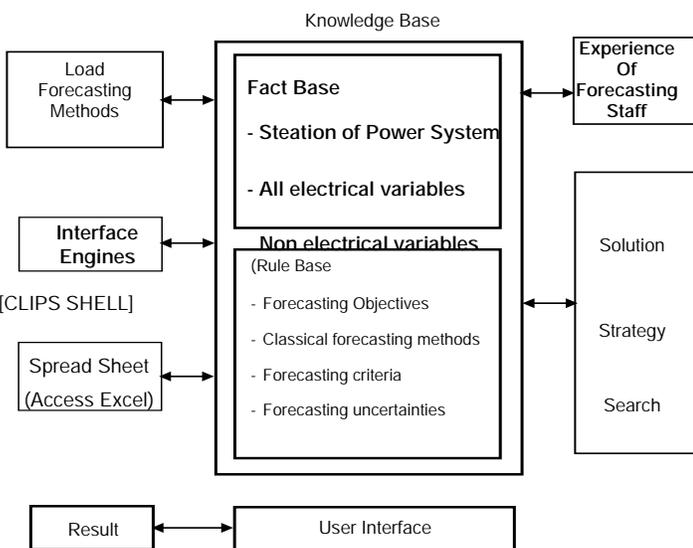


Fig. 4: Structure of ANN and Fuzzy based used

3.3.9 Expert System Method of Long-Term Load Forecasting:- It is a classical forecasting method, a long-term forecasting strategies using a knowledge – based expert system is applied to obtain the long-term load demand forecast, for typical fast growing utility as well as normal developing system [34]. The proposed expert system is applied successfully to forecasting for yearly peak load, for normal and fast developing power systems, it considers the influence of both history and future uncertain factors. Since the expert system is very flexible in updating the forecasting methods and heuristic rules, it is expected that the expert system can serve as a variable assistant to system planning in performing their annual load forecasting duties and also serve as a valuable assistant for training purpose [34].

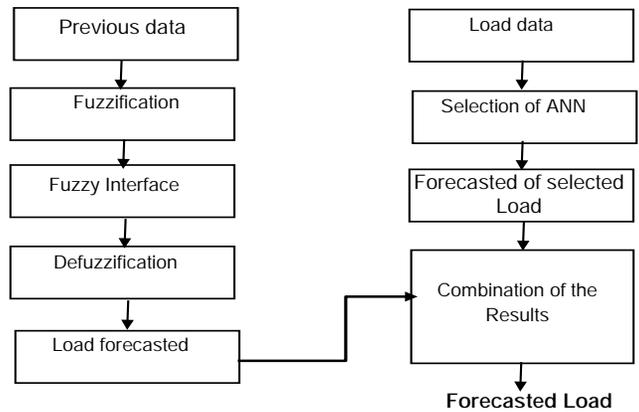


Fig. 5: Structure of Expert System Method

IV. NEW FORECASTING METHODS AND THEIR CONTRASTING FEATURES

Several statistical and artificial intelligence techniques have discussed earlier in this paper and also its development for short, medium and long term electrical load forecasting, the accuracy of the load forecasting could be improved if one would study these statistical models and develop mathematical theory that explains the convergence of the algorithms. There is no single model or algorithms that is superior for all utilities company, a better investigation on the boundaries, and the application of the developed models and algorithms must be earned out carefully. The utility Company service areas vary differently for the industrial commercial and residential customers, they also vary in geographic, climatologic, economic and social characteristics.

Selecting the most suitable algorithm by a utility can be done by testing the algorithms on real data. In fact, some utility companies use several load forecasting methods in parallel. As far as we know, nothing is known on a priority conditions that could detect which forecasting method is more suitable for a given load area. An important question is to investigate the sensitivity of the load forecasting algorithms and models to the number of customers, characteristics of the area, energy prices, and other factors.

In the short term forecasting weather seen to be the major factor that affect and influence load so the better method for forecasting in the short term of all the methods that would mentioned early to use the forecasted weather. Scenario as input in the recent development in the short term is the ensemble approach which consist of computing multiple forecast. Instead of using the single weather forecast which might not give the accurate result, the weather ensemble predictions can be used as multiple inputs for load forecasts.

While in the long term forecasting the various method mentioned early has their better advantage like the wavelet network.

The Genetic Algorithm (GA) for forecasting results to be the best by researchers because of its numerical optimization technique which indicates that the GA approach is quite

promising and deserves serious attention of its robustness and suitability for parallel implementation.

Fuzzy system as another method is normally to replace a skilled human operator with a fuzzy rule-based system. One of the applications of the fuzzy rules is to combine them with neural network to train ANN and have a better load demand forecasting.

While expert system, we can use traditional methods to forecast the peak load forecasting. The expert system is very flexible in updating the forecasting methods and heuristic rules, it is expected that the expert system can serve as a valuable assistant to system planners in performing their annual load forecasting duties.

Now there is a new method for forecasting future load without restriction to term length either long, medium or short and it's based on the principles of time series and it's the time series segmentation and decomposition. It has some additional statistical analysis which follow with the aid to the decision making based on the adopted forecasts such as probability plots [3]. This method can be shown in the diagram below:

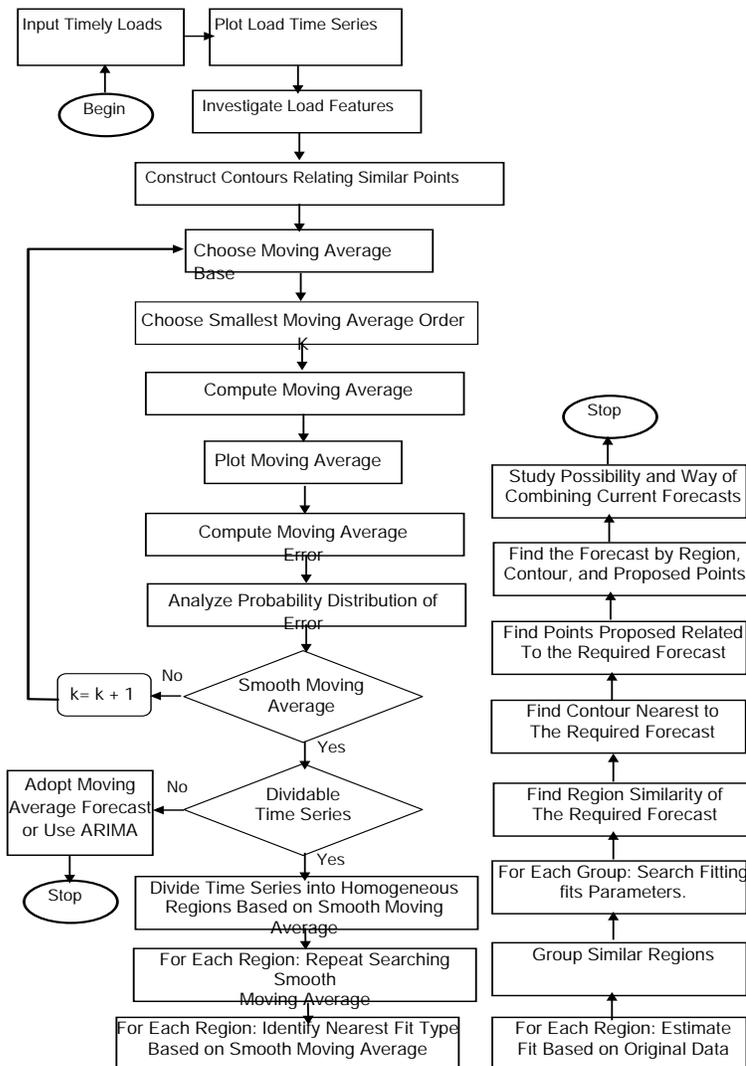


Fig. 6: Flowchart for the time series segmentation and decomposition method

V. CONCLUSION

Various method of load forecasting in the various terms (short, medium, long) were presented and it was discovered that there is no suitable method that supersedes the other in getting the best result of the forecasting. In order to get a more accurate result in load forecasting we need to study the load carefully to get the optimal result and know which statistical or/and artificial intelligence technique that should be used for electrical load forecasting. It is very important for electrical utility companies to get the accurate load forecasting that would be used in their competitive environment created by the electrical industry deregulation.

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Utilization of WRF-Chem Modelling for Barujari Mount of Volcanic Ash Distribution Analysis

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Abstract- By the development of NWP (Numerical Weather Prediction), the using of weather model is used to being done and it get better and better. Starting from a Rick Anthes' 3-layer hurricane model on 1960, a mesoscale model on 1970s, MM4 on 1980s and MM5 model on 1990s which was developed until the third version. Then WRF (Weather Research and Forecasting) launched in beta version up to now WRF was launched with different core in ARW and NMM with additional modules which is also included in WRF-Chem and WRF-Fire. WRF-Chem is a WRF Mode that has chemistry additional module which is able to simulate air quality on regional scale, on field analysis and interaction analysis between clouds and chemical particles in atmosphere. The eruption of Barujari Mount in Lombok island on 4th of November 2015 caused 3 airports was closed, they are International Airport of Lombok, Ngurah Rai Airport and Banyuwangi Airport. The height of Barujari Mount is about 2376 ms above sea level. The height of Barujari mount's eruption reached about 20,000 feet. To analyse volcanic ash spread using WRF-Chem model, we can use NCEP FNL on 3rd of November 2015 on 00.00 UTC until 5th of November 2015 on 00.00 UTC. NCEP FNL is a product from GDAs which is a global data asimilation system that is frequently collecting data from GTS. Volcanic ash spreading data from Himawari-8 is used as a comparison. From the analysis model using WRF-Chem, volcanic ash on 850 mb layer until 500 mb on spreading to South West until West area of Lombok island. It shows the conformity in spreading direction on Himawari-8 images. Even though, there are several differences with Himawari-8 where spreading direction on WRF-Chem went to West-North West and Himawari-8 satellite images showed the spreading volcanic ash moved to South West-West of Lombok island.

Keyword: WRF-Chem, Barujari Mount, Volcanic ash, Himawari-8 Satellite

I. INTRODUCTION

WRF Model (Weather Research and Forecasting) is an atmosphere model, the next generation of MM5 which was stopped for its development, this model applies meteorological research using NWP (Numerical Weather Prediction). WRF gives users a freedom to select physical process in atmosphere which is

most applicable in their research. Beside that, WRF can be run on many computer platform. This model is good for research on tens meters scale until global scale.

WRF model has 2 different cores. Even though these cores are different, they have same architecture program, they are :

- 1) ARW (Advanced Research WRF) which is developed by NCAR in MMM laboratory.
- 2) NMM (Non-hydrostatic Mesoscale Model) which is developed by NCEP.

WRF-Chem is one of development from WRF model which is combined with chemical particle or chemistry. This model is used to investigate air quality on regional scale, on field analysis, and also cloud and chemical particles interaction analysis in atmosphere.

Chemistry module on WRF-Chem is necessary for the grid emission input data. The input data is made by WPS (on dust erosion) or on real.exe (biogenic emission, GOCART, biomass burning, etc.) or it read along execution process on WRF (anthropogenic emission, volcanic emission, etc.). The emission input data creation for the atmosphere chemistry simulation becomes so complex, not all of emission selection useful for every namelist selection on WRF-Chem. A user has to be able to modify the script and configure it to get the best model.

WRF-Chem has 5 scheme in aerosol handling, they are :

- 1) Efficient aerosol scheme from GOCART (Georgia Tech/Goddard Global Ozone Chemistry Aerosol Radiation and Transport model).
- 2) Modal Aerosol Dynamics Model for Europe – MADE
- 3) Model for Simulating Aerosol Interactions and Chemistry (MOSAIC).
- 4) MAM – Modal Aerosol Model from CAM5
- 5) Volcanic dust aerosol division scheme (bin)

Based on the using of WRF-Chem for volcanic ash spreading, then it uses volcanic dust spreading 10-scheme bin aerosol. This scheme could analyze the moving, precipitation and dry deposition of volcanic ash. This scheme can also be combined with or without another aerosol scheme. In these scheme there are 1535 mount database in the world (Latitude, Longitude, and Height of mount).

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These are the classification for 10-bin scheme volcanic ash in WRF-Chem :

Table I. Classification of 10-bin scheme volcanic ash

Particle Size Bin	Phi	% of mass
1 – 2mm	-1 – 0	2
0.5 – 1 mm	0 – 1	4
0.25 – 0.5 mm	1 – 2	11
125 – 250 μm	2 – 3	9
62.5 – 125 μm	3 – 4	9
31.25 – 62.5 μm	4 – 5	1
15.625 – 31.25 μm	5 – 6	16
7.8125 – 15.625 μm	6 – 7	16
3.9065 – 7.8125 μm	7 – 8	10
< 3.9 μm	> 8	10

This research is held to use WRF-Chem model as a model that can simulate and analyse volcanic ash spreading on Barujari Mount in 4th of November 2015. Barujari mount is a part of Rinjani Mount in Lombok island, West Nusa Tenggara, Indonesia. Volcanic ash spreading on 4th of November 2015 moved to West and caused the airports in Lombok, Denpasar and Banyuwangi was closed.

WRF-Chem is hopefully able to analyse and predict volcanic ash spreading in the next day so that it can give earlier and more accurate information on decision making by authorized institution.

II. DATA AND METHODS

This research uses several data, they are :

- 1) NCEP FNL data on November 3–5, 2015 from <http://rda.ucar.edu/datasets/ds083.2/index.html#sfol-wl-/data/ds083.2?g=22015>
- 2) Satellite image for volcanic ash spreading on 4th of November 2015 from Himawari-8 for comparison with WRF-Chem model output.

NCEP FNL (Final) data is global analysis data that has 1° resolution in every 6 hours. This data is a product from GDAs which is a global data assimilation system that collect data from GTS (UCAR, 2016) continuously. BMKG (Indonesian Meteorological and Geophysics Agency) is also a member for this world GDAs and GTS where BMKG's data is also exchanged. This NCEP FNL data will be used for first input in WRF-Chem models.

This research uses WRF-Chem 3.61 that run on LINUX Ubuntu v.14 Operating System. The configuration domain for this research are:

Table II. WRF- Chem Domain Configuration

Input_inname	String
parent ID	1,1
parent_grid_ratio	1,3
i_parent_start	1,36
j_parent_start	1,24
e_we	100,88
e_sn	65,55
geog_data_res	30s
dx	30000,10000
dy	30000,10000
map_proj	Mercator
ref_lat	-8.479
ref_lon	116.459
truelat1	-8.479
truelat2	0
stand_lon	116.459

These are chemistry modules configuration run on WRF-Chem in this research :

Table III. WRF-Chem Configuration

Chemistry and Atmospheric Process	Model Option
Chemistry	Volcanic ash fall and concentration only
Photolysis	No photolysis
Anthropogenic Emissions	GOCART simple emissions
Biogenic Emissions	No biogenic emissions
Biomass Burning Emissions	Include biomass burning emissions and plume rise calculation
Dust Emissions	GOCART dust emissions
Aerosol Optical Properties	Aerosol optical properties calculated based upon volume approximation
Gas phase chemistry	Turn on
Aerosol chemistry	Turn on
Feedback from the aerosol	feedback from the aerosols to the radiation schemes turned on
Sub grid convective transport	Turn on

Cumulus scheme	Grell 3D
Microphysics	Lin et al. scheme
Shortwave radiation	RRTMG scheme
Longwave radiation	RRTMG scheme
Land surface model	Noah Land Surface Model
Surface-layer	MM5 similarity
Boundary-layer	Yonsei University scheme
Number of x grid points	e_we = 67, 70
Number of y grid points	e_sn = 67, 70
Map projection	Mercator
Grid point of Resolution in x (meter)	dx = 30000, 10000
Grid point of Resolution in y (meter)	dy = 30000, 10000
Central Latitude of Model Domain (degrees)	-8.479
Central Longitude of Model Domain (degrees)	116.459
Time step	180
Initial conditions	NCEP FNL Operational Model Global Tropospheric Analyses
Lateral boundary conditions	NCEP FNL Operational Model Global Tropospheric Analyses

A WRF-Chem model perform real.exe twice. The first process is performed to get meteorological data on every domain and the second process is performed to join the output fo chemistry module in every domain so that it creates the output that combine meteorological and chemistry data in one WRF-Chem model execution process. The execution process for this model can be seen in this illustration:

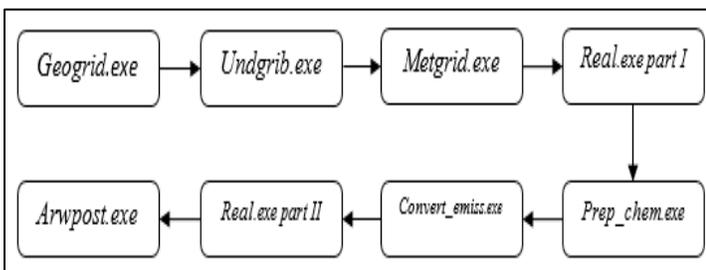


Figure 1: Flow chart for WRF-Chem modelling

After execution for data processing using WRF-Chem models, the next step is analysis using supporting image for volcanic ash image from Himawari-8.

III. ANALYSIS AND DISCUSSION

A. WRF Chem Model Analysis

On 850 mb layer (Figure 2), volcanic ash spreading moved to South West – West from the center of Barujari mount eruption.

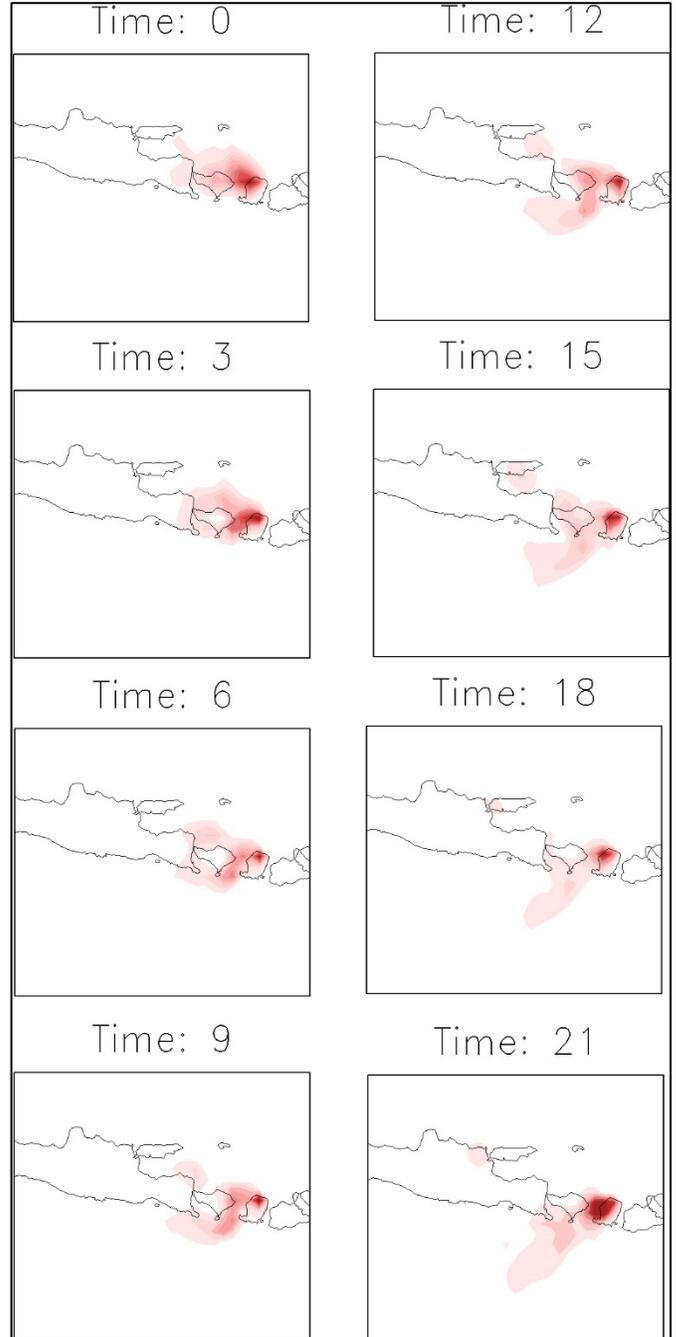


Figure 2: Volcanic Ash Spreading of Barujari mount on 4th of November 2015 on 850 hPa layer

Highest concentration was visible above Lombok island, and it dispersed to South West – West with thinner and thinner concentration by the range changing from the centre of eruption. Figure 3 shows volcanic ash spreading on 700 hPa layer mostly moved to South West from Lombok island. Volcanic ash

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concentration visible on 700 hPa layer was thicker than volcanic ash concentration on 850 hPa layer. It covered half of Bali island

especially on south on 700 hPa layer.

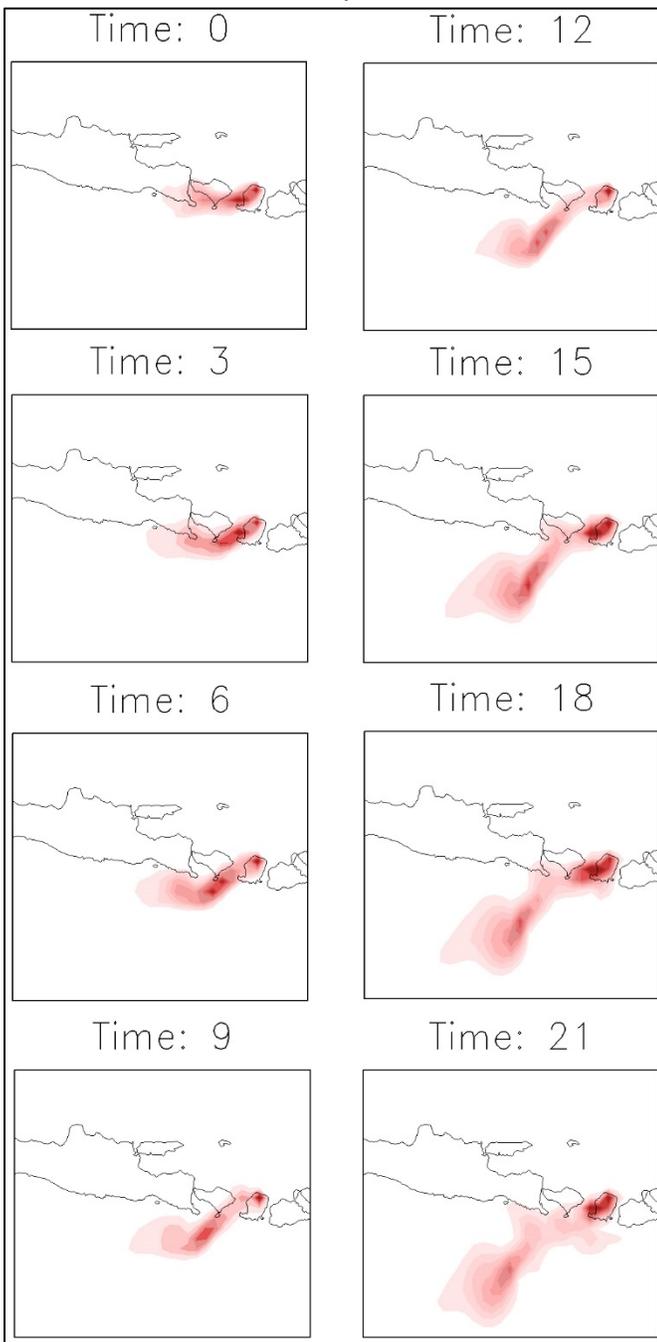


Figure 3: Volcanic Ash Spreading of Barujari mount on 4th of November 2015 on 700 hPa layer

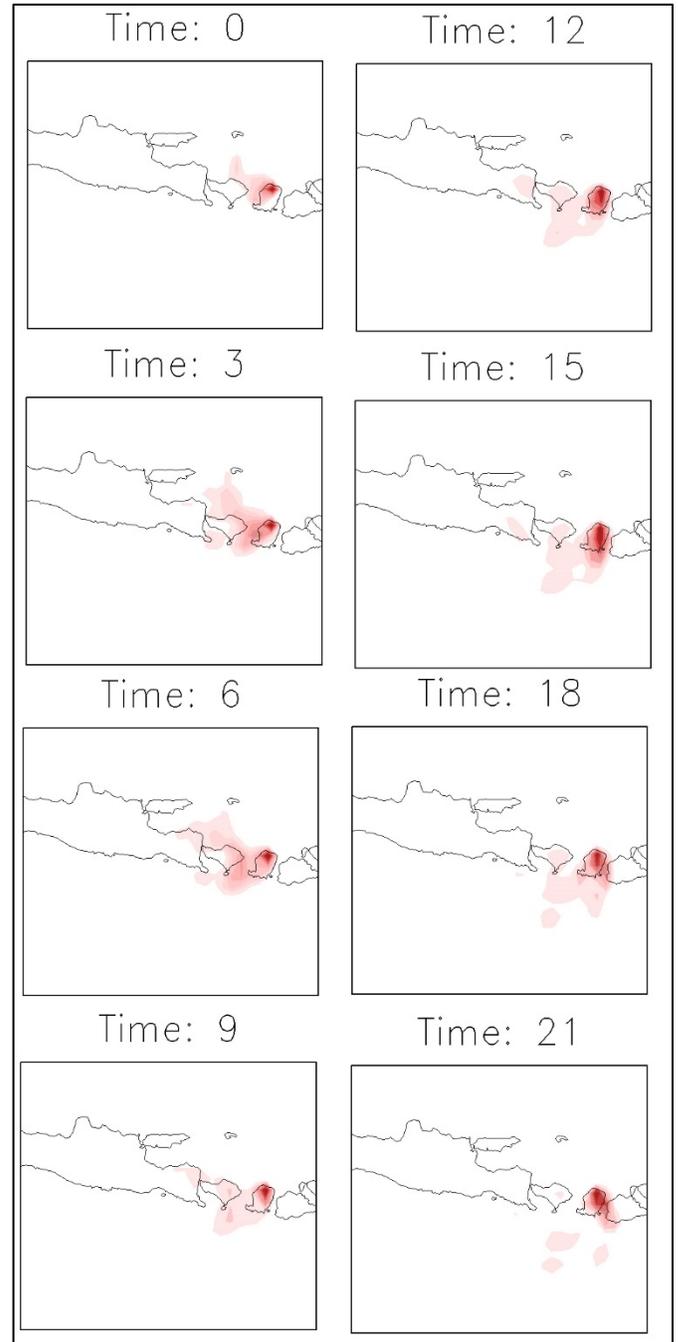


Figure 4: Volcanic Ash Spreading of Barujari mount on 4th of November 2015 on 500 hPa layer

Figure 4 shows data on 00.00 UTC to 12.00 UTC, volcanic ash spreading on 500 hPa layer mostly moved to West with the dust dispersion is concentrated more on Lombok island. Less concentration of volcanic ash covered almost all Bali island and a little area on East Java. Begin from 12.00 UTC, dispersion of dust was not so far as began to be sporadic. Thick spreading tends to cover Lombok island and dispersed less to the South of Lombok island.

Figure 5 shows image on 00.00 UTC to 12.00 UTC, volcanic ash spreading on 400 hPa layer dispersed to North West with thicker concentration until sea of Bali. It moved until Madura island. On 12.00 UTC, the spreading began to change to West in thinner spreading and began to dispersed sporadically.

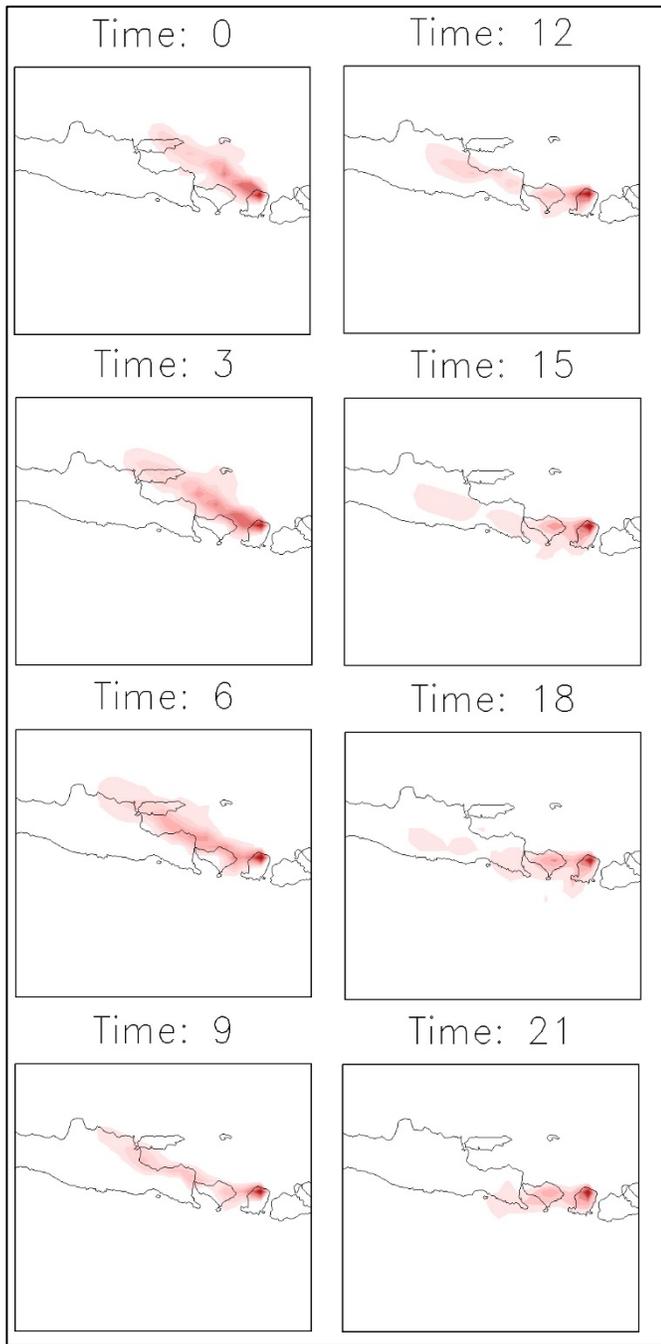


Figure 5: Volcanic Ash Spreading of Barujari mount on 4th of November 2015 on 500 hPa layer

3.2 Himawari-8 Satellite Analysis

Figure 6 at 00.00 UTC, volcanic ash spreading moved to North West – West from Lombok island. Volcanic ash covered almost all of Bali island until East Java. At 03.00 UTC and 06.00 UTC, volcanic ash was dispersed on the same direction with the direction on 00.00 UTC, but it got thicker, where pink color looked to be thicker than before. On 09.00 UTC, volcanic ash began to be dispersed, covered most of Lombok island and half of Bali island. On 15.00 UTC, volcanic ash spreading got thicker and thicker on Lombok island, it spread to most of Bali island on Southwest-West direction.

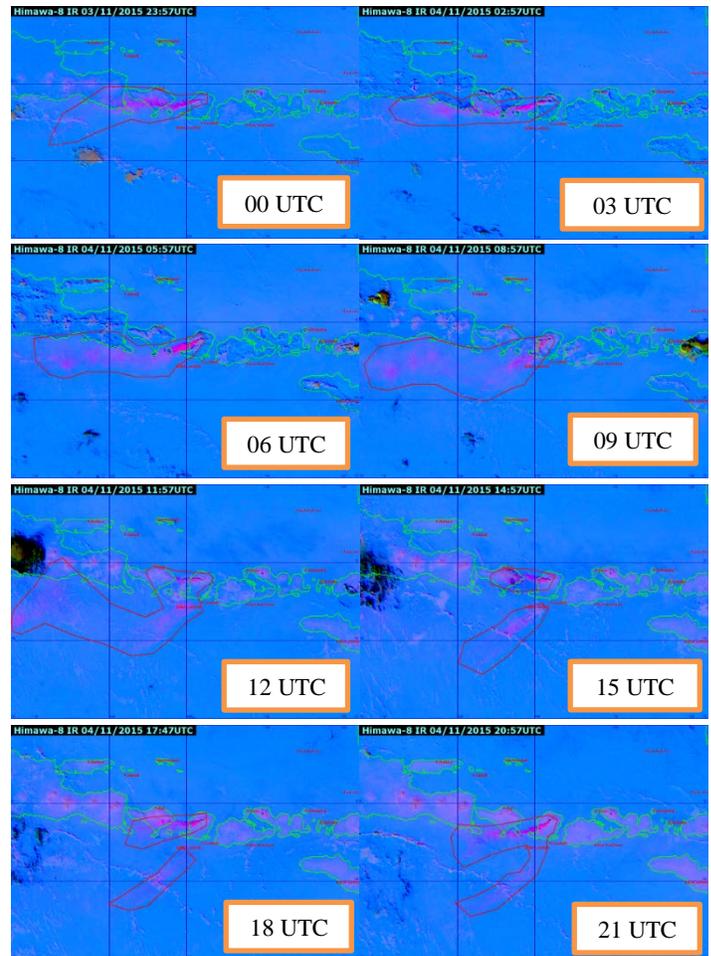


Figure 6: Volcanic ash spreading on Barujari Mount on 4th of November 2015 via Satellite Image of Himawari-8

IV. CONCLUSION

From the output of WRF-Chem modelling, volcanic ash spreading of Barujari Mount on 850 hPa, 700 hPa and 500 hPa on 4th of November 2015 was visibly moving to South West – West. Except on 400 hPa layer, the spreading of volcanic ash moved to West – Northwest.

Volcanic ash spreading on 850 hPa and 700 hPa seemed to have more dust concentration than volcanic ash spreading on 500 hPa and 400 hPa.

Volcanic ash spreading was visibly detected on Himawari-8 could be explained well on WRF-Chem model on 850 hPa and 700 hPa layer. On 500 hPa layer, the direction of its spreading has been similar to satellite image, but the spreading distance was not as far as the distance on satellite image. On 400 hPa layer, there is a difference in volcanic ash spreading direction on 00.00 UTC until 09.00 UTC where the direction on model showed spreading direction to North West, and the spreading direction on satellite image moved to West from Lombok island.

The using of WRF-Chem model is good enough to simulate volcanic ash spreading, because it is not disturbed by meteorological cloud which can cover volcanic ash, it can also detect until the smallest particles of volcanic ash which is under 3.9 μ m where this research uses its size. However, the using of WRF-Chem to find the distribution of volcanic ash needs to be

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verified with the real condition using Satellite image or visual observation.

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Decadal Pattern of Female Main and Marginal Worker Participation in India: A Spatial Evaluation

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Abstract- This paper shows the decadal pattern of work participation rate among females in India using the evidence of thirty five states and union territories of India for three census years 1991, 2001 and 2011. This study uses the census data of female main workers and marginal workers to show the work participation. It is found that after the introduction of New Economic Policy in 1991, female worker participation rates are declining, however pattern that is found from the evidences of the states and union territories in India reveals the difference in the work participation behaviour of female main and marginal workers. Though female main worker participation has been declined during both the decades of (2001-1991) and (2011-2001), the female marginal worker participation increased during (2011-2001). Available literature on female labour and work force participation find that declining female worker participation in World as well as in India is attributed to the increasing educational attendance of girls and effect of higher household incomes with the pace of economic development. To trace the causes of declining female worker participation and as well as of difference in the pattern of change of main and marginal workers, this paper reveals the pattern of work participation for two age groups. One is (5-19 years) age group which is generally consisted of the females attending education primary to higher secondary and another is the age group of (20-59) years female. Though educational factor is found to be influencing in the female worker participation of (5-19) years age group and but the paper finds that in India actually the shrinking employment opportunities for female after Economic reforms are mainly contributing to the declining female work participation rate.

Index Terms- Female Worker Participation Rate, Female Main Workers and Female Marginal Workers, Decadal change, Age groups of (5-19) years of female and (20-59) years of female

I. INTRODUCTION

Decadal Pattern of Female Main and Marginal Work Participation in India: A Spatial Evaluation **Introduction:**

Women are assigned different role to part particularly in family life from their male counterpart and this difference spread to the economic, political and social life also.

In almost every sphere of human functioning in India, the roles defined for women are subordinated to those defined for males, the rights for women are fewer or less emancipating than those of men, and women's obligations are more limiting than those of men, resulting in gender disparity at every level, cutting across all types of class and caste powerlessness [Malhotra et al., 2002].

Hence, the issue of empowerment of women or the rise of the power or capacity of women is much popular in today's world. "The empowerment of women has been widely acknowledged as an important goal in international development" [Malhotra & Schuler 2006:71]

Discrimination that is occurred towards women in terms of their economic possessions can be revealed from the fact that women perform two-thirds of the world's work, receive one-tenth of its income and own less than one-hundredth of its property (Desai and Thakkar 2001:40). The World Development Report 2012 of World Bank showed the differential behaviour between women and men regarding time use. Women devote 1 to 3 hours more a day to housework than men do; 2 to 10 times the amount of time a day to care (for children, elderly, and the sick), and 1 to 4 hours less a day to market activities. Thus, women spend large part of their day's time in economically unviable work that inhibits women's access to paid work. Economic empowerment of women comprises economic opportunities (e.g. expanding employment and entrepreneurship, promoting decent and productive work, improving access to finance); legal status and rights (e.g. improving women's property, inheritance and legal rights); and voice, inclusion and participation in decision-making (e.g. developing mechanisms to enhance women's involvement in decision-making bodies). [UNDP 2010]

Thus, women's accessibility to the economically productive work can be regarded as one of the main indicator for the economic empowerment of women. According to the Census survey, work is defined as participation in any economically productive activity with or without compensation, wages or profit and All persons engaged in 'work' are workers. Census survey of India divides workers in two main groups i.e. main and marginal workers. Those workers who had worked for the major part of the one year reference period of census (i.e. 6 months or more) are termed as main workers, while those workers who had not worked for the major part of the reference period (i.e. work for less than 6 months) are termed as marginal worker. Both main and marginal workers consist of the four main categories of workers (i.e. cultivators¹, agricultural Labourers², household industry workers³, other workers⁴)

¹ A person is classified as cultivator if he or she is engaged in cultivation of land owned or held from Government or held from private persons or institutions for

With the inception of New Economic Policy, it was expected that under the globalised economy, the situations of women in India would be better and women would get new employment opportunities. Since economic theory (Heckscher-Ohlin theorem) states that, each country produces and exports the commodity in which it uses its abundant factor intensively. Hence increased trade resulted from globalisation, should lead to the increased employment of abundant labour in the labour surplus developing country like India. The advocates of globalisation have always been of the firm view that globalisation would result in significant increases in labour intensive exports thereby promoting employment and income generation in developing countries. They put forwarded the view that larger flows of FDI would result in increased investment in Greenfield areas and would lead to accelerated direct and indirect employment and income growth in the developing countries in Washington Consensus during the 1980s. [Bhalla (2008)] There are some studies which show the positive effect of globalisation on women labour in India and argue that the employment of women during the post reform period in India is growing though not a sustained manner and not through the all the sectors of the economy. [Bhalla.(2008), Vijaya,(2014), Project Report of UNCTAD- Govt. of India- DFID Project 'Strategies and Preparedness for Trade and Globalisation in India', Patel(2014)]. There also exists ample literature which blame globalisation for increasing the level of unemployment and underemployment among women and also have given rise to many forms of discriminations in the labour market. Though some women are getting better access to the labour market but the majority are being engaged at relatively low levels of pay and skills.[Sharma(2010)]. This paper tries to show the scenario of female workers during the post reform period and to trace out the changes through the decades and the throughout the states and union territories of India. It is an effort to depict the picture of the women work participation in India during post reform period without going to analyse the factors behind the scene.

Objectives:

This study aims

- (1) To trace the decadal changes of female main and marginal workers participation rate among states and union territories in India.
- (2) To explore the cause of decadal changes in female work participation showing the age-wise differential pattern of work participation .

Female Main and Marginal Workers Participation in the States and Union Territories of India:

To depict the scenario of female work participation after the inception of Economic Reforms in 1991, the percentage of female main workers as well as female marginal workers to the total female population has been calculated in the paper. This study covers thirty five states and union territories of India using census survey data of three census years 1991, 2001 and 2011 to show the decadal changes in female worker participation throughout the twenty years period.

payment in money, kind or share. Cultivation includes effective supervision or direction in cultivation. Cultivation involves ploughing, sowing, harvesting and production of cereals and millet crops such as wheat, paddy, jowar, bajra, ragi, etc., and other crops such as sugarcane, tobacco, ground-nuts, tapioca, etc., and pulses, raw jute and kindred fibre crop, cotton, cinchona and other medicinal plants, fruit growing, vegetable growing or keeping orchards or groves, etc. Cultivation does not include the following plantation crops - tea, coffee, rubber, coconut and betel-nuts (areca).

(Census Survey)

² A person who works on another person's land for wages in money or kind or share is regarded as an agricultural labourer. She or he has no risk in the cultivation, but merely works on another person's land for wages.

³ Household Industry is defined as an industry conducted by one or more members of the household at home or within the village in rural areas and only within the precincts of the house where the household lives in urban areas.

⁴ All workers, i.e., those who have been engaged in some economic activity during the last one year, but are not cultivators or agricultural labourers or in Household Industry, are 'Other Workers(OW)'. The type of workers that come under this category of 'OW' include all government servants, municipal employees, teachers, factory workers, plantation workers, those engaged in trade, commerce, business, transport banking, mining, construction, political or social work, priests, entertainment artists, etc

Table 1: Region-wise female main workers participation in India

Name of the Regions	Percentage of female main workers in total female population				
	1991	2001	2011	Change(2001-1991)	Change(2011-2001)
India	16	15	15	-1	0
North	10	14	12	+4	-2
Delhi	7	8	10	+1	+2
Haryana	6	13	10	+7	-3
Himachal Pradesh	19	21	18	+2	-3
Jammu & Kashmir		8	6	NA	-2
Punjab	3	12	9	+9	-3
Rajasthan	13	17	18	+4	+1
Uttaranchal		16	16	NA	0
Central	15	15	15	0	0
Chhattisgarh		22	19	NA	-3
Madhya Pradesh	23	17	18	-6	+1
Uttar Pradesh	7	6	8	-1	+2
East	10	9	9	-1	0
Bihar	10	9	8	-1	-1
Jharkhand		10	10	NA	0
Orissa	12	9	9	-3	0
West Bengal	8	9	9	+1	0
North East	28	23	22	-5	-2
Arunachal Pradesh	36	28	27	-8	-1
Assam	13	10	11	-3	+1
Manipur	33	21	25	-12	+4
Meghalaya	31	24	23	-7	-1
Mizoram	34	32	28	-2	-4
Tripura	10	11	11	+1	0
Nagaland	37	30	31	-7	+1
Sikkim	29	26	24	-3	-2
West	19	17	18	-2	+1
Goa	17	15	17	-2	+2
Gujarat	14	15	13	+1	-2
Maharashtra	26	22	25	-4	+3
South	23	20	22	-3	+2
Andhra Pradesh	30	25	27	-5	+2
Karnataka	23	21	23	-2	+2
Kerala	13	11	12	-2	+1
Tamil Nadu	25	24	25	-1	+1
Others Union Territories	14	14	12	0	-2
ANDAMAN & NICOBAR ISLANDS	8	10	13	+2	+3

[Author's
 Census
 of
 2011]

CHANDIGARH	10	13	14	+3	+1
D &N HAVELI	31	25	14	-6	-11
DAMAN & DIU	12	13	13	+1	0
LAKSHADWEEP	6	5	5	-1	0
PONDICHERRY	14	15	15	+1	0

calculation, Source:
 India,1991,2001 and
 2011]

It is seen from the table that the female main worker participation at all India level was at 16% in 1991, while it decreased to 15% and remained it as the same in 2011 also. In case of the states consisting the North of India, female main worker participation of all the states increased during the period(2001-1991) but declined during (2011-2001) except Delhi and Rajasthan.

In the Central part of India ,where the data of 1991 of Chhattisgarh is not available, in other two states Madhya Pradesh and Uttar Pradesh, the female main worker participation decreased during the period of (2001-1991)while these rates marginally increased during (2011-2001).While in Chhattisgarh, the rate has decreased from 22% (2001)to 19%(2011)

In case of the East, all the states Bihar, Jharkhand, Orissa and West Bengal have experienced a declining trend. While the data of Jharkhand in 1991 is not available and the percentage of women as main worker in West Bengal increased from 8% (1991) to 9% in 2001.

In case of the North Eastern States of India, on an average the percentage of FMWP decreased from a higher 28% in 1991 to 23% in 2001and again decreased by 1% during (2011-2001).During the period (2001-1991),all the North Eastern states showed a negative change except Tripura, though during (2011-2001),Assam, and Nagaland have shown positive change.

In the West, during the decade (2001-1991),in Goa and Maharashtra, the female main worker participation got a negative change, while during (2011-2001),only Gujarat got a negative change.

In the area of "Other Union Territories", the FMWP in Dadra & Nagar Haveli declined in both the decades during (2001-1991) and (2011-2001) while Lakshadweep got negative change during (2001-1991). Lakshadweep, Pondicherry & Daman & Diu remained at the same level during.(2011-2001).

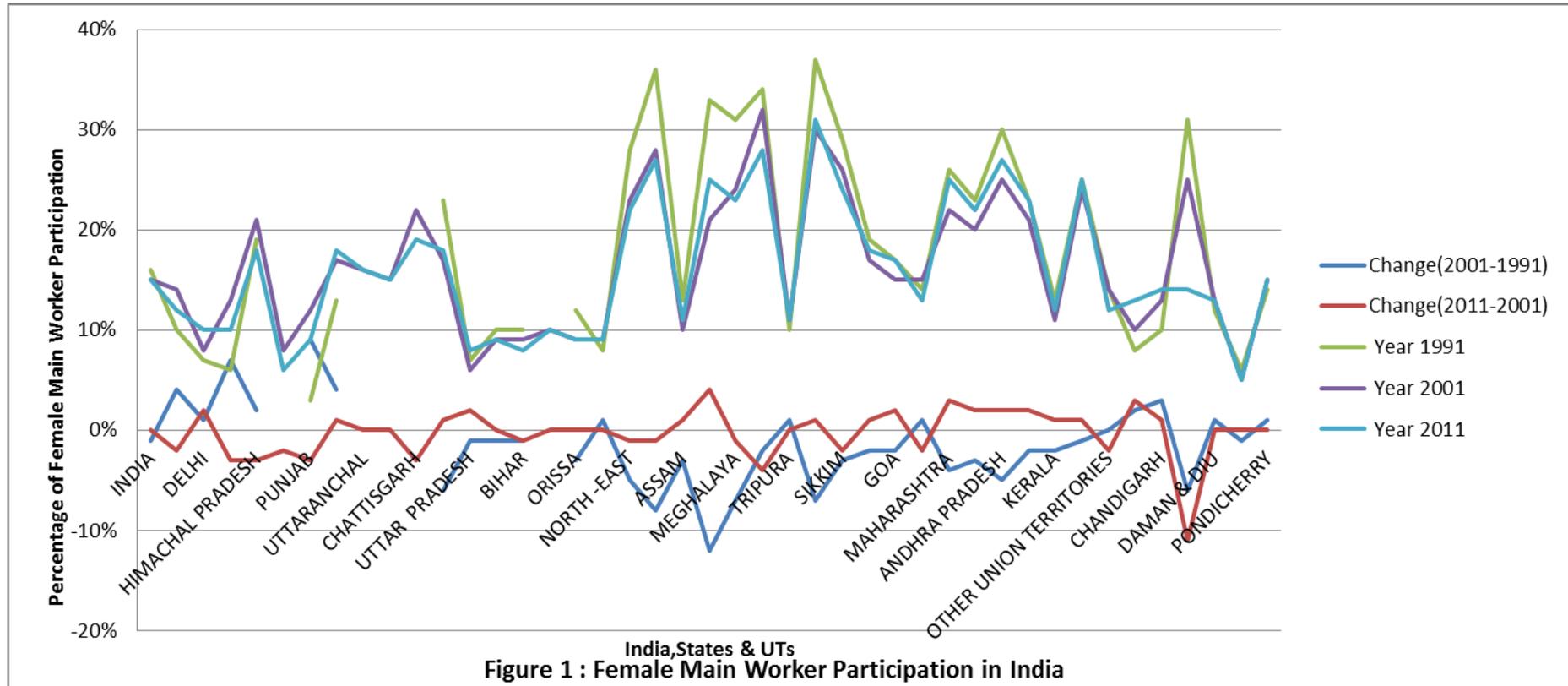


Table 2: Region-wise Female Marginal Workers Participation In India

Name of the Regions	Percentage of female Marginal workers in total female Population				
	1991	2001	2011 ⁵	(2001-1991)	(2011-2001)
India	6	11	10	+5	-1
North	7	12	12	+5	0
Delhi	0	1	1	1	0
Haryana	5	14	8	+9	-6
Himachal Pradesh	15	23	26	+8	+3
Jammu & Kashmir		14	15	NA	+1
Punjab	2	7	5	+5	-2
Rajasthan	14	17	18	+3	+1
Uttaranchal		11	11	NA	0
Central				+8	-1
	7	15	14		
Chattisgarh		18	18	N A	0
Madhya Pradesh	10	16	15	+6	-1
Uttar Pradesh	5	10	9	+5	-1
East				+7	+1
	6	13	14		
Bihar	5	10	11	+5	+1
Jharkhand		16	19	NA	+3
Orissa	9	16	18	+7	+2
West Bengal	3	9	9	+6	0
North East				+7	0
	5	12	12		
Arunachal Pradesh	2	8	9	+6	+1
Assam	9	11	12	+2	+1
Manipur	6	18	15	+12	+3
Meghalaya	4	11	10	+7	-1
Mizoram	10	16	8	+6	-8
Tripura	4	10	13	+6	+3
Nagaland	1	8	13	+7	+5
Sikkim	2	12	15	+10	+3
West				+2	-3
	8	10	7		
Goa	4	7	5	+3	-2
Gujarat	12	13	10	+1	-3
Maharashtra	7	9	6	+2	-3
South				+3	-1
	5	8	7		
Andhra Pradesh	4	10	9	+6	-1
Karnataka	7	11	8	+4	-3
Kerala	3	5	6	+2	+1
Tamil Nadu	5	7	7	+2	0
Others Union Teritorries				-1	0
	6	5	5		

⁵ In the calculation of the percentage of female marginal workers for the year 2011, both the female workers under categories “worked for less than 3 months” and “worked for 3 to 6 months” are included.

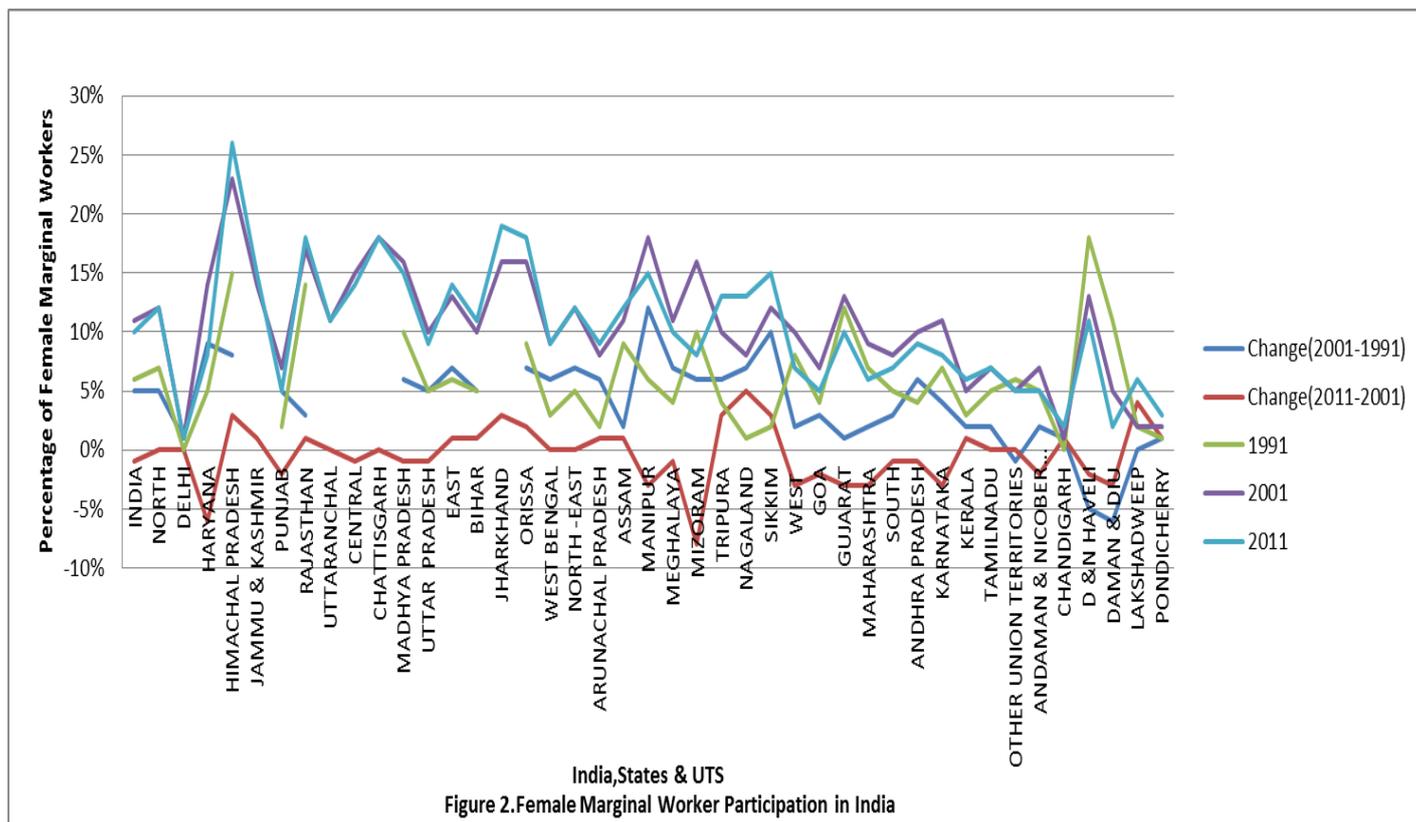
ANDAMAN & NICOBER ISLANDS	5	7	5	+2	-2
CHANDIGARH	0	1	2	+1	+1
D & N HAVELI	18	13	11	-5	-2
DAMAN & DIU	11	5	2	-6	-3
LAKSHADWEEP	2	2	6	0	+4
PONDICHERRY	1	2	3	1	+1

[Author’s calculation, Source: Census of India,1991,2001 and 2011]

In contrary to the declining nature of female main workers participation the female marginal workers had shown positive change during (2001-1991) except Daman & Diu. Table 2 shows that percentage of female marginal workers at all India level had increased from 6% in 1991 to 11% in 2001 and again declined by 1% in 2011. During (2011-2001), among the states comprising North,, Haryana and Punjab got negative change..In the states of Centre, Madhya Pradesh, Uttar Pradesh during (2011-2001) got negative change, while Chhattisgarh was remained at the same level of female marginal worker participation. The “East” comprising Bihar, Orissa, Jharkhand and West Bengal has been showing a continuous increasing trend from 6% in 1991 to 13% in 2001and again to 14% in 2011.In case of “North East”, except Meghalaya and Mizoram all other five states are showing a continuous rising trend of female marginal workers. The marginal worker participation among the females of Western states Goa, Gujarat and Maharashtra decreased during (2011-2001).Among the states of South, the participation rates Andhra Pradesh and Karnataka declined during (2011-2001). While,during (2011-2001), Andaman & Nicobar Islands, D&N Haveli and Daman & Diu showed negative change.

Thus, from the above statistics it should conclude that while in India, the female work participation as main workers declined, the rates of female marginal workers were showing a constant increase during (2001-1991) and also to some extent during (2011-2001). Which indicates a disappointing fact that the number of women working for comparatively less time of the year in comparison to the women working for longer part of the year was growing after the Economic Reforms. This scenario also implies one thing that though studies show that the decreasing labour force participation rate in India can be attributed to the increased educational attendance of the girls and income effect caused by higher household income. [(Bourmpoula,E.,Kapsos,S.Silberman,A.(2014);PlanningCommission,2011;DasGupta.,&Goldar.(2005);Rangajan,Seema(2011),;Vinoj(2013)etc], but if these same reasons are considered for the declining female main worker participation in India, it will not be logical, because if it would be the case the same phenomenon would be seen for the female marginal worker participation in India. Otherwise we have to assume that school going girls engage themselves in some part time works and hence marginal work participation of female does not decline. In this regard Bhagat, R.B & Das,K.C. (2008) in their study stated that the phenomenon of the rise in the growth rates of marginal workforce with the decline in main workforce during the decade 1991-2001 was occurred because of the jobs generated after the new economic policy and since most of them were of the part time nature. Similarly,for the increase female marginal worker participation in some of the developed states likePunjab, Haryana, Delhi and Chandigarh and in the lagging states like Bihar, Assam and Rajashtan and Uttara Pradesh they accounted the very faster marginal workforce growth engaged in household industry. Apart from this Wolfgang(1985),the fertility rate among the marginal workers are higher than the main workers, so this higher fertility might beone factor among females that compelled that to be attracted to work for the lesser months.

To find the cause of the declining main worker participation and comparatively growing marginal worker participation during (2001-1991), this paper throws a light into the age-wise pattern and change of female worker participation. The female main and marginal workers participation rates for two age groups (5-19) years and (20-59) years. The female workers of the age of five to nineteen generally represent the primary to higher secondary level students and therefore increased educational attendance of women refers the possible decline of the female work participation within the range of 5 to 19 years of age of female workers. Bourmpoula,E., Kapsos, S. Silberman, A.(2014) in their ILO Research Paper indentifies the factors behind the sharp decline in female labour force participation in India as a whole and there they show the increased educational attendance of girls as one of the main factor for driving out a large portion of female labour force form the economy. This paper tries to find out the intensity of that education factor in affecting the female worker participation by calculating the trend of female main and marginal worker participation for (5-19) years age group.



Female Main and Marginal Worker Participation in age group of (5-19) years

Table 3 shows the region-wise female main workers participation within the female population of age group (5-19) years for the three census years of 1991, 2001 and 2011.

Table 3 : Percentage of female main worker participation in the (5-19) years age group female population in India

Name of the Regions	Percentage of female main workers in the age group (5-19 years)				
	1991	2001	2011	(2001-1991)	(2011-2001)
India	7	5	4	-2	-1
North	4	3	3	-1	0
Delhi	1	1	1	0	0
Haryana	2	3	2	+1	-1
Himachal Pradesh	8	4	3	-4	-1
Jammu & Kashmir		3	1	NA	-2
Punjab	1	3	2	+2	-1
Rajasthan	8	7	5	-1	-2
Uttaranchal		4	3	NA	-1
Central	7	5	4	-2	-1
Chattisgarh		7	5	NA	-2
Madhya Pradesh	11	5	5	-6	0
Uttar Pradesh	3	3	2	0	-1
East	5	3	2	-2	-1
Bihar	4	3	1	-1	-2
Jharkhand		3	2	NA	-1
Orissa	6	3	3	-3	0
West Bengal	4	3	2	-1	-1
	11	6	4	-5	-2

North East					
Arunachal Pradesh	15	8	1	-7	-7
Assam	6	3	2	-3	-1
Manipur	10	1	5	-9	+4
Meghalaya	13	8	6	-5	-2
Mizoram	13	10	6	-3	-4
Tripura	4	3	2	-1	-1
Nagaland	12	8	6	-4	-2
Sikkim	13	10	5	-3	-5
West	8	5	5	-3	0
Goa	6	4	5	-2	+1
Gujarat	7	5	4	-2	-1
Maharashtra	11	6	6	-5	0
South	11	9	5	-2	-4
Andhra Pradesh	17	11	8	-6	-3
Karnataka	12	8	6	-4	-2
Kerala	3	4	1	+1	-3
Tamil Nadu	12	12	5	0	-7
Others Union Territories	6	4	3	-2	-1
ANDAMAN & NICOBAR ISLANDS	1	1	2	0	+1
CHANDIGARH	1	2	3	+1	+1
D &N HAVELI	21	13	6	-8	-7
DAMAN & DIU	7	5	4	-2	-1
LAKSHADWEEP	1	0 ⁶	0	0	0
PONDICHERRY	5	4	2	-1	-2

calculation, Source:
India,1991,2001 and 2011

Census [Author's
of

From table 3, it is seen than except the cases of Haryana, Punjab, Kerala and Chandigarh during (2001-1991) and Manipur, Goa, Andaman & Nicobar Islands and Chandigarh again during (2011-2001),in all other states and union territories of India female main worker participation for the female population of age group(5-19) years shows a negative change. It indicates the thing that the education effect is working in lowering the female main worker participation. However, since the increasing number of young female population(5-19) years in the states can also lower female worker participation rate in that age group, which can mislead the interpretation. Therefore, to nullify that population effect this study has also calculated percentage share of female main worker participation from the age group (5-19)years to the total female main workers.

⁶ The percentage o indicate very negligible amount of number of female workers

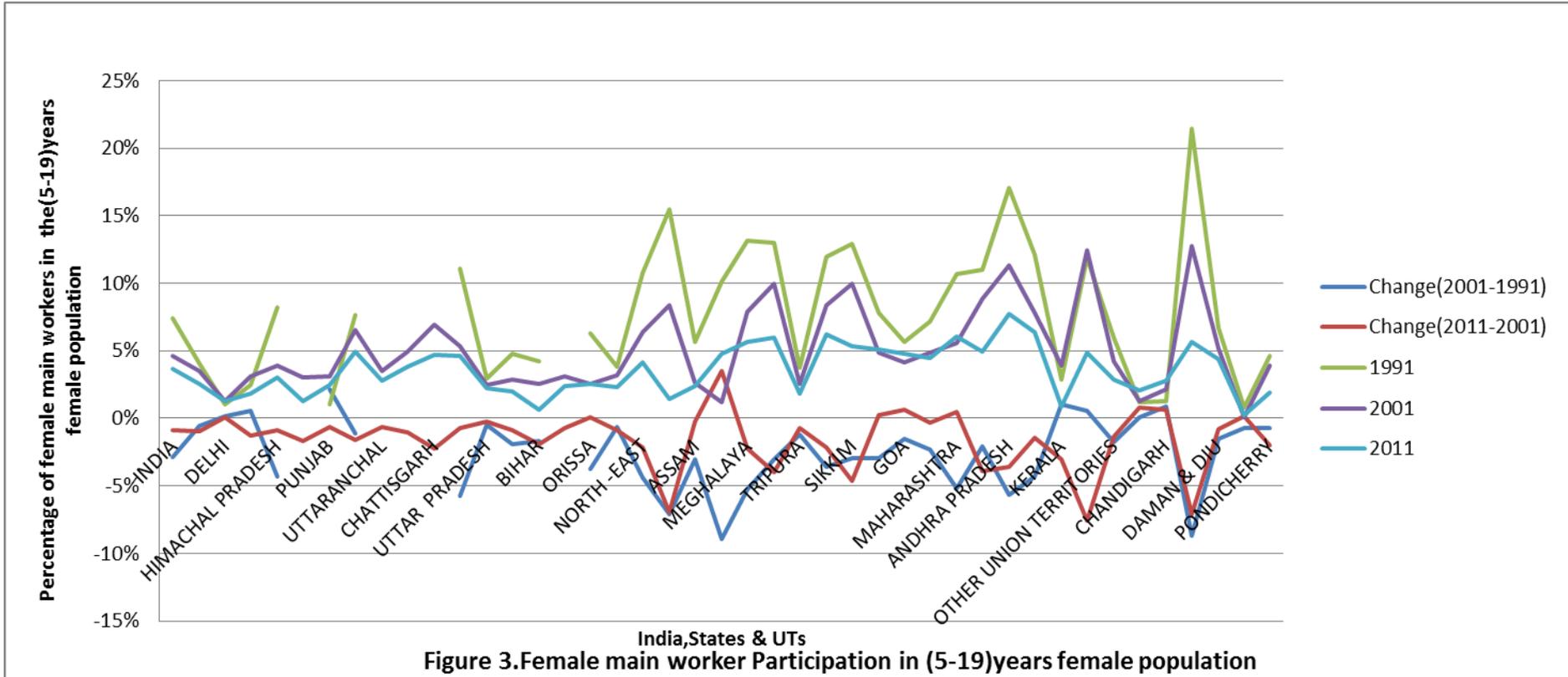


Table 4: Percentage of female from age group (5 -19 years) to the total female main workers participation in India

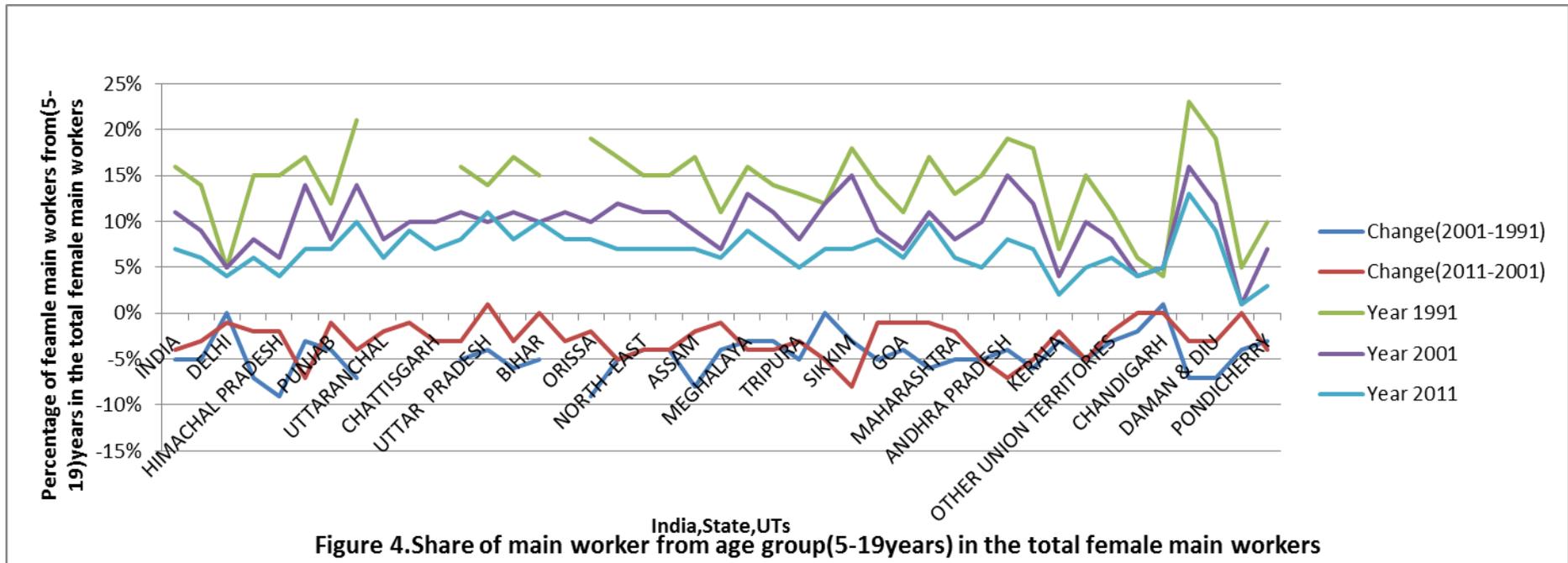
Name of the Regions	Percentage of female from the age group (5-19years) to the total female main worker participation				
	1991	2001	2011	Change(2001-1991)	Change(2011-2001)
India	16	11	7	-5	-4
North	14	9	6	-5	-3
Delhi	5	5	4	0	-1
Haryana	15	8	6	-7	-2
Himachal Pradesh	15	6	4	-9	-2
Jammu & Kashmir	17	14	7	-3	-7
Punjab	12	8	7	-4	-1
Rajasthan	21	14	10	-7	-4
Uttaranchal		8	6	0	-2
Central	15	10	9	-5	-1
Chattisgarh		10	7	0	-3
Madhya Pradesh	16	11	8	-5	-2
Uttar Pradesh	14	10	11	-4	+1
East	17	11	8	-6	-3
Bihar	15	10	10	-5	0
Jharkhand		11	8	0	-3
Orissa	19	10	8	-9	-2
West Bengal	17	12	7	-5	-5
North East	15	11	7	-4	-4
Arunachal Pradesh	15	11	7	-4	-4
Assam	17	9	7	-8	-2
Manipur	11	7	6	-4	-1
Meghalaya	16	13	9	-3	-4
Mizoram	14	11	7	-3	-4
Tripura	13	8	5	-5	-3
Nagaland	12	12	7	0	-5
Sikkim	18	15	7	-3	-8
West	14	9	8	-5	-1
Goa	11	7	6	-4	-1
Gujarat	17	11	10	-6	-1
Maharashtra	13	8	6	-5	-2
South	15	10	5	-5	-5
Andhra Pradesh	19	15	8	-4	-7
Karnataka	18	12	7	-6	-5
Kerala	7	4	2	-3	-2
Tamil Nadu	15	10	5	-5	-5
Others Union Territories	11	8	6	-3	-2
ANDAMAN & NICOBER ISLANDS	6	4	4	-2	0
CHANDIGARH	4	5	5	+1	0
D &N HAVELI	23	16	13	-6	-3

[Author's
Source: Census of
and 2011]

DAMAN & DIU	19	12	9	-7	-3
LAKSHADWEEP	5	1	1	-4	0
PONDICHERRY	10	7	3	-3	-4

calculation,
India,1991, 2001

The table shows that except the cases of Uttar Pradesh and Chandigarh, all other states and union territories of India showed a drastic decline through the two decades, it supports the view that educational attendance of the girls is actually contributing to the declining female main worker participation. But it is seen that the negative change exhibited by Uttar Pradesh in the percentage of female workers to female population was only because of its overpopulation, increasing the denominator, which underestimated the result. Similarly, the education effect on the female main worker participation can be seen clearly for the state like Kerala by the percentage share of female main workers of (5-19) years to the total female main workers, where it declined from 7% in 1991 to 4% in 2001 and again to 2% in 2011. But because of the lower population of Kerala, as a percentage to the total female population they got a higher value and got a positive change during(2001-1991),In Haryana and Punjab too, there showed the positive change during(2001-1991), but as percentage share of total female main workers it is declining.. Thus , we can state that, the educational attainment of girls has become a leakage in the flow of female workers' participation in India,. If we see the same things for the female marginal workers, we get the following table 5.



India,State,UTs
Figure 4.Share of main worker from age group(5-19years) in the total female main workers

Table 5: Percentage of female marginal workers in the age group (5-19)years Female population in India

Name of the Regions	Percentage of female marginal workers in the age group(5-19)years in India				
	1991	2001	2011	Change(2001-1991)	Change(2011-2001)
India	3	6	5	+3	-1
North	4	7	6	+3	-1
Delhi	0	0	0	0	0
Haryana	2	8	3	+6	-5
Himachal Pradesh	7	13	14	+6	1
Jammu & Kashmir		9	6	NA	-3
Punjab	1	3	3	+2	0
Rajasthan	8	11	9	+3	-2
Uttaranchal		5	5	NA	0
Central				+5	-3
	4	9	6		
Chhattisgarh		10	9	NA	-1
Madhya Pradesh	6	9	6	+3	-3
Uttar Pradesh	2	7	4	+5	-3
East				+3	0
	3	6	6		
Bihar	2	4	4	+2	0
Jharkhand		8	8	NA	0
Orissa	5	8	8	-3	0
West Bengal	2	5	4	+3	-1
North East				4	-1
	3	7	6		
Arunachal Pradesh	1	6	2	+5	-4
Assam	4	6	5	+2	-1
Manipur	2	2	7	0	5
Meghalaya	2	7	5	+5	-2
Mizoram	9	15	4	+6	-11
Tripura	1	4	4	+3	0
Nagaland	0	7	14	+7	7
Sikkim	1	11	10	+10	-1
West				1	-2
	4	5	3		
Goa	1	3	2	+2	-1
Gujarat	6	8	5	+2	-3
Maharashtra	4	4	2	0	-2
South				+1	0
	2	3	3		
Andhra Pradesh	2	5	4	+3	-1
Karnataka	4	6	4	+2	-2
Kerala	1	0	1	-1	1
Tamil Nadu	2	1	2	-1	1
Others Union Territories				0	-1
	3	3	2		
ANDAMAN & NICOBER ISLANDS	2	3	2	+1	-1
CHANDIGARH	0	1	1	+1	0
D &N HAVELI	10	10	5	0	-5
DAMAN & DIU	4	2	1	-2	-1
LAKSHADWEEP	1	0	1	-1	1
PONDICHERRY	0	1	1	+1	0

[Author's calculation, Source: Census of India, 1991, 2001 and 2011]

It is surprising to see that during the decade (2001-1991), except the states of Orissa, Kerala, Tamil Nadu and UTs Daman & Diu, Lakshadweep, all are showing a positive change. Only at the 21st century, it can be claimed that education factor is operating in lowering the marginal female worker participation and during (2011-2001), it has got negative change throughout the states and union territories. Thus, in case of female marginal worker participation, the effect of educational attendance of girls is not very convincing. The Table 6, which shows the share of female marginal worker participation from age group (5-19) is different from the table showing percentage of female marginal workers in the female population of 5-19 years, since in a greater number of states share of female marginal worker are found declined. Delhi, Punjab, West Bengal, Mizoram, Tripura, Goa, Maharashtra, Karnataka, Pondicherry are the addition in the names of getting negative change in the female marginal worker participation during (2001-1991) apart from Kerala, Tamil Nadu, Orissa.

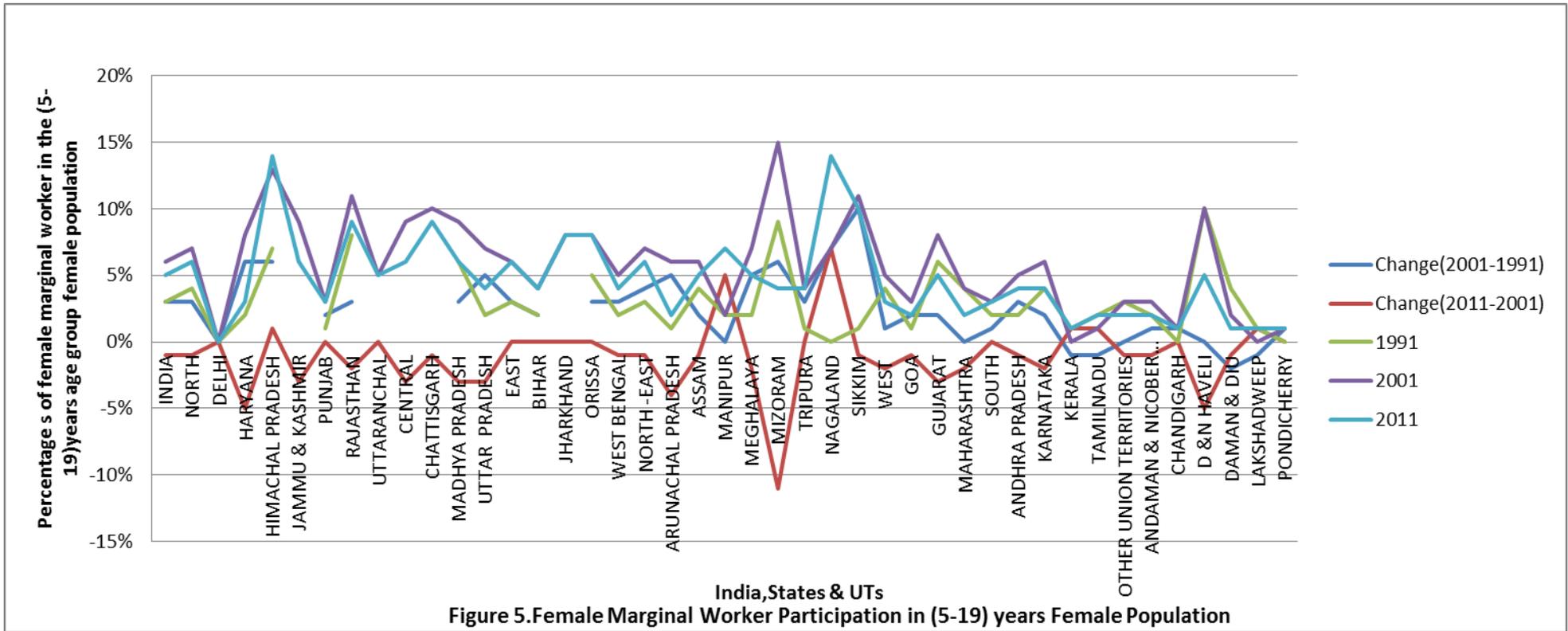
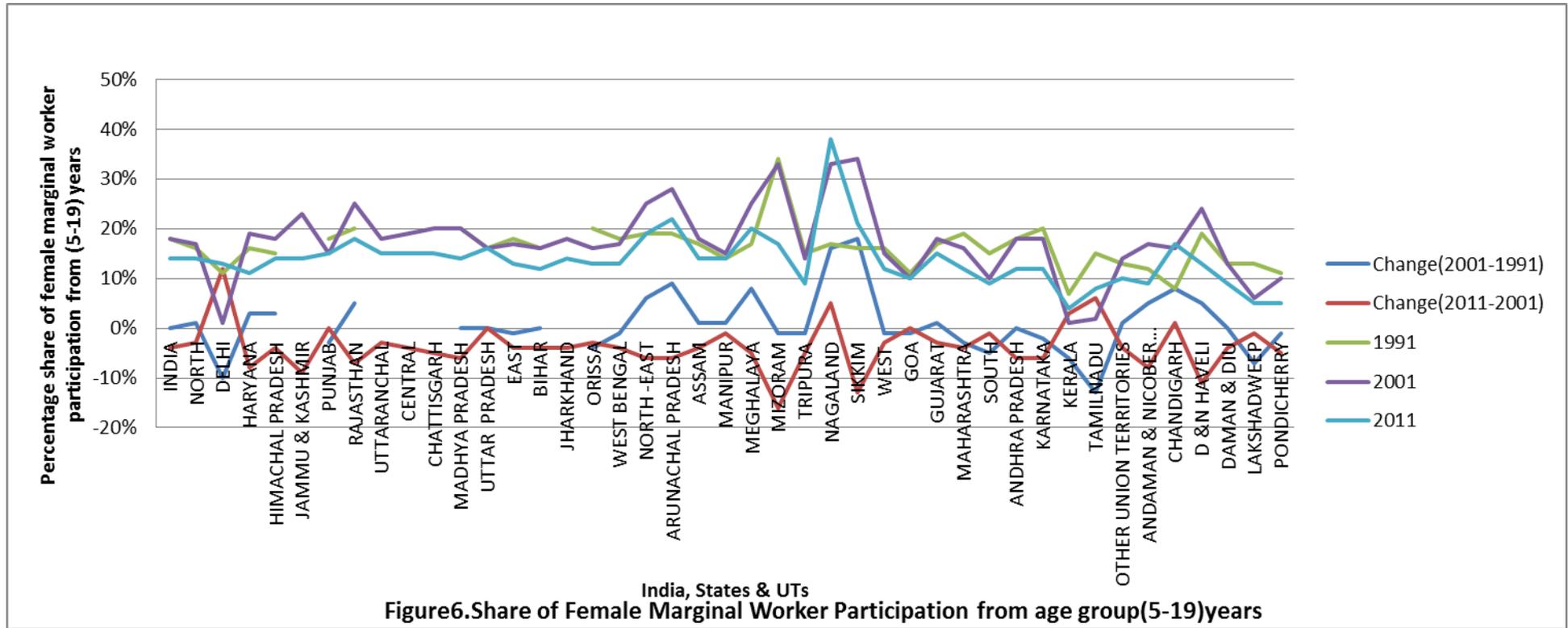


Table 6: Percentage share of (5-19) years female in the total female marginal worker participation

Name of the Regions	Percentage share of female(5-19)years in the total female marginal worker participation in India				
	1991	2001	2011	Change(2001-1991)	Change(2011-2001)
India	18	18	14	0	-4
North	16	17	14	1	-3
Delhi	11	1	13	-10	+12
Haryana	16	19	11	3	-8
Himachal Pradesh	15	18	14	3	-4
Jammu & Kashmir		23	14	NA	-9
Punjab	18	15	15	-3	0
Rajasthan	20	25	18	5	-7
Uttaranchal		18	15	NA	-3
Central				1	-4
	18	19	15		
Chattisgarh		20	15	NA	-5
Madhya Pradesh	20	20	14	0	-6
Uttar Pradesh	16	16	16	0	0
East				-1	-4
	18	17	13		
Bihar	16	16	12	0	-4
Jharkhand		18	14	NA	-4
Orissa	20	16	13	-4	-3
West Bengal	18	17	13	-1	-4
North East				6	-6
	19	25	19		
Arunachal Pradesh	19	28	22	9	-6
Assam	17	18	14	1	-4
Manipur	14	15	14	1	-1
Meghalaya	17	25	20	8	-2
Mizoram	34	33	17	-1	-6
Tripura	15	14	9	-1	-5
Nagaland	17	33	38	16	5
Sikkim	16	34	21	18	13
West				-1	-3
	16	15	12		
Goa	11	10	10	-1	0
Gujarat	17	18	15	1	-3
Maharashtra	19	16	12	-3	-4
South				-5	-1
	15	10	9		
Andhra Pradesh	18	18	12	0	-6
Karnataka	20	18	12	-2	-6
Kerala	7	1	4	-6	3
Tamil Nadu	15	2	8	-13	6
Others Union Territories				1	-4
	13	14	10		
ANDAMAN & NICOBER ISLANDS	12	17	9	5	-8
CHANDIGARH	8	16	17	8	1
D &N HAVELI	19	24	13	5	-11
DAMAN & DIU	13	13	9	0	-4
LAKSHADWEEP	13	6	5	-7	-1
PONDICHERRY	11	10	5	-1	-5

[Author's calculation, Source: Census of India, 1991, 2001 and 2011]

From both the above tables it is seen that in case of the female marginal workers neither the percentage share of population nor the percentage share of the female marginal workers are showing a continuous declining trend. The states where the (5-19) years main workers participation are declining, for the same age group the marginal workers participation is increasing. It reveals a serious cause of concerns and cause it might be an indicator of a fact that it is not the increased educational attendance of female that has been sharply affecting the female main workers' decline, rather they are not getting the more than 6 months of work.



Female Main and Marginal Worker Participation in the age group (20-59) years :

This paper calculates the female main and marginal workers participation for the age group of (20-59) years. Analysing the pattern of the work participation of this actively worked group of population, this paper reveals the difference of the female main and marginal workers participation in that group and tries to explain the cause of this difference.

Table 7: Percentage of female main workers in the age group (20-59) years in India

Name of the Regions	Percentage of female main workers in the age group(20-59)years in India				
	1991	2001	2011	Change(2001-1991)	Change(2011-2001)
India	27	26	25	-1	-1
North	17	25	21	+8	-4
Delhi	14	15	16	+1	+1
Haryana	11	25	17	+14	-12
Himachal Pradesh	34	36	29	+2	-7
Jammu & Kashmir		14	10	NA	-4
Punjab	5	21	14	+16	-7
Rajasthan	22	31	31	+9	0
Uttaranchal		30	27	NA	-3
Central				+1	-1
	27	28	27		
Chhattisgarh		40	36	NA	-4
Madhya Pradesh	40	32	31	-8	-1
Uttar Pradesh	14	12	13	-2	+1
East				-1	-1
	17	16	15		
Bihar	18	17	15	-1	-2
Jharkhand		18	18	NA	0
Orissa	20	15	15	-5	0
West Bengal	14	15	14	+1	-1
North East				-10	-2
	51	41	39		
Arunachal Pradesh	64	55	49	-9	-6
Assam	23	18	18	-5	0
Manipur	58	37	41	-11	+4
Meghalaya	58	46	43	-12	-3
Mizoram	64	57	47	-7	-10
Tripura	19	20	17	+1	-3
Nagaland	68	53	54	-15	+1
Sikkim	53	46	39	-7	-7
West				-3	-1
	32	29	28		
Goa	28	23	25	-5	+2
Gujarat	23	25	21	+2	-4
Maharashtra	45	38	40	-7	+2
South				-5	+2
	37	32	34		
Andhra Pradesh		40	42	-8	+2
	48				
Karnataka	38	35	36	-3	+1
Kerala	22	18	20	-4	+2
Tamil Nadu	39	37	37	-2	0
Others Union Territories				+4	-5
	21	25	20		
ANDAMAN & NICOBER ISLANDS				+28	-9
	1	29	20		

CHANDIGARH	19	22	23	+3	+1
D & N HAVELI	50	42	23	-8	-19
DAMAN & DIU	20	21	20	+1	-1
LAKSHADWEEP	12	10	9	-2	-1
PONDICHERRY	24	24	23	0	-1

[Author's

Source: Census of India, 1991, 2001 and 2011]

calculation,

Since the age group (20-59) does not include the school-going girls, the declining worker participation ratio of this group indicates the point that the overall decline in the female worker participation is not attributed to only the increasing education attendance of the girls. While at all India level, during both the decades (2001-1991) and (2011-2001), the female main workers participation rate declined by 1%, the North Eastern States experienced except Tripura drastic decline of main worker participation among females. During the decade of (2011-2001) also except Nagaland and Manipur did not show any increase in the participation rates. The States of Punjab & Haryana showed large increase during the decade (2001-1991), though in the next decade (2011-2001), they showed negative change. In the same way, the union territory Andaman & Nicobar Islands also experienced huge increase by 28%, but decreased during (2011-2001) by 9%. Except Delhi which showed marginal increase in both the decades, no more regions of India had shown consistent increase in the female main worker participation during post reform period. If we compare the tables 3 and 7, then will find that the states which showed positive change though by a small amount during (2001-1991) in the age group (5-19) are same as of (20-59) i.e. Punjab and Haryana. Thus, from this statistics we can refer one thing that the declining main worker participation in India does not only belong to the decline in the main worker participation rate among the educational age group of girls, the participation rates of higher age group women are also decreasing. But percentage share of (20-59) age group women to the total female main worker participation are not declining except the advanced states of Maharashtra and Gujarat and in the comparatively backward states of Uttar Pradesh, Bihar, Uttaranchal, Andaman & Nicobar Islands, Chandigarh and Lakshadweep. This decline in the female main workers participation might be the effect of higher household income as referred by many studies (Bourmpoula, Kapsos, Silberman, (2014); Rangajan, Seema (2011); Vinoj (2013). Which shows that worker participation rates are highest among the women from poorest household, but lowest among the women living in the households with higher incomes. But for the states like Bihar, the effect of the household income for lowering the decline of female worker participation is not found very logical. Rodgers (2012) examined rural Bihar and finds that the decline in Female Labour Force Participation can be attributed to limited job opportunities outside agriculture.

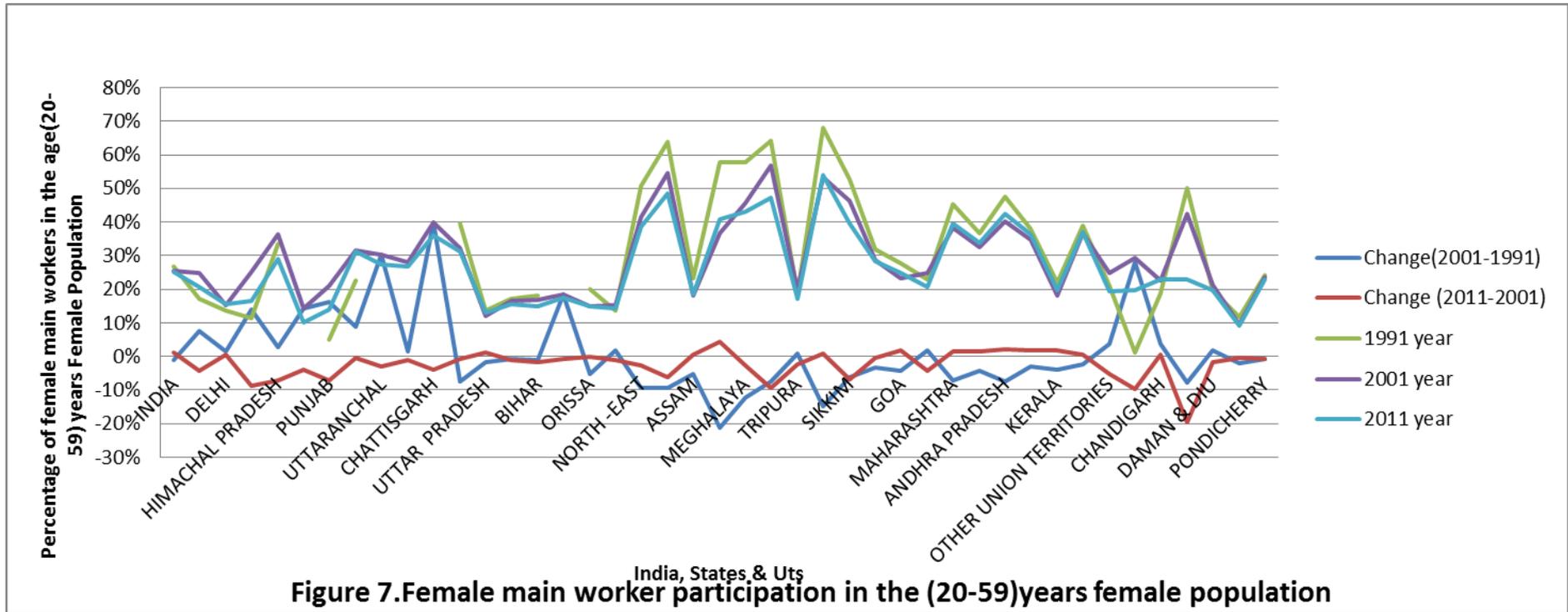


Table 8: Percentage Share of female from age group (20-59 years) to the female main worker participation in India

Name of the Regions	Percentage share of female from age group(20-59 years) to the female main worker participation in India				
	1991	2001	2011	Change(2001-1991)	Change(2011-2001)
India	78	83	84.	+5	+1
North	83	85	87	+2	+2
Delhi	93	92	92	-1	0
Haryana	81	87	88	+6	+1
Himachal Pradesh	80	86	87	+6	+1
Jammu & Kashmir		80	87	NA	+7
Punjab	84	85	85	+1	0
Rajasthan	75	81	83	+6	+2
Uttaranchal		85	84	NA	-1
Central	79	82	82	+5	0
Chhattisgarh		83	86	NA	+3
Madhya Pradesh	78	83	83	+5	0
Uttar Pradesh	79	81	77	+2	-4
East	80	83	84	+3	+1
Bihar	80	82	80	+2	-2
Jharkhand		83	84	NA	+1
Orissa	81	84	85	+3	+1
West Bengal	80	83	87	+3	+4
North East	80	83	86	+3	+3
Arunachal Pradesh	79	83	87	+4	+4
Assam	80	85	86	+5	+1
Manipur	82	85	86	+3	+1
Meghalaya	79	81	84	+2	+3
Mizoram	81	84	87	+3	+3
Tripura	82	85	88	+3	+3
Nagaland	79	81	84	+2	+3
Sikkim	78	80	87	+2	+7
West	82	86	85	+4	-1
Goa	85	88	88	+3	0
Gujarat	79	85	83	+4	-2
Maharashtra	82	84	83	+2	-1
South	80	84	87	+4	+3
Andhra Pradesh	80	80	84	0	+4
Karnataka	76	83	85	+7	+2
Kerala	77	91	92	+14	+1
Tamil Nadu	88	83	86	-5	+3
Others Union Territories	86	89	91	+3	+2
ANDAMAN & NICOBER ISLANDS	92	93	92	+1	-1
CHANDIGARH	95	93	92	-2	-1
D &N HAVELI	74	80	83	+6	+3
DAMAN & DIU	75	82	87	+7	+5
LAKSHADWEEP	93	98	97	+5	-1
PONDICHERRY	85	87	92	+2	+5

[Author's calculation, Source: Census of India, 1991, 2001 and 2011]

As expected, though the female main worker participation of (20-59) age group female population has gone down some extent, but the share of main workers to total female main workers from this age group has increased in almost all of the regions. Where the exceptional cases are Delhi experiencing decline by 1%, Tamil Nadu by 5% and Chandigarh by 2% during (2001-1991) and in the decade (2011-2001), Uttarakhand experiencing decline by 1%, Uttar Pradesh by 4%, Bihar by 2%, Gujarat by 2% and Maharashtra, Andaman & Nicobar Islands, Chandigarh and Lakshadweep, all by 1%.

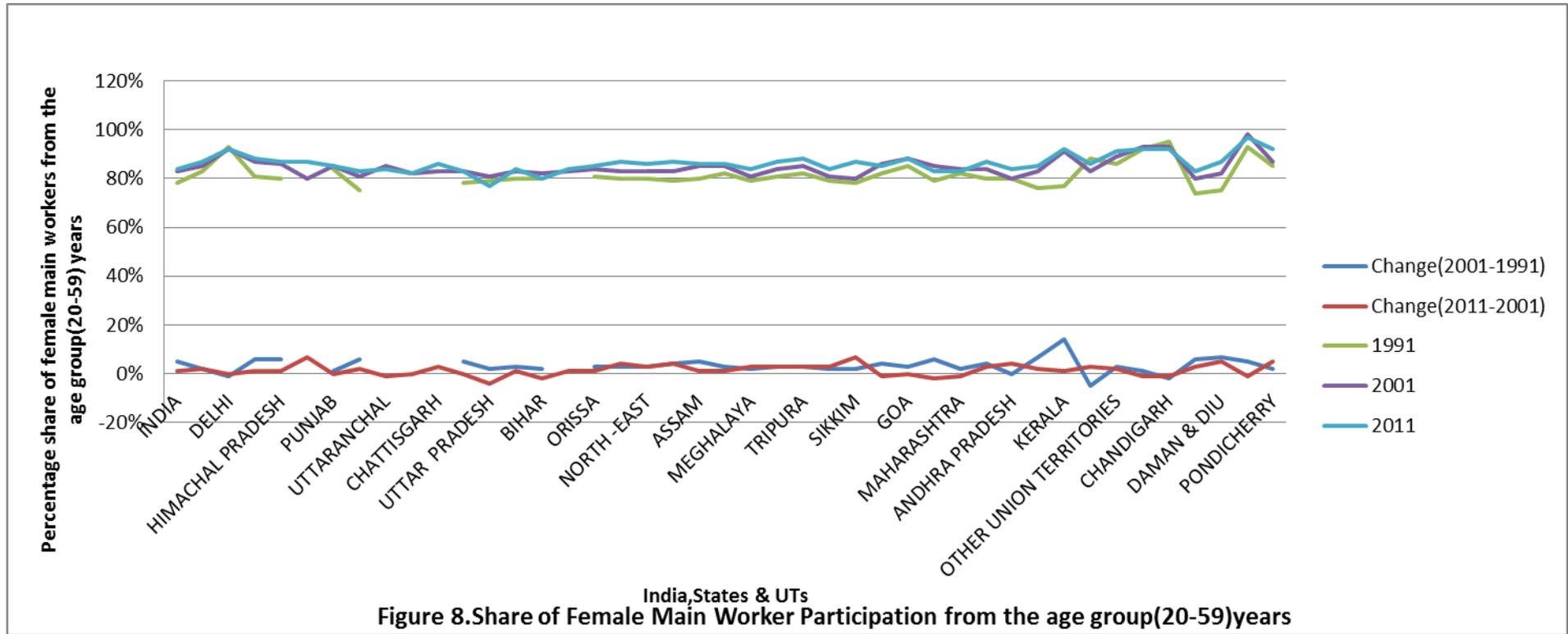


Table 9:Percentage of female marginal workers in the age group(20-59)years Female population in India

Name of the Regions	Percentage of female marginal workers participation in the total female population(20-59)yrs in India				
	1991	2001	2011	Change(2001-1991)	Change(2011-2001)
India	10	17	16	+7	-1
North	13	19	17	+6	-2
Delhi	0	2	1	+2	-1
Haryana	9	22	13	+13	-9
Himachal Pradesh	26	33	36	+7	+3
Jammu & Kashmir		23	22	NA	-1
Punjab	3	10	7	+7	-3
Rajasthan	25	26	28	+1	+2
Uttaranchal		17	16	NA	-1
Central				+12	-1
	12	24	23		
Chattisgarh		28	29	NA	+1
Madhya Pradesh	16	26	23	+10	-3
Uttar Pradesh	9	18	15	+9	-3
East				+12	+2
	9	21	23		
Bihar	9	18	19	+9	+1
Jharkhand		28	32	NA	+4
Orissa	14	25	27	+11	+2
West Bengal	5	15	14	+10	-1
North East				+10	-1
	8	18	17		
Arunachal Pradesh	3	12	14	+9	+2
Assam	17	18	18	+1	0
Manipur	11	28	22	+17	-6
Meghalaya	8	19	16	+11	-3
Mizoram	13	20	12	+7	-8
Tripura	7	17	20	+10	+3
Nagaland	1	12	16	+11	+4
Sikkim	3	16	21	+13	+5
West				+3	-5
	12	15	10		
Goa	6	11	8	+5	-3
Gujarat	20	20	15	0	-5
Maharashtra	10	13	8	+3	-5
South				+5	-2
	8	13	11		
Andhra Pradesh	7	14	13	+7	-1
Karnataka	11	16	12	+5	-4
Kerala	5	8	9	+3	+1
Tamil Nadu	7	12	10	+5	-2
Others Union Territories				0	-2
	9	9	7		
ANDAMAN & NICOBER ISLANDS	1	16	8	+15	-8
CHANDIGARH	0	2	2	+2	0
D &N HAVELI	29	20	17	-9	-3
DAMAN & DIU	20	9	3	-11	-6

LAKSHADWEEP	3	4	9	+1	+5
PONDICHERRY	2	4	4	+2	0

Table 9 shows that in the marginal workers participation at all India level during (2001-1991),the percentage of female marginal workers in the age group(20-59) shows increase of 7%,while in the next decade (2011-2001), it declined by 1% . In the states of North also, during the decade (2001-1991),they got positive change, but at (2011-2001),the rates declined except the states of Himachal Pradesh and Rajasthan. In the Central and Western states also, the female marginal worker participation in the age group (20-59) declined after 2001,while the states of East exhibited an increasing decadal change both during (2001-1991) and (2011-2001) except the case of West Bengal where the rate declined by 1% in 2011. The female marginal worker participation also declined for some of the North –Eastern states (Manipur, Meghalaya, Mizoram).The female marginal workers declined in Western states of India during(2011-2001) and in the states of ‘South’ also, except Kerala, all show negative change during this decade..It is the case for Union territories also except Lakshadweep.

This table also shows that while the number of female marginal workers in this age group is higher in the states of North, Central and North –East India, in comparison to that the rates are lower in West and South India and in the union territories also. As in the case of the (5-19) years age group, in this age group also the female marginal worker has not declined during (2001-1991) in contrary to the declining behaviour of female main worker participation. It means the number of women worked for lesser time of a year during the first decade after reform (2001-1991) were more, though the number of female workers worked for more than 6 months in a year were declined. Gradually after 2001,shrinking job opportunities of India might be condemned the marginal worker participation also.

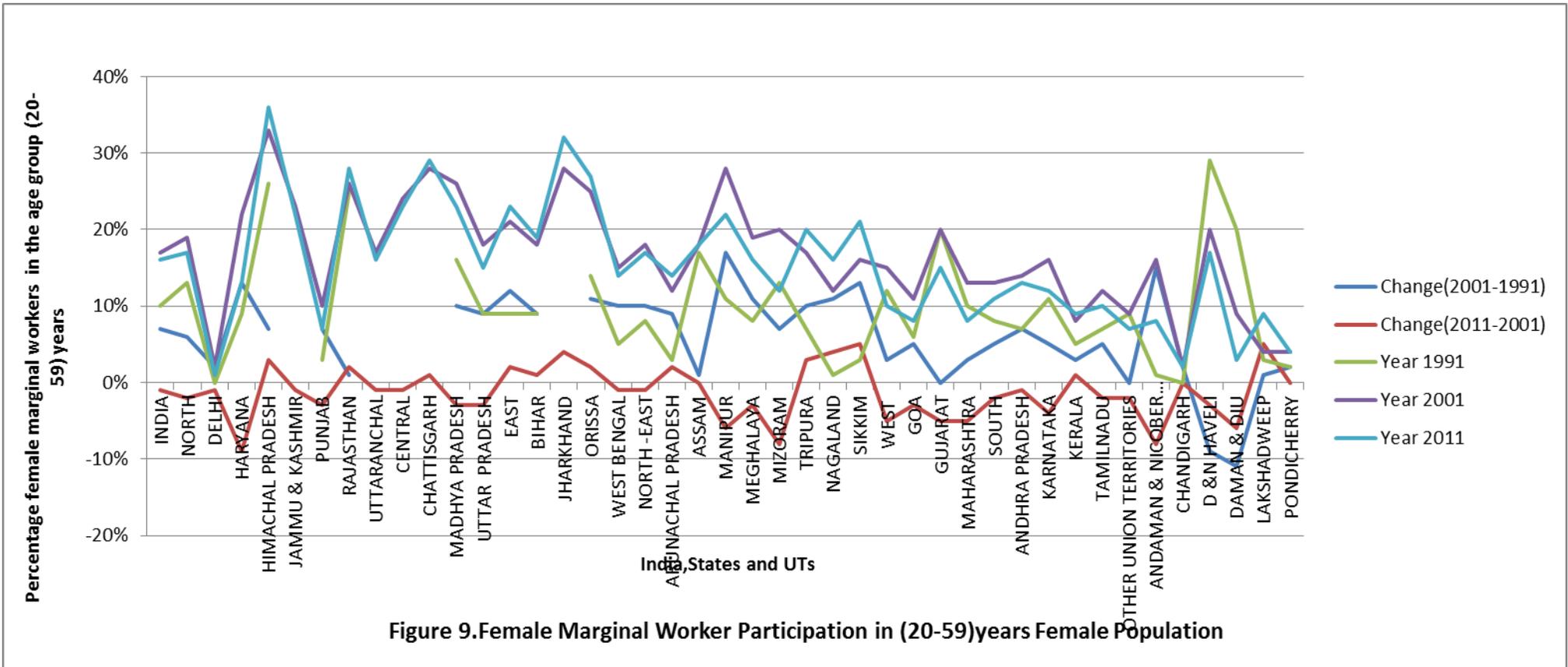
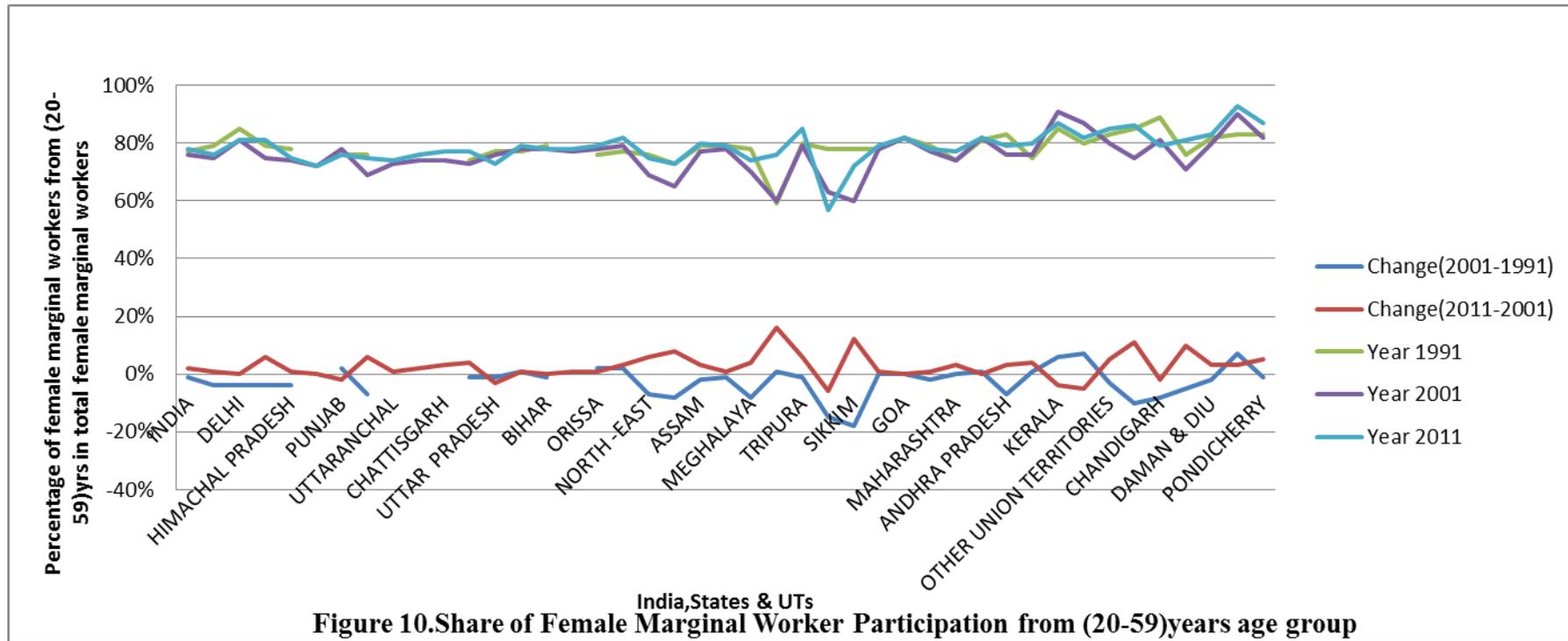


Table 10: Percentage share of female marginal workers from the age group(20-59)years in total female marginal worker participation India

Name of the Regions	Percentage share of female(20-59)years in the total female marginal worker participation in India				
	1991	2001	2011	Change(2001-1991)	Change(2011-2001)
India	77	76	78	-1	+2
North					
	80	75	76		+1
Delhi	85	81	81	-4	0
Haryana	79	75	81	-4	+6
Himachal Pradesh	78	74	75	-4	+1
Jammu & Kashmir		72	72	NA	0
Punjab	76	78	76	+2	-2
Rajasthan	76	69	75	-7	+6
Uttaranchal		73	74	NA	+1
Central					
	76	74	76	-2	+2
Chattisgarh		74	77	NA	+3
Madhya Pradesh	74	73	77	-1	+4
Uttar Pradesh	77	76	73	-1	-3
East					
	77	78	79	+1	+1
Bihar	79	78	78	-1	0
Jharkhand		77	78	NA	+1
Orissa	76	78	79	+2	+1
West Bengal	77	79	82	+2	+3
North East					
	76	69	75	+3	+6
Arunachal Pradesh	73	65	73	-8	+8
Assam	79	77	80	-2	+3
Manipur	79	78	79	-1	+1
Meghalaya	78	70	74	-8	+4
Mizoram	59	60	76	+1	+16
Tripura	80	79	85	-1	+6
Nagaland	78	63	57	-15	-6
Sikkim	78	60	72	-18	+12
West					
	78	78	79	0	+1
Goa	82	82	82	0	0
Gujarat	79	77	78	-2	+1
Maharashtra	74	74	77	0	+3
South					
	81	82	82	+1	0
Andhra Pradesh	83	76	79	-7	+3
Karnataka	75	76	80	+1	+4
Kerala		91		+6	-4
	85		87		
Tamil Nadu		87		+7	-5
	80		82		
Others Union Territories					
	83	80	85	-3	+5
ANDAMAN & NICOBER	85	75	86	0	11

ISLANDS					
CHANDIGARH	89	81	79	-8	-2
D &N HAVELI	76	71	81	-5	+10
DAMAN & DIU	82	80	83	-2	+3
LAKSHADWEEP	83	90	93	+7	+3
PONDICHERRY	83	82	87	-1	+5

Table 10 shows the percentage share of female from age group (20-59) years in the total female marginal worker participation shows somewhat different result from the table 9 showing the percentage of female marginal workers in the age group of (20-59) years of female population. Firstly the share of marginal workers from this age group to the total female marginal workers is almost at the more or less same level for all the states and union territories of India. The share of marginal worker from this age group to the total female marginal workers declined by 1% during (2001-1991) and increased by 2% during(2001-2001) being the contrary to the findings of table 9. Only the states of Punjab, Kerala and Tamil Nadu are different in this regard, which shows t positive change during(2001-1991) and negative change during (2001-2001).



II. CONCLUSION

Authors like Olsen et al.(2006),Choudhury (2011) and Neff,et al.(2012) have argued that social and cultural barriers in a predominantly patriarchal society like India can explain women's work choices. That is why having comparatively liberal societies,tribal states showed a very good performance regarding work participation from 1991.But in these states also, with the introduction of New Economic Policy the participation rates gradually declines. A comparison between male and female employment by occupation shows that female employment growth between 1994 and 2010 largely took place in occupations that were not growing at all and Less than 19% of the new employment opportunities generated in India's 10 fastest growing occupations were taken up by women [Bourmpoula,E., Kapsos, S. Silberman, A.(2014,). A large body of literature is devoted to quantifying the role of education and income in explaining the decline in female LFPR in rural areas, including studies by Choudhury(2011),Himanshu(2011),Rangarajan, et.al (2011), Kannan et.al(2012),Neff et.al (2012), Abraham (2013) and Klasen and Peters(2013) . Across the process of economic development, the adult women labour force participation rate is U- shaped.When incomes are extremely low and when certain types of agriculture dominate,women are in the labour force to a great extent. As income rises,often because of an expansion of the market or the introduction of the new technology, women labour force participation rates fall. [Goldin,2014].But if we see the trend of the female worker participation of India, then we get the idea that In India that increasing educational attendance and higher household income are not the cause of declining main as well marginal worker participation in India. Rather it is the result of the low employment opportunities for women.There is evidence that available employment opportunities for women have declinedOne reason is that employment generation has not kept up with the rise in the working-age population,due to increased competition with men for scarce jobs and an increasing reluctance of women to take up informal(and partly remunerated) work. Another possibility is that industrial and occupational segregation may be hindering an increase in female employment,that is if industries and occupations that are experiencing job growth tend to be male dominated, women would be less likely to be benefitted from overall job gains and may remain out of the work force given the limited opportunities. (Chowdhury,2011)

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A Study on Effectiveness of the Internal Control System in the Private Banks of Trincomalee

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Abstract- This study is about the Effectiveness of Internal Control System in the Private Banks of Trincomalee. There was found through observation and discussion that there are some deviations in the internal control system in the daily banking activities. Based on this problem the researcher was intended to do this research on the objectives of evaluate the bank's control environment and internal control system in the bank, to identify the bank's risk assessment process and the internal control in the bank, to evaluate bank's accounting, information and communication system relevant to financial reporting and the internal control in the bank, to find out bank's control activities affect the internal control in the bank and to find out bank's self assessment affect the internal control in the bank. This study is based on the dependent variable; effective internal control and five independent variables; control environment, risk assessment, accounting, information and communication, control activities and self assessment.

In this study, data were collected through primary as well as secondary to measure the relationship between two variables. The main tool of primary data is questionnaires. The questionnaires distributed among permanent staff of ten banks. And in the case of data analysis and evaluation, univariate as well as bivariate analysis methods were used. Under the univariate analyses mean, standard deviation, percentages were used to evaluate the data

According to the data evaluation, all the independent variables are moderately supportive in the effectiveness of internal control system. And in the consideration of all independent variables as overall they were moderately supportive in the effectiveness of internal control system. In the discussion part, presented data discussed in qualitatively. And under the conclusion and recommendations researcher have been given summary on the data analysis and recommended some suggestions to implement in the bank to enhance the internal control system in the bank.

I. INTRODUCTION

Internal control is a broad term with a wide coverage. It covers the control of the whole management system in order to carry on the business of the enterprise in an orderly and efficient way by having an automatic check and balance overall the transaction. The control may be financial and or non-financial. It has become one of the basic and essential factors for efficient and effective management.

Effective internal controls are the foundation of safe and sound banking. A properly designed and consistently enforced

system of operational and financial internal control helps a bank's board of directors and management to safeguard the bank's resources, produces reliable financial reports, and complies with laws and regulations. Effective internal controls also reduce the possibility of significant errors and irregularities and assist in their timely detection frauds and error. The internal control system is equally important to the management and the auditor concerned. It helps to the organization to meet its own goals more effectively. (*Internal Control Comptroller's Hand Book January 2001*)

The need for the internal control systems in the organizations, especially banks, cannot be undermined due to the fact that the banking sector which has crucial role to play in the economic development of the nation is now being characterized by macro economic instability, slow growth in real economic activities, corruption and the risk of frauds.

Internal control includes internal check, internal audit and other devices of control. Although internal control and internal audit are closely related, they are distinct from each other. Internal control is the systems, policies, procedures, and processes affected by the board of directors, management and other personnel to safeguard the bank assets, limit or control risks, and achieve a bank's objectives. Internal audit provides an objective, independent review of bank activities, internal controls, and management information systems to help the board and management monitor and evaluate internal control adequacy and effectiveness.

1.1 Problem Statement

Thus researcher intends from this study to find out the effectiveness of the internal control system in the Private Banks of Trincomalee.

1.2 Research Questions

- Does the bank's control environment affect the effectiveness of the bank's internal control?
- Does the bank's risk assessment process affect the effectiveness of the bank's internal control?
- Does the bank's accounting, information and communication system relevant to financial reporting affect the effectiveness of the bank's internal control?
- Does the bank's control activity affect the effectiveness of the bank's internal control?
- Does the bank's self assessment affect the effectiveness of the bank's internal control?

1.3 Objectives of the Study

- To evaluate the bank's control environment and internal control system in the bank.
- To identify the bank's risk assessment process and the internal control in the bank.
- To evaluate bank's accounting, information and communication system relevant to financial reporting and the internal control in the bank.
- To find out bank's control activities affect the internal control in the bank.
- To find out bank's self assessment affect the internal control in the bank.

1.4 Significance of the Study

System of Internal control is very important factor affecting the effective and efficient working condition in the bank. A successful internal control system can reach its goals. This study,

- Will identify the failures over the internal control system and it will help to management to overcome the deficiencies.
- The system of Internal control prevailing in the bank.
- This will provide suggestions and recommendations success the internal control system.

1.5 Assumptions of the study

- There is no change in the internal control systems within the study period.
- There is no change in the banking policies within the study period.

1.6 Limitations of the study

- This study will be conducted within a limited geographical area.
- The confidentiality of the bank to provide relevant data is high.

II. LITERATURE REVIEW

What is Internal Control?

Internal Control implies the whole system of control employed by the management in order to carry on the business of the enterprise in an orderly and efficient way by having an automatic check and balance overall the transactions. It includes internal check, internal audit and other devices of control. Internal control system assures the management that the information it receives is both reliable and accurate. The system also helps to ensure that assets are secure and management policy is being followed properly. Its efficient working not only guarantees management as to the reliability of accounting information, independent auditors also rely on system of internal control in determining the timing, nature, and extent of the audit work. (Ravinder Kumar, Virender Sharma, 2005)

As part of its on-going efforts to address bank supervisory issues and enhance supervision through guidance that encourages sound risk management practices, the Basle Committee on Banking Supervision is issuing framework for the evaluation of internal control systems. A system of effective internal controls

is a critical component of bank management and a foundation for the safe and sound operation of banking organizations.

A system of strong internal controls can help to ensure that the goals and objectives of a banking organization meets, that the bank achieves long-term profitability targets, and maintain reliable financial and managerial reporting. Such a system can also help to ensure that the bank complies with laws and regulations as well as policies, plans, internal rules and procedures, and decrease the risk of unexpected losses or damage to the bank's reputation. (*Basle Committee for banking supervision, September 1998*)

Internal control is a company's system, defined and implemented under its responsibility.

It comprises a set of resources, patterns of conduct, procedures and actions adapted to the individual characteristics of each company which contributes to the control over its activities, to the efficiency of its operations and to the efficient utilization of its resources, and enables it to take into consideration, in an appropriate manner, all major risks, be they operational, financial or compliance. The system more particularly designed to ensure that:

- a) Laws and regulations are complied with
- b) The instructions and directional guidelines fixed by Executive Management or the Management Board are applied.
- c) The bank's internal processes are functioning correctly, particularly those implicating the security of its assets.
- d) Financial information are reliable.

Internal control is therefore not limited to a set of procedures it simply to accounting and financial processes. It embrace all of the initiatives taken by the executive bodies or by management, such as defining company strategy, fixing objectives, and management decisions, and dealing with the risks or monitoring performance. [*Internal control reference, AMF 2004*]

Distinction among Internal Audit, Internal Check and Internal Control

The expressions internal audit, internal check and internal control can be differentiated from one another in the following manner.

- 1) **Internal Audit**—It is an independent appraisal activity within an organization to review the operations and records as to service for management and is done by specially assigned staff.
- 2) **Internal Check**—It means a system under which the work relating to carrying out and recording of transactions is arranged in such a manner that the work of one staff member is automatically checked by another. Thus under this system possibilities of fraud and error or irregularities are minimized, if not completely eliminated.
- 3) **Internal Control**—By internal control, it means not only internal check and internal audit but the whole system of controls—financial and otherwise, established by the management in the conduct of a business in an orderly manner, safeguard its assets and maintain the accuracy and reliability of its operations and records. Thus it is apparent that internal control expression is used in a wide sense and includes internal check and

internal audit besides other forms of control. *(Ravinder Kumar, Virender Sharma 2005)*

Objectives of Internal Control

Internal control is a process affected by the board of directors, senior management and all levels of personnel. It is not solely a procedure or policy that is performed at a certain point in time, but rather it is continually operating at all levels within the bank. The board of directors and senior management are responsible for establishing the appropriate culture to facilitate an effective internal control process and for monitoring its effectiveness on an ongoing basis; however, each individual within an organization must participate in the process. The main objectives of the internal control process can be categorized as follows,

1. Efficiency and effectiveness of activities (performance objectives)
2. Reliability, completeness and timeliness of financial and management information (Information objectives) and
3. Compliance with applicable laws and regulations (compliance objectives).

Performance objectives for internal controls pertain to the effectiveness and efficiency of the bank in using its assets and other resources and protecting the bank from loss. The internal control process seeks to ensure that personnel throughout the organization are working to achieve its goals with efficiency and integrity, without unintended or excessive cost or placing other interests (such as an employee's, vendor's or customer's interest) before those of the bank.

Information objectives address the preparation of timely, reliable, relevant reports needed for decision-making within the banking organization. They also address the need for reliable annual accounts, other financial statements and other financial-related disclosures and reports to shareholders, supervisors, and other external parties. The information received by management, the board of directors, shareholders and supervisors should be of sufficient quality and integrity that recipients can rely on the information in making decisions. The term reliable, as it relates to financial statements, refers to the preparation of statements that are presented fairly and based on comprehensive and well-defined accounting principles and rules. *(Basle Committee for banking supervision, September 1998)*

The reliability of financial information can only be obtained through the implementation of internal control procedures which are capable of faithfully recording all the operations performed by the bank. The quality of this internal control system can be targeted by means of: segregation of duties, enabling a clear distinction to be made between recording duties, operational duties and retention duties; function descriptions which should enable the origins of the information prepared to be identified, together with its recipients; an accounting internal control system enabling to check that the operations have been performed in accordance with general and specific instructions, and that they have been accounted for so as to produce financial information which complies with generally accepted accounting principles.

Compliance objectives ensure that all banking business complies with applicable laws and regulations, supervisory

requirements, and the organization's policies and procedures. This objective must be met in order to protect the bank's franchise and reputation. *(Basle Committee for banking supervision, September 1998)*

This refers to the laws and regulations to which the bank is subject. The laws and regulations in force determine the behavioral standards that the company incorporates into its compliance objectives. Given the large number of areas that exist (company law, commercial law, security, environment, social, etc.), the bank needs to be structured in such a way so that bank is aware of the various rules that applied. *[Internal control reference, AMF 2004]*

Advantages of Internal Control System

The existence of an efficient system of internal control can be of great help to the management as well as to the auditor because it offers the following advantages,

1. Assures a high degree of accuracy and reliability of all the financial and operating information management receives.
2. Minimizes occurrence frauds and errors or any other irregularity, if not eliminates completely.
3. Safeguard assets against any misuse.
4. Promotes operational efficiency and prevent wastages.
5. Judges operating efficiency and highlights weaknesses.
6. Above all encourages adherence to the established managerial policies.

Forms of Internal Control

The definition of internal control given by the American Institute of Certified Public Accountants (AICPA), mentioned earlier, indicates that internal control goes beyond the accounting functions of the organization and incorporates both accounting and administrative controls.

- i. **Accounting Controls**-According to the first part of the said definition, accounting control concerns the controls related to the accounting system that is checking transactions as per the prescribed procedures and safeguarding the assets. Accounting control comprises the followings;
 - a. Budgeting Control.
 - b. Standard control and deviation analysis.
 - c. Internal check.
 - d. Internal Audit.
 - e. Bank reconciliation.
 - f. Self-balancing ledgers etc.
- ii. **Administrative Control**-The last phrase of the definition "Operational efficiency and encourage adherence to prescribe managerial policies", indicates towards Administrative Control. Administrative Control comprises the following;
 - a. Time Studies.
 - b. Motion Studies.
 - c. Quality Control.
 - d. Performance Appraisal.
 - e. Statistical Analysis etc.

Requisites/Principles of Good Internal Control

- I. A well-designed accounting system should be in operation. Financial and accounting operations must be separated, that is, handling of cash and the recording of the movement thereof should be done by different persons.
- II. Responsibility for the performance of the job must be clearly stated so that there remains no room for doubt or confusion subsequently. To achieve this clear-cut and well-conceived organization structure should be established.
- III. Too much confidence should not be pinned in one individual. Nearly all frauds are committed by 'trusted' officials are employees. It is interesting to note that frauds have acquired owing to their being trusted.
- IV. Rotation principle relating to transfer of an employee from one job to another should be the inflexible guiding rule. This is effective safeguard against collusion and is recognized as an important canon of sound organization.
- V. Mechanization of the work wherever feasible and practicable, should be resorted to. Mechanical devices such as cash register, recording time clocks, calculation machines, etc should be introduced.
- VI. The work should be so arranged that work done by one employee could be promptly checked by another independent employee such continuous and constant checking stimulates moral control and also the error and the frauds cannot go undetected.
- VII. The arrangement of the work should be in such a manner that written record of the role played by each employee should be maintained and the work should pass through several hands in a well-defined manner.
- VIII. Clear and well-defined rules should be laid down and practically followed relating to dealing of the cash, ordering, receiving and issuing goods etc. Instructions should be in writing in the form of accounting manuals.
- IX. Employees must be in bond so that the tempted employee will be deterred from committing fraud and employer being protected.
- X. Although not a substitute for protective financial internal control, yet existence of an efficient internal auditing staff is an important element of an effective internal control system. *(Ravinder Kumar, Virender Sharma, 2005)*

The Components of Internal Control System

The internal control system consists of five closely related components. Although these components apply to all companies, the way they are implemented will vary depending on the size and the business sector of companies. They are; control environment, risk assessment, control activities, information and communication, monitoring of controls. *[Internal control reference, AMF 2004]*

Control environment-This element is the underlying foundation for all of the other elements of an internal control system. The control environment is indicative of the overall awareness of both a bank's board and management - and their attitude as well - in assigning an adequate level of importance to the control activities. The control environment reflects the

overall contributions by a bank's board and management towards the necessary discipline and the appropriate structure for ensuring proper internal controls over a bank's operations. The essential components of an effective control environment include.

- i. Personnel integrity and ethical values.
- ii. Dedication to staff competence and skill enhancement.
- iii. Participation of Board Members and Board Committees.
- iv. Positive influence of Management's commitment.
- v. Organizational structure that enables the management of the bank.
- vi. Authority and responsibility that is clearly defined.
- vii. Effective policies and practices for human resources *(A Guide for Directors and Managers of Liberian Banks, March 2005)*

An organization comprising a clear definition of responsibilities, with suitable resources and competencies and supported by appropriate information systems, procedures or operating methods, tools and practices. The implementation of an internal control system must be based on fundamental principles but also on:

- i. **a suitable organization** which provides the framework in which the activities implicit in meeting the objectives are planned, carried out, followed up and controlled;
- ii. **Clearly defined responsibilities and powers** which are granted to the right people depending on the bank's objectives. Bank can be formalized and communicated by means of task or job descriptions, operating and functional line organization charts, delegation of powers, and should respect the principle of the
- iii. **a human resource management policy** which should enable people to be recruited with the appropriate knowledge and competencies required to carry out responsibility and to meet the current and future objectives of the company;
- iv. **Operating procedures or methods** which specify the way in which an action or process should be carried out (objectives to be achieved within a given time frame, definition of function and operating/reporting lines, policy framework, decision-making and assessment tools, control frequency, person responsible for the control,..) regardless of their format and type of support aid.
- v. **Tools or work facilities** (office automation, IT) which are adapted to everyone's needs and which every user should be suitably trained.
- vi. **Practice** which are commonly accepted within the company. *[internal control reference AMF 2004]*

Risk assessment is the umbrella term for the process and methodology by which a bank's board and management identify and analyze the various kinds of risk that might prevent a bank from realizing its budgetary objectives. Risk assessment is intended to assist in determining exactly what kinds of risks are present, how to manage those risks identified and what kinds of controls are needed to be established. Risks are not a static phenomenon but arise and change because of a number of factors, as:

- A change in a bank's operating environment.
- A change in staffing, either through reassignments or new employees.
- A new or a revised information system.
- A change in a bank's growth pattern and / or rate.
- An introduction of new technology.
- An introduction of new or expanded business lines, products or activities.
- A merger or other corporate restructuring.
- A change in accounting requirements. (*A Guide for Directors and Managers of Liberian Banks, March 2005*)

A system for identifying and analyzing the main identifiable risks in relation to the company's objectives and for ensuring that procedures exist for managing those risks. Given the ever-changing environment and regulatory context, bank's implement methods to identify, analyze and manage the risks, both internal and external, with which may be confronted and which could reduce the likelihood of meeting business objectives.

- i. **Risk identification** The bank identifies the main identifiable risks, both internal and external, which could have an impact on the likelihood of it meeting the objectives it has fixed for bank. This identification process, which is on-going, should cover those risks which could have a significant impact on its situation.
- ii. **Risk analysis** This involves taking into consideration the likelihood of the risks occurring and their potential seriousness, as well as considering the environment and existing control measures.
- iii. **Risk management procedures** Executive Management or the Management Board, supported by a risk management function, if there is one, should define risk management procedures. [*internal control-internal control reference AMF 2004*]

Control Activities Control activities are all of the policies and procedures that have been instituted by the bank to direct bank staff in carrying out the directives of both board and management. All of these activities help the board and management control risks that could adversely affect the bank's operations and results. The policies that direct these control activities should also provide that the bank personnel who are responsible for these control activities do not evaluate their own work in these areas. Control activities are engaged in at various levels within the bank's organizational structure which include,

- i. **Operational Performance** - Control activities in this area include the review of risk in the actual financial performance compared against the budgeted forecasts. Any significant variances are then analyzed to determine whether any specific bank activity should be revised.
- ii. **Information Processing** - Control activities in this area include the verification of the accuracy and completeness of bank transactions to determine whether they had been properly authorized. Control activities in the information area are broadly measured through two approaches general controls and application controls. General controls are oversight over data center operations, including mainframes and servers, and

system software procurement, maintenance and access. Application controls are the oversight for the programs that the bank utilizes to process and monitor transactions.

- iii. **Physical Controls** - Control activities in this area generally refer to the physical
- iv. **Segregation of Duties** - Control activities in this area refer to the assignment of the various duties involved in a transaction, or any bank activity, to different persons. This approach is intended to prevent a bank employee from being in a position to effect and conceal an irregular or illegal activity in the course of that person's normal duties. (*A Guide for Directors and Managers of Liberian Banks, March 2005*)

Control activities proportionate to the implications of each individual process and designed to ensure that the appropriate measures are taken in order to control the risks that could affect the bank's ability to achieve its objectives.

Control activities can be found everywhere in the organization, at every level, and in every function, whether controls focusing on prevention or detection, manual or computerized controls, or controls by virtue of the reporting structure.

In any event, control activities are determined in the light of the nature of the objectives with which controls are associated and are proportionate to the implications of each process. In this context, particular attention should be paid to the controls over the processes involved in designing and running information systems. [*Internal control reference, AMF 2004*]

Information and Communication-capture and impart pertinent and timely information in a form that enables the board, management, and employees to carry out their responsibilities. Accounting systems are the methods and records that identify, assemble, analyze, classify, record, and report a bank's transactions. Information and communication systems enable all personnel to understand their roles in the control system, how their roles relate to others, and their accountability. Information systems produce reports on operations, finance, and compliance that enable management and the board to run the bank. (*Internal control Comptroller's Handbook, January 2001*)

Information systems which are adapted to the current objectives of the organization and designed to be able to respond to its future objectives. The IT systems on which these information systems depend must be effectively protected, both in terms of physical and logical security, thereby ensuring that there is no loss of the information stored. Bank operational continuity is guaranteed by back-up procedures. The information on the analyses, the programming and processing functionalities must be documented. [*Internal control reference, AMF 2004*]

The following processes must be used to control the components of the accounting information production tool:

- a. The use of computerized accounting systems calls for a clear and formalized organizational structure, and measures to ensure the physical security of computer systems and data integrity;
- b. Information systems have been developed to meet requirements with regard to the security, reliability,

- availability and relevance of accounting and financial information;
- c. Overall information system organization and operations must be governed by specific rules on system access, validation of processing, cut-off procedures, record keeping and verification;
 - d. Procedures and controls must be established for quality assurance and operational security, for maintenance and development (or parameterization) of accounting and management systems, along with other systems that provide data directly or indirectly to accounting and management systems;
 - e. Critical information system controls must be established (preventing duplicate entries, thresholds for entries, limited access for critical transactions, automated reconciliations, etc.);
 - f. The company must be capable of meeting the specific requirements of the tax authorities:
 - i. Storage of data processed by computer applications that prepare accounting records or substantiate transactions recorded in the documents filed with the tax administration;
 - ii. Documentation: Data and file management rules implemented by computer programs that contribute to the determination of book income, taxable income and tax returns must be described;

In this case, management systems that contribute to the preparation and processing of published accounting and financial information. The in-house dissemination of relevant and reliable information, the awareness of which enables everyone to exercise their responsibilities. The company should employ processes which ensure that all relevant and reliable information is communicated in a timely manner to all relevant players within the company, thereby enabling them to exercise their responsibilities. *[Internal control reference AMF, 2004]*

Monitoring-Self-assessment or monitoring is intended to provide an oversight function in assessing the performance of the bank's control systems. Bank directors and management constantly review internal controls for their proper functioning and for modifications to the internal control systems when deemed necessary. Self-assessment is only one approach to a basic review of these internal control activities; however, self-assessment cannot be the only approach to assessment of the effectiveness of a bank's internal control systems. Internal and external audits provide a more independent approach to the assessment of the bank's internal control function. Supervisory examinations additionally provide another layer of assessment of these controls. *(A Guide for Directors and Managers of Liberian Banks, March 2005)*

On-going monitoring of the internal control system together with a regular review of the way it is operating. As for any system, the internal control system requires on-going monitoring. The aim is to check its relevance and appropriateness to the bank's objectives implemented by management and steered by the Executive Management or the Management Board. This monitoring principally comprises the analysis of the main incidents that have been recorded, the result of the controls

performed, together with the work carried out by the internal audit team, when there is one. This monitoring also takes in to consideration the observations made by the statutory auditors and by regulatory oversight bodies. Another useful complement to the monitoring tools can be to keep an active watch on internal control best practices. Monitoring, together with the best practices watch, culminate, where required, in the implementation of corrective actions and adjustments to the internal control system.

The objectives of the monitoring processes for the accounting and financial reporting structure are to define and implement accounting policies and to manage resources and constraints in order to meet senior management's objectives. Monitoring of the accounting and financial reporting structure is based on the principles and key analytical points discussed in detail below. This monitoring is the task of the Accounts and Financial Reporting Departments, as well as senior management. *[Internal control reference AMF, 2004]*

These five components are linked together, thus forming an integrated system that can react dynamically to changing conditions. The internal control system is intertwined with the organizations operating activities, and is most effective when controls are built in to the organizations infrastructure, becoming part of the very essence of the organization. *[American Institute Committee of Public Accountants (AICPA), 2005]*

What Internal Control Cannot Do

As important as internal control structure is to an organizational effective system is not a guarantee that the organization is successful. An effective internal control structure keeps the right people informed about the organization's progress (or lack of progress) in achieving its objectives, but it cannot turn a poor manager in to a good one. Internal control cannot ensure success, or even survival.

Internal control is not an absolute assurance to management and the board about the organization's achievement of its objectives. It can only provide reasonable assurance, due to limitations inherent in all internal control systems. For example, breakdown in the internal control structure can occur due to simple error or mistake, as well as faulty judgments that could be made at any level of management. In addition, controls can be circumvented by collusion or by management override. Finally; the design of the internal control system is a function of the resources available, meaning that there must be a cost-benefit analysis in the design of the system.

Roles and Responsibility

Everyone in the organization has some role to play in the organization's internal control system

Chief Executive Officer (CEO)-the CEO has ultimate responsibility and ownership of the internal control system. The individual in this role sets the tone at the top that affects the integrity and ethics and other factors that create the positive control environment needed for the internal control system to thrive. Aside from setting the tone at the top, much of the day-to-day operation of the control system is delegated to other senior managers in the company, under the leadership of CEO.

Chief financial officer (CFO)-Much of the internal control structure flows through the accounting and finance area of the

organization under the leadership of the CFO. In particular, controls over financial reporting fall within the domain of the chief financial officer. The audit committee should use interactions with the CFO, and others, as a basis for their comfort level on the internal control over financial reporting.

Controller/director of accounting or finance-Much of the basics of the control system comes under the domain of this position. It is key that the controller understands the need for the internal control system, is committed to the system, and communicates the importance of the system to all people in the accounting organization. Further, the controller must demonstrate respect for the system through his or her actions.

Internal audit-The main role for the internal audit team is to evaluate the effectiveness of the internal control system and contribute to its ongoing effectiveness. With the internal audit team reporting directly to the audit committee of the board of directors and/or the most senior levels of management, it is often this function that plays a significant role in monitoring the internal control system. It is important to note that many not-for-profits are not large enough to employ an internal audit team. Each organization should assess the need for this team, and employ one as necessary.

Board of director/audit committee-A strong, active board is necessary. This is particularly important when the organization is controlled by an executive or management team with tight reins over the organization and the people within the organization. The board should recognize that its scope of oversight of the internal control system applies to all the three major areas of control: over operations, over compliance with laws and regulations, and over financial reporting. The audit committee is the board's first line of defense with respect to the system of internal control over financial reporting.

It is important to realize that both the design and compliance with the internal control system so important. The audit committee should be tuned-in to the tone- at-the-top of the organization as the first indicator of the functioning of the internal control system.

In addition, audit committees should realized that the system of internal control should be scaled too the organization. Some organization will be so small, for example, that they will not be able to have appropriate segregation of duties. The message here is that the lack of segregation of duties is not automatically a material weakness, or even a reportable condition, depending on the compensating controls that are in place.

For example, suppose an organization's accounting department is so small that it is not possible to segregate duties between the person who does the accounts payable and the person who reconciles the bank statements. In this case, it is one and the same person, so the implication is that there are no checks and balances on the accounts payable person, who could be writing checks to a personal account, then passing on them during the bank reconciliation process (that is there is no one to raise the red flag that personal checks are being written on the company account). Compensating controls could make up for this apparent breach in the internal control system. Here are some examples of compensating controls in this situation:

1. All checks are hand signed by an officer of the company, rather than using a signature plate that is in the control of the person that prepared the checks.
2. The bank reconciliation may be reviewed by the person's manager.
3. A periodic report of all checks that are cleared at the bank could prepare by the bank and forwarded to an officer of the company for review.

Audit committees should be aware of situations like this and be prepared to ask questions and evaluate the answers when an obvious breach in internal control is surfaced.

All other personnel-The internal control system is only as effective as the employees throughout the organization that must comply with it. Employees throughout the organization should understand their role in internal control and the importance of supporting the system through their own actions and encouraging respect for the system by their colleagues throughout the organization.

Management Override of Controls

Another area that an audit committee needs to focus on is the ability of management to override internal controls over financial reporting to perpetrate a fraud. Examples of techniques used by management in overriding internal controls over the financial reporting function include:

- a. Back dating or forward dating documents to a different period.
- b. Making adjusting entries during the financial reporting closing process.
- c. Reclassifying items improperly between the statement of activity and the statement of financial condition.

Some of these override techniques were used in some of the recent scandals and have gained substantial notoriety.

An audit committee has the responsibility to help prevent or detect a management override of controls. It is important for the audit committee to understand that there is system to uncover an override, as well as to follow-up to determine its appropriateness. Question about management override, and the controls over management override, as well as audit steps to detect if a management override has occurred, should be address to the CEO, CFO, and independent auditor during the respective executive sessions with the audit committee. [AICPA Audit Committee Toolkit, 2005]

Need for evaluation Of Internal Control

The auditors are increasingly recognized the importance of evaluating internal controls before undertaking specific audit tests. This may be attributed to many factors.

In view of the enormous growth in their size and complexities, proper management of modern business undertaking is not possible unless they have an effective system of internal control. Hence, sophisticated system of management information and control have been introduced in many organizations. An auditor should, therefore, evaluate these systems as a part of his audit assignments.

Evaluation has also become impracticable for an auditor too undertake a detailed vouch-and-post audit of the large number of

transactions of an organizations. Within the constraints of the resources available. Actually auditor can conducted a more effective audit if he concentrates on intelligently selected areas. Another development which makes it imperative for an auditor to evaluate the internal control system is the increasing use of computers on maintaining accounts. Electronic data-processing devices have considerably changed the flow of documents and transactions and the auditor may not now have the intermediary documents and links which are useful in detailed vouch-and-post audit. In such a situation, the auditor has to rely a great deal on the in-built controls in the system.

Various professional accounting bodies now recognize the fact that the evaluation of internal control system helps in formulating a programme of detailed verification. In the context of an audit of financial information, basic Principles Governing an Audit, states: "The auditor should gain an understanding of **Conceptualization Framework.**

the accounting systems and related internal controls and should study and evaluate the operation of those internal controls upon which he wishes to rely in determining nature, timing and extent of other audit procedures. Where the auditor concludes that he can rely on certain internal controls, his substantive procedures would normally be less extensive than would otherwise be required and may also differ as to their nature and timing". If an auditor finds that internal controls in certain areas are inadequate, he may decide to apply more effective substantive tests, or change the timing of the test to be applied, or extend his audit test to carry out a more detailed examination of the unsatisfactory aspects of the system.

III. CONCEPTUALIZATION FRAMEWORK AND METHODOLOGY

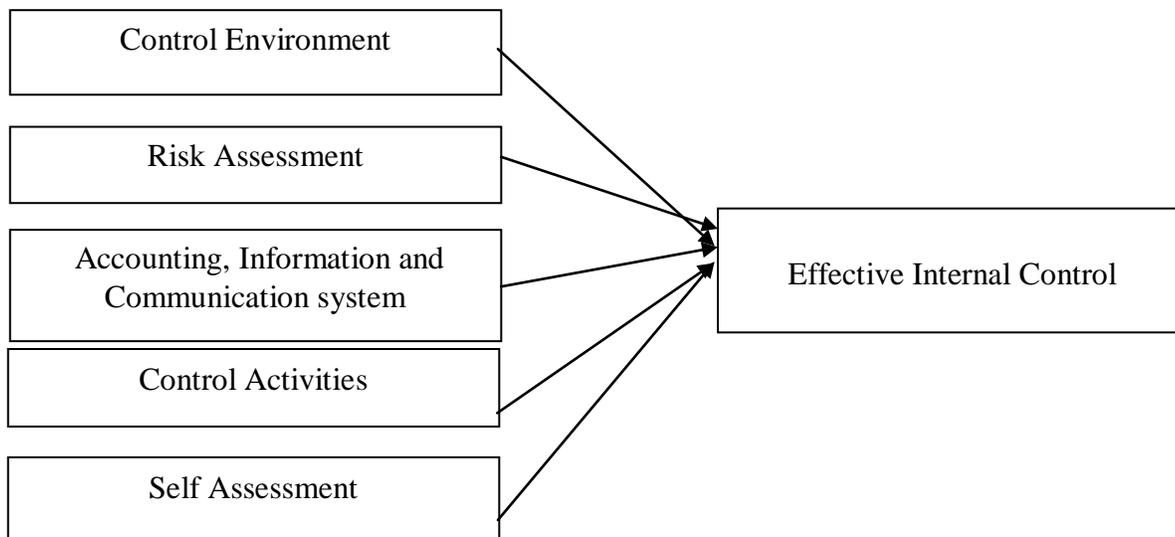


Figure 3.1: Conceptualization Framework
(Source: Developed for the Research purpose)

Operationalization of Variable

Table.3.1 (Operationalization Of variable)

Concept	Variable	Indicator	Measurement
Effectiveness of Internal control	Control Environment	<ul style="list-style-type: none"> ▪ Effective policies and practices for human resources. ▪ Authority and responsibility that is clearly defined. ▪ Organizational structure that enables the management of the bank. 	Questionnaire 5 Point Scale
		An introduction of new or expanded business lines, product activities. An introduction of new technologies. New or a revised information system. A change in staffing either through reassignment or new employees. A change in a bank's operating	Questionnaire

	Risk Assessment	environment.	5 Point Scale
	Accounting, Information and Communication system	<ul style="list-style-type: none"> ▪ Accounting. ▪ Information systems. ▪ Communication systems. 	Questionnaire 5 Point Scale
	Control Activities	<ul style="list-style-type: none"> ▪ Operational performance. ▪ Information processing. ▪ Physical controls. ▪ Segregation of duties. 	Questionnaire 5 Point Scale
	Self assessment	Continuous assessments. Documentation. Verification.	Questionnaire 5 Point Scale
	Effectiveness of internal control	<ul style="list-style-type: none"> ▪ Scope of responsibilities of the accounting and financial reporting. ▪ Accounting rules and procedures. ▪ Reliable accounting and financial information. 	Questionnaire 5 Point Scale

(Source: Developed for the research Purpose)

Research Design

This study is based on measure the effectiveness of internal control system. Research design concern with the followings,

- I. Sampling criteria & size of sample.
- II. Data collection instruments.
- III. Measure for all variables.
- IV. Data analysis techniques.

Sample.

The sample for this study is consisting the list of permanent employees, namely, District Manager, Manager, Assistant manager, Executive Officer, Junior Executive Officer and Staff Assistant in the Private Banks of Trincomalee in which researcher intends to select the sample.

Sample Selection.

The researcher was selected private banks in Trincomalee. These selected banks are Hatton National Banks, Commercial bank, Seylon bank, Pan Asia, DFCC, Housing Development Bank, Union Bank, National Development Bank , Nations Trust

Bank and Sampath Banks include 130 permanent employees and it is taken as same as the sample size. Sample size for each bank will be illustrated in the figure bellow.

Table: Sample

Name of the Bank	No of Employees(population)
Hatton National Banks	27
Commercial bank	16
Seylon bank	11
Pan Asia	11
DFCC	16
Housing Development Bank	12

Union Bank	08
National Development Bank	08
Nations Trust Bank	11
Sampath Bank	10
Total	130

(Source: Develop for the research purpose)

Methods of Data Analysis and Evaluation.

• **Five point Likert Scale**

In this research one of the ordinal measures called “**Five Point Likert Scale**” was used. A likert scale consist of a series of evaluative statements concerning an attitude object; respondents are asked to rate the object on each statements using a five point as follows.

Strongly agree	1	
Agree	2	
Neutral		3
Disagree		4
Strongly disagree		5

By using this scale, it will be easy to find out which factors affect for **Effectiveness of the internal control system.**

Based on the values indicated in the questionnaire a mean value for each question is calculated.

XI= Mean value of variable.

I=1, 2, 3, 4, 5

X1 = Mean value Control Environment.

X2 = Mean value Risk Assessment.

X3 = Mean value Accounting, information and Communication systems.

X4 = Mean value Control Activities.

X5= Mean value self assessment.

The value of each respondent for a variable is compared with the mean value. Therefore the decision rule can be formulated as follows.

Decision Criteria

- | | |
|--------------------------|---|
| 1) $1 \leq X_i \leq 2.5$ | Factors highly supportive to Internal Control Systems. |
| 2) $2.5 < X_i \leq 3.5$ | Factors moderately supportive to Internal Control System. |
| 3) $3.5 < X_i \leq 5$ | Factors low supportive to Internal Control System. |

Decision Rule

• **Univariate Analysis**

Univariate analysis is the simplest form of quantitative (statistical) analysis. The analysis is carried out with the description of a single variable and its attributes of the applicable unit of analysis. Univariate Analysis describes the pattern of response to the variable and describes each variable on its own. Univariate descriptive statistics can summarize large quantities of numerical data and reveal patterns in the raw data.

IV. DISCUSSION

Research Information Discussion

Under this study, researcher has analyzed effectiveness of the internal control system of Private bank based on the independent variables; such as control environment, risk assessment, accounting, information and communication, control activities and self assessment. These variables are analyzed based on the univariate analysis such as standard deviation, mean, charts and percentages.

Discussion on control environment

In discussion on control environment variable, it has 2.96 mean value that is moderately supportive to effectiveness of internal control system in private bank. It can be conclude that the control environment within private bank is in moderate level of effectiveness as there are 90 employees fallen under moderately supportive level. On the whole this can be concluded that the overall awareness of management to build appropriate environment within the bank to implement control activities is in moderate level including implementing policies and practices for human resource management and giving authority and responsibilities to the right persons at right time to carry out the banking activities.

This says that bank circulars may not be properly reviewed and not be made available to the employees for the regular exposure. The internal control policies do not promptly communicate to all the employees and their subsequent changes. As there is lack of staff organizational structure may not clearly define the responsibilities and authorities to be carried out by the each staff.

Discussion on Risk Assessment

In the discussion on the risk assessment variable it is observed that it has a mean value of 3.05 and 100 respondents have given their responses moderately. That means evaluating the risk when planning and approving new products or activities, using of new technologies such as laser lamps, cash counter machines, security system for computers, adequate training programmes to the employees and job rotation procedure among employees would be in the moderate level of effectiveness.

That cannot say that those procedures have not been implemented fully within the bank but there may be some deviations in the implementation. According to the discussions held with management, it can be concluded that although there are some risks in assessing the procedures when introducing new products or services those are not controlled by the bank and implemented regularly within the bank. Through observation by researcher, it can be said that there is no sufficient trend in using new technological measures such as laser lamps, cash counting machines etc and bank is not tend to give training programmes on their own to the employees except other common programmes.

Discussion on Accounting, information and communication

Accounting, information and communication has 3.16 mean value and out of 50 respondents 30 have fallen under moderately supportive criteria. That means 96% of respondents accept fact

that accounting, information and communication procedure is in moderate level of effectiveness. This implies that accounting procedure within the bank, technological measure adopting in the bank security such as alarm bell on safes, technological failures prevention, convenience of communication method implementation around the bank such as weekly meetings, memos, intercom system etc, and line management accountability are in moderate level of effectiveness.

Through observation and discussion with managers by the researcher it can be said that, information and communication system is in lower level since these banks still look forward to adopt new technological measures on information and communication system. These banks are not profit oriented and they try to involve in contributing the development in the country and they are not much concern with competitiveness in the banking sector.

Discussion on Control Activities

When considering control activities variable it has 2.97 mean value and 87% of respondents have accepted that control activities within the bank is in moderate level of effectiveness. This refers to the moderate level of effectiveness in the aspects of employees' performance review and documentation, policies and procedures for approvals and authorization of transactions, internal audit procedure, segregation of duties and physical controls.

Through survey data, observation and discussions held by the researcher, it can be said that although there are segregation of duties, operational performances, physical controls and information processing within the bank, it has some deviation in implementing the regular performance such as engaging in periodical external and internal auditing procedures and amending the errors at the time of regular review.

Thus according to the survey data it can be said that existing control activities within the bank is not in a satisfying effective level that is to say that all the personnels are not aware of all the banking activities, existing proper policies and procedures to conduct activities.

Discussion on Self assessment

In discussion of self assessment variable in the Univariate analysis it has 3.12 of mean value and 95% of respondents have accepted that self assessment procedure within the bank is in moderate level of effectiveness. In other words continuous assessment, documentation and verification are in moderate level of effectiveness. The reason for this condition the training programmes for employees, proper checking procedure on all vouchers and other documents, proper key handling procedure, pass word renewals systems are not properly practiced.

They are not giving prominent concern on pass-word usage in computers and proper key control system in the bank and to have continuous check on them. To achieve higher effectiveness of self assessment, the necessity of employees training should be taken in to the consideration, proper documentation, bottom level management should go under the supervision of top level management regularly etc. Self assessment is review by themselves on their system and take corrective actions, it should be a proper procedure as it will be more helpful in achieve an effective internal control system.

Discussion on overall variables

Overall discussion on independent variables means that concerning the all independent variable as whole. The overall analysis has 3.05 mean value and 100% of respondents are accepting that all variables support moderately in effectiveness of internal control system. That refers that all independent variables as one variable and support moderately in the effectiveness of internal control system.

In this case it should concern on all independent variables same at once. For example it cannot achieve good internal control system only having good control environment within the bank but it should concern on accounting procedures, communication process within the bank and should implement good self assessment process etc to achieve good internal control system in the bank.

V. CONCLUSION AND RECOMMENDATIONS

The main purpose of this chapter, Conclusion and Recommendation is giving summary of entire findings on the research based on the chapter Data Analysis and Presentation. And further, researcher will suggest recommendation to implement in the bank to enhance the effectiveness of the internal control system in the Private Bank at Trincomalee District.

Conclusion

The Study on effectiveness of the internal control system in Private Bank was based on the independent variables; control environment, risk assessment, accounting, information and communication, control activities and self assessment. In the univariate analysis of data, control environment that is organizational structures, policies and practices for human resources, authority and responsibility of private bank is in moderate level of effectiveness.

Then concerning the risk assessment, that means introducing new product lines or services, introducing new technologies, new or revised information system, change in bank operating environment and change in staffing etc are in moderate supportive in effectiveness of internal control system. Risk assessment refers to give attention on present, past as well as future banking activities to evaluate their results and take necessary steps to correct them if there is any deviations and prevent to occur them again and should build a bank environment which can be faced competition well.

Accounting, information and communication variable is moderately supportive in the effectiveness of internal control system. This variable indicates the accounting, information system and communication system within the bank. That means bank has proper, timely reporting accounting method, sound information system over the bank to prevent frauds and errors, convenient communication system which enable to communicate over the bank immediately to overcome problems.

In the consideration of control activities variable, it is in moderately supportive level in the effectiveness of internal control system and 87% of respondents are accepting that control activities within the bank is in moderate supportive level. Control activities should be an integral part of the daily activities of bank;

it includes operational performances, information processing, physical controls and segregation of duties

In the consideration of self assessment variable, it is fallen under moderately supportive in the effectiveness of internal control system. There 95% of respondents have accepted that self assessment is in the moderately supportive category. Self assessment is a review of banking activities it includes continuous assessment, documentation and verification.

In the overall analysis, all variables are moderately supportive in the effectiveness of internal control. That is five independent variables are moderately supportive in the effectiveness of internal control. And all respondents have accepted that independent variables are in the moderate level.

This study "Effectiveness of Internal Control system in Private Bank" was based on the independent variables; control environment, risk assessment, accounting, information and communication, control activities and self assessment but the effectiveness of internal control system affected by some other unexplained factors such as time framework that is minimum time taken by the bank to correct the errors or frauds occurred in the bank, effectiveness of the resource utilization within the bank that is utilize resources by minimizing wastages and optimally use resources etc.

Recommendations

Control environment mainly focus on policies and procedures on human resources, authority and responsibility and organizational structure. Following recommendations are suggesting enhancing the effectiveness of internal control.

Private bank consist of three commercial bank branches, two Hatton national bank branches, two Seylan bank branches and one nation trust bank branch. Thus these all banks could establish an internal control council to act upon internal control of these banks and they should revise and approve periodically at least per year. All the policies and procedure on each and every activity such as loans, pawning, deposits, human resources management etc implemented. It should be approved by the council on internal control of the Regional Development bank.

Internal control policies should be changed frequently base on changing business environment especially for human resources such as for employees' recruitment, socialization programme, probationary period, training programmes etc and there should be a separate section for dealing with this. That section should be have continuous evaluation of existing policies and procedures. It should be taken corrective actions if there are any deviations and they should be approved by the council. According to the changes in internal control policies, it needs to evaluate the employees that how they adopted the changes, what are the problems they are facing with changes and should take solutions to correct them.

From the survey data and discussion, the researcher has found out that there is no proper method to communicate internal control procedures to employees. If it is possible to publish a manual which could be used to every employee at any time including short and long term objectives and strategic within the bank, internal regulations are providing detailed description of functions, obligation and responsibilities of employees, flow of reporting and communication, procedure for accounting at least

annually. It will help to functioning the banking activities to the employees specially newly recruited ones.

Risk assessment is a process to identify and analyze various risks, which can prevent bank to realize them. Following suggestions that bank is not familiar with, are making to prevent risk that might be occurred. The researcher has found out that there is no frequent and regular review policies and procedures established on loans and other banking activities. Thus it is need to be appointing a committee or a person to evaluate and verify the deposits, loans and lending with the view of timely identify the problems. According to observation two people share one cash machine and printer or in some banks all the counters have one cash machine. Therefore it needs to give cash machine and printer to each and every teller.

Scanned /lesser signature should be checked every withdrawal and in the case of change in the signature it needs to verify. No cameras could be found and it needs to fix the cameras to observe the daily entrances and exits of the customers. According to observations, it is found out that securities are appointing by outside companies in contract basis. But it needs to appoint securities recruited by bank under some training on banking activities. Training programmes, workshops need to plan for employees, based on the internal control policy changes and changes in business environment. Job rotation should be proceeding in specific period in same management level effectively under the top level management supervision.

Accounting, information and communication are the systems that can be used bank personnel to perform their tasks. Following are some suggestions which made by researcher to implement in the bank. Researcher found out that some banks are not operated emergency alarm bell and those operated alarm bells are not inspecting their operations. Therefore it need to fixed emergency alarm bell and already fixed should be inspected their operations.

Technical officer should appoint to every branch to evaluate the technical condition of whole system to prevent the technical failures. It needs to provide intercom phones to Assistant manager, Executive officers and staff assistants for efficient communication. The researcher has found through observation that some banks are not exhibit name boards to all relevant places except Manager's office. Therefore it should exhibit relevant name board in the bank for the convenience of customers. And if it is possible to assign a person to direct customers at their entrance it will more helpful for customers. Control activities are policies and procedures those institute in the bank to direct bank personnel established under the control environment. Following recommendations are made by researcher base on the data collected to enhance their effectiveness of internal control system.

There should be maintain descriptive reports for all management level employees on their works and they should be analyzed at least once a month and take corrective actions for giving trainings or any other programme. Due to the lack of staff, there is same person responsible to record keeping and custody of assets in some bank. But it should segregate between different persons. Operational reports should prepare by the branches on day to day operations for the purpose of review operations. And Board of Directors and senior management often request presentation and performance reports that enable them to review

the progress. Divisional level management should review standard performance reports daily or weekly such as pawning section, loan section.

Employees should have proper knowledge on each and every person's responsibilities and authorities. For example, in the authorization and approval procedure when manager is not available employee should have proper knowledge who is the second officer he/she can be reached.

In some banks, they do not have extra backup files except computerized files and manuals for every transaction. Thus it is necessary to keep backup files for every section's transaction outside the bank to protect bank's information from disasters.

In my view internal audit procedure should function in specific time period as ongoing monitoring procedure in every branch. Through discussions researcher found out that internal control procedure done only by the necessity of Board of Directors (BOD) under the supervision of Head of internal audit in Regional offices. It is done annually or quarterly but only under the decision of BODs and internal audit. It is directly responsible for the top level management, but external audit is done annually by independent party. The specimen signature should maintain in a book for all officers by management in every branch to use in the case of verification of inter branch documents.

Self assessment is the process which intends to provide an oversight function in assessing the performance of bank's control system. There are some suggestions made by the researcher to self assessment process based on the collected data. According to the survey data, researcher found out that counter officers not go under supervision when they are balancing their teller. Thus

counter officers should be gone under the supervision of senior management.

Not only the cash payments and receipts but also it should be gone under the supervision of physical aspects such as daily passbooks, assets, pawning documents etc and they should be incorporated with daily reports. Through the discussion the researcher found that pass-words for computers not frequently change in every branch such as front office, pawning section, loan section. Thus it needs to change frequently and different pass-words used in different sections. And it should be reviewed the key control procedure within the bank and should be changed the keys using in the bank, safes. Board of directors should active in approving and monitoring loan policies and practices, especially private bank is giving prominent place to give loans to Small and Medium Entrepreneurs. And in the loan review procedure it should consider on maturity limits, rate structure, and security requirements and also the adequacy of the loan documentation in the loan procedure and should monitor the borrower frequently after loan originated.

Current Status:

Currently the study has been successfully completed and awaiting for the publication in any Business and Management magazine or conference.

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Facial Expression Recognition System for Autistic Children in Virtual Reality Environment

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Abstract- Autism Spectrum Disorder (ASD) may be viewed as a neuro developmental disability that can affect social interaction, language (or) behavioral skills of children. Most autistic children show symptoms of withdrawal from social interaction and a lack of emotional empathy towards others. The underlying causes of ASD are still not well understood but an alarming number of children are diagnosed and also suffered from this disorder. Among the fundamental social impairments in the ASD are challenges appropriately recognizing and responding to nonverbal cues and communication. Several existing assistive devices mostly serve as remedial tool that provides a learning environment for autistic children to learn about the norms and difficulties of social behavior. However this tool lacks the capability to operate in conjunction with real world scenarios. So we proposed a new intervention paradigm that act as a portable system called facial expression recognition system that recognizes virtual reality (VR) based facial expressions in a synchronous manner and also to break the dependency of an autistic child by enhancing expression based accessing and controlling process in this modern environment.

Index Terms- autism spectrum disorder, nonverbal communication, facial expression, virtual reality

I. INTRODUCTION

Autism Spectrum Disorders (ASD) is characterized by atypical patterns of behaviors and impairments in social communication [1]. Studies have found that children with ASD in a controlled environment were able to perform basic facial recognition tasks as well as their control peers, but they are often failed in identifying more complex expressions as well as required more prompts and more time to respond to facial emotional expression understanding tasks. In general, children with ASD have shown significant impairment in processing and understanding complex and dynamically displayed facial expressions of emotion. The human face is an important human body part which plays an extraordinary role in the human to human or human to machine communications. As such, it is essential to design robust emotion detection system for real world applications like human decision making and effective human computer interaction [2]. Our paper mainly focuses on human computer interaction via facial expressions. Social Interaction is the use of non-verbal or verbal communication to engage in interaction with people. This may involve speech, body postures, gestures, eye gaze and facial expressions used to initiate and respond to interaction with other. Autistic children face tremendous difficulties in understanding social cues and

conventions; they are unable to properly express non-verbal communication and body language. These inability hinder them from understanding verbal and non-verbal communications, as well as reading human facial expressions effectively. The ability to identify and determine one's emotions can serve as an empowerment for the field of artificial intelligence and give rise to smarter, more powerful machines that understands the intention of users. An intelligent machine with emotional awareness can achieve the shortcomings of autistic children. With that emotional awareness, the machine is capable of teaching and guiding autistic child on how to respond appropriately when the person that he or she is communicating with is expressing various emotions [1]. Such machine has the potential to bridge the communication chasm between the society and those diagnosed with autism.

II. SOCIAL COMMUNICATION

Children with ASD usually have difficulties to interacting or communicating with other people. Conversation relies on two peoples listening to each other and taking their turns to speak. For children with autism, this is a particular problem. Children who have ASD are attempted to address several difficulties. Some important early communication characteristics of this group are

- Limitation in speech, even not responding to their name itself
- Reduced communication rates
- Deficits in skills including coordinating attention between objects and people, following the gaze and gestures of others, shifting gaze between objects (or) people for the purpose of directing another's attention and also for sharing experiences.
- Deficits in symbolic languages and also in imitation of vocal and other behaviors.
- Limitation in the range of communicative intentions like requests and protests

Communication problem in children with autism are differentiated in many ways based on the problem type and severity. Some children have severe communication problems even they do not speak at all while other children have delayed, unusual speech that makes it difficult to communicate with others and also have trouble to express their own needs itself [12]. A smaller group of children's have better speech but they have some problems regarding how to use language to communicate

with others. Based on the problem type and severity children with ASD are categorized as

A. Verbal Children

Some children with autism acquire functional speech. They will begin to speak (or) acquire speech more slowly and unevenly [12]. Some children use words but the words are not effectively used to communicate. Verbal children acquire two major problems

1) Receptive Language (or) Comprehension Problems

- Difficult in understanding the meaning of what others say
- Literal usage and interpretation of what others say, e.g. “put your socks properly”
- Difficult in understanding a sequence of conditions/instructions
- Lack of understanding the metaphor, e.g. “shake a hand”

2) Expressive Language Problems

- Development of speech may occur very slowly and also previously learned words may disappear
- The same word is repeated over and over
- Speech may come delayed or unusual, sentences may be spoken out of blue
- Echolalia (repeated words or phrases) may be present in any forms
- Pronouns are often confused and reversed
- Tone, modulation and pitch may be too loud (or) too soft.

B. Non-Verbal Children

Some children with autism have non-functional speech. They express their feelings and share their ideas without use of words. Messages can be communicated through gestures, eye contact, body postures and facial expression. Children who are non-verbal must be able to convey their needs to others in some way because they have strong underlying social deficits and problem with joint attention [12]. It is important to assess how the non-verbal child expresses his/her needs and get his/her message across to others. Now days there are several augmented communication systems were developed for improving non-verbal communication.

Augmentative communication helps children who don't have speech so they communicate by using other system. These systems are called “augmentative” because they increase the strength of the child power to communicate. Some augmented systems are signing, pictographs, photographs and objects, picture exchange communication system (PECS)

1) Signing

Signing was first alternate system used for non-verbal children with autism. Signs are very portable and do not require the children to carry around equipment. Signs are simple, concrete and do not require difficult finger spelling. Many of the

first signs use only one hand. For example, the sign for “drink” uses one hand in the shape of a cup that is lifted to the mouth and titled as if the child were having a drink.

2) Pictographs (line drawings)

Children who have low cognitive skills (or) otherwise called as low functioning people with autism can generally use a picture system to communicate more effectively. When children are familiar with picture system, they can be put into books that the child carries with him/her and also used to indicate their own needs.

3) Photographs and objects

One advantage of photographs and objects is that the child can attend to them for as long as he/she needs and return to them to refresh their memory. This system is mostly useful for low functioning children. Use of photographs usually requires that the child first learn to match an actual object with an exact photograph of the object.

4) Picture Exchange Communication System (PECS)

PECS is widely used to teach children how to initiate communication. An advantage of this system is that it does not require complex (or) expensive materials and can be used in a variety of settings by parents, caretakers and teachers. Picture based system to help improve the child's communications will depend upon his/her level of cognitive and language ability and mainly developmental profile of strengths and weakness.

This paper was mainly focusing on non-verbal children interaction (or) communication with the help of another real-time an emerging system called facial expression recognition system was developed to break the manual intervention and dependency of an autistic child.

III. EARLY INTERVENTION SYSTEM

Non-verbal child expresses his/her needs and communicate with others using several augmented system. This system must need manual intervention to train an autistic child. Early augmented system like signing has major disadvantage that it might understood only with in their communities but outside the circle of those child who can sign with him/ her may not always be well understood. Signing also requires person for teaching the signs to the autistic child. Pictographs and PECS are useful only for low cognitive functioning child because they are completely non-verbal and even do not communicate with the closest of the family members. Before the usage of PECS system, speech language pathologist (SLP) should provide a comprehensive assessment for evaluating the autistic child. Testing tools are used to gather data include standardized assessment, qualitative measures, screeners, observation and records review. This system required manual intervention called SLP as well as it can useful only for mild autistic child with good IQ. Ultimately, the choice of system to improve autistic child communication will depend on language ability, cognitive ability and developmental profile of strengths/weakness. PECS requires more assessment efforts to teach children how to initiate communication. Later innovative VR-based facial emotional recognition system was developed

that allows monitoring of physiological signals and eye gaze of an autistic child for emotion identification. However, VR systems applied in the context of autism therapy focus on explicit user feedback as primary means of evaluation so it lacks adaptability. This intervention system was not accessible to the vast majority of child with ASD due to lack of trained therapists and intervention costs. VR-based system uses head mounted display (HMD) as VR tool that can be rated as heavy and discomfort. The main problem found in existing system was classification based on one emotional label per input utterance if the expression cannot be well captured by single emotional label then multiple algorithms are needed for finding the emotion . Innovative technology promises alternative therapeutic system called facial expression recognition system based on desktop VR tool with comfort and reduced intervention cost as well as decreasing assessment efforts, promoting intervention and ultimately skill generalization. We believe that such ability will provide insight to the emotion recognition process of children with ASD and eventually help in designing new intervention paradigms to address the emotion recognition vulnerabilities.

IV. DIAGNOISING TOOL: CHILDHOOD AUTISM RATING SCALE (CARS)

A. History of Autism Diagnostic Tool

In 1828, Itard has made first attempt to differentiate children with “intellectual mutism” from mentally retarded children. Itard has described some key symptoms for intellectual mutism are language disabilities , preoccupation with their own needs , deficits in memory as well as poor sense of imitation . Finally, Itard considered intellectual mutism is totally differ from a psychological state [11].

In 1911, Blueler coined the term “autism” while studying schizophrenia. Autism has considered as a central symptom for schizophrenia (Minkowski, 1927). He defined the key features of autism as a lack of social-relation system and also social withdrawal.

In 1943, Kanner was the first to distinguish between autism and childhood schizophrenia. He described a group of children identified as “infantile autism”. Kanner regarded a lack of need for other and preference for aloneness as major symptoms of infantile autism. Kanner was unclear and confused by the fact to regard some of the criteria as non- essential such as good cognitive potentialities and physically essentially normal [11].

In 1956, Kanner and Eisenberg named five distinct features of autism (i) failure to use language for the purpose of communication (ii) good cognitive potential (iii) fascination for objects which are handled (iv) Extreme detachment from human relationship (v) limitation in the variety of spontaneous activity.

In 1960, Creak has published nine criteria for the diagnosis of autism were (i) sustained impairment of emotional relationship with people (ii) abnormal behavior toward self (iii) pathological preoccupation with particular objects (iv) abnormal perceptual experience (v) distortion in patterns like locking , spinning , hyperkinesias (vi) excessive and acute illogical anxiety (vii) lack of development in speech (viii) background of serious mental retardation (ix) sustained resistance and striving maintain.

In 1967, O’Gorman offered an alternative model based on Creak’s group criteria. He concluded only one criterion as

particular symptom for autism i.e “withdrawal from people”. He published six important features of autism are (i) failure to involved with reality (ii) failure to acquire speech (or) improve on speech already learned (iii) exceptional intellectual function (iv) pathological resistance to change like severe anger (or) terror , excitement , attachment to objects (v) abnormal response to one (or) more types of sensory stimulus (vi) peculiarities of movement.

In 1977, Autism Society of America described autism as a developmental disorder (Ritvo & Freeman , 1977) . They defined autism as severely lifelong developmental disability that appeared during 3 years of age. The four criteria were (i) abnormal responses to sensations (ii) abnormal ways of relating to people, objects and events (iii) disturbance in the rate of appearance of social, physical and language skills (iv) delayed speech and language. He suggested that social problems and communication were central symptoms of autism.

In 1978, Rutter suggested that there are four essential for the diagnosis for autism: (i) diagnose before 30 months of age (ii) impaired development of communication (or) abnormal language (iii) social impairment that do not reflect mental retardation (iv) Stereotypical behaviors.

In 1980, the two prior edition of DSM (edition I and II) has excluded the autism. Autism was first included in the third edition of Diagnostic and Statistical Manual of Mental Disorder (DSM-III). Adoption of the term pervasive developmental disorder emphasized the developmental aspects or abnormalities that occur during childhood developmental process itself. Four criteria of autism were included (i) Age of onset under 30 months (ii) communication deficits (iii) perseverative behavior (iv) lack of relatedness.

In 1987, American Psychiatric Association published DSM-III-R and listed in one of three major categories: (i) qualitative impairment in reciprocal social interaction (ii) qualitative impairments of verbal and nonverbal communication skills and activities of imagination (iii) markedly restricted repertoire of activities and interests.

In 1994, DSM-IV/ ICD-10 characterize autism by deficits in three areas (i) social interaction (ii) communication and (iii) patterns of behavior, interests and activities. A total of six or more criteria from three areas with at least two from social interaction and one each from communication and patterns of behavior, interests and activities must be present in order for a child to receive a diagnosis of autism.

B. Childhood Autism Rating Scale

The CARS was first utilized by diagnosticians for observing the autistic children which is done by qualified professionals. They conduct physiological and behavioral evaluations such as clinical observation, psychological testing, parental report of developmental and health histories, speech and language assessment. Goldfischer in 2002 said that the CARS is considered the “Gold Standard” for assessing autism. His results provided additional support for the utility of new factor based scoring of the CARS.

The CARS was first called as Childhood Psychosis Rating Scale .it was developed mainly for TEACCH (Treatment and Education of Autistic and related Communication Handicapped Children).the CARS consist of 15-item behavioral rating scale which is utilized by trained diagnosticians, professionals,

caregivers or parents for observation about their child. The main purpose is to identify children with autism and to distinguish them from developmentally delayed children .it is especially effective in discriminating between children with autism and those who are mentally retarded and also able to distinguish among children from mild to moderate and moderate to severe autism [11].

When a child is being observed by professionals, brief discussions and notes are made on the form and ratings are completed only when all data have been collected then the child behavior is compared with normative children of same age finally peculiarity, frequency, intensity and duration of behaviors are noted [11]. Behavioral assessments are: Relating to People, Imitation, Emotional Response, Body Use, Object Use, Adaption to Change, Visual Response, Listening Response, Taste, Smell, and Touch Response and Use, Fear or Nervousness, Verbal

Communication, Nonverbal Communication, Activity Level, Level and Consistency of Intellectual Response, General Impressions.

Each of the 15 item is given as rating that should be done within 1-4 range (including midpoints).1: Normal Child, 2: Mildly Abnormal, 3: Moderately Abnormal, 4: Severely Abnormal. A total score is computed by summing the 15 individual ratings which can range from 15 to 60.the scores below 30 in children categorized as non autistic, 30-36.5 indicating mild to moderate autism, 37-above are categorized as severe autism. Finally

The children who received the diagnosis of autism using CARS are numbered as 25 from n=40 (5-10 age) children at the developmental disability center called Aadhuraa special school

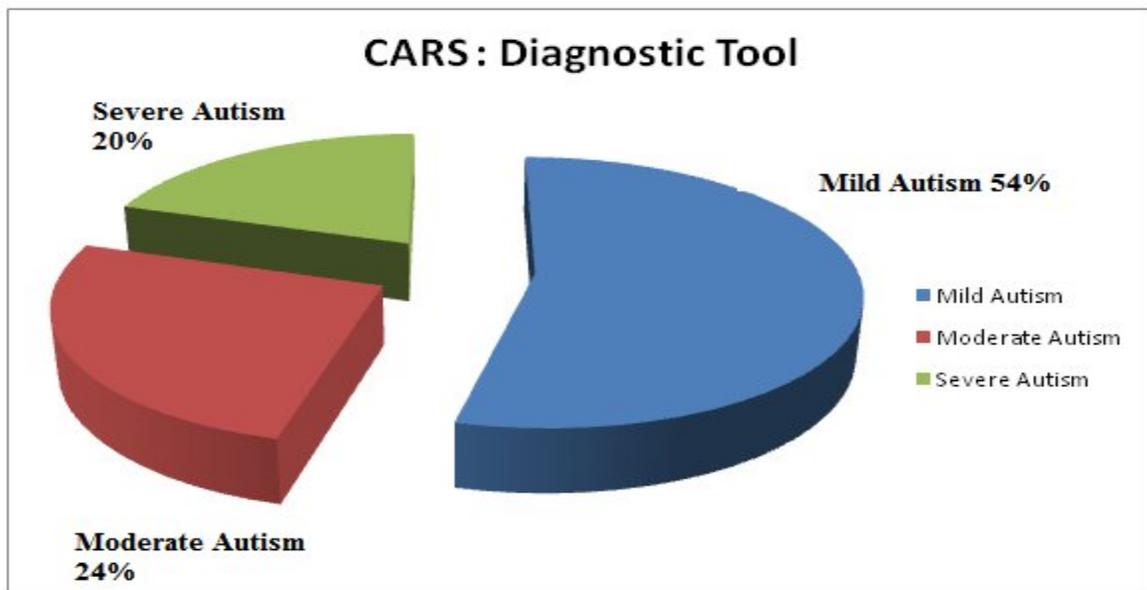


Figure 1 : Diagnostic Classification according to CARS (N=25 Autistic Disorder)

V. COMPARITIVE STUDY : NORMATIVE VS AUTISTIC CHILDREN

To analyze the communication of an autistic child first we have to recognize the normal children with 5 different kinds of emotions. The normative samples are collected from “Government Elementary School, vaiyavoor village, Kanchipuram”. I analyzed 40 normal children under the age group of 5-9 .These children express their emotions in efficient manner and their communication is mostly verbal. Children learning capability differs in many ways. Some children are fast learners where as some children are slow so it is must not to compare one child’s language development with another. A child communication was mostly depends on parent behavior. Parent has to talk in natural way so that he or she respond and listen to the sounds. Read stories together from an early age and also make communicating fun.

To identify whether the children is affected by autism or not, several evaluations has to be carried out to understand the characteristics of an autistic children. Speech Language Pathologist – “communication expert” plays an important role in team evaluation apart from others [psychologist, Educational Diagnostician, Occupational Therapist].SLP specializes in treatment of both language as well as communication skills. They identify the effectiveness and communicative intent of the autistic child and then maintain a review of records to classify the autistic children as mild, moderate and severe according to the CARS diagnostic tool.

In some cases, communication strengths and weakness are directly impacted by responses to the environment. Some of the testing tools used to gather data are standardized assessment, qualitative measures, screeners, observation and record review. Therefore assessment intervention is a lifelong necessity for children with ASD [13].



Figure 2 Normative Samples with 5 different kinds of emotions (i) Neutral (ii) Smile (iii) Angry (iv) Sad (v) Surprised

Autistic child express their emotions by means of speech or non-verbal communication like gestures, body postures, eye gaze and facial expression. According to the Severity range, mild autistic children express their emotions like normative children so this application is more feasible and helpful compared to moderate and severe autistic children. For moderate & severe

autistic children, adequate training has been required to express their own emotions. After training, some children also lacking in their communication to express themselves for their own needs. To overcome this demerit training duration must have to exceed and therapist has to provide language assessment regularly to utilize this system.

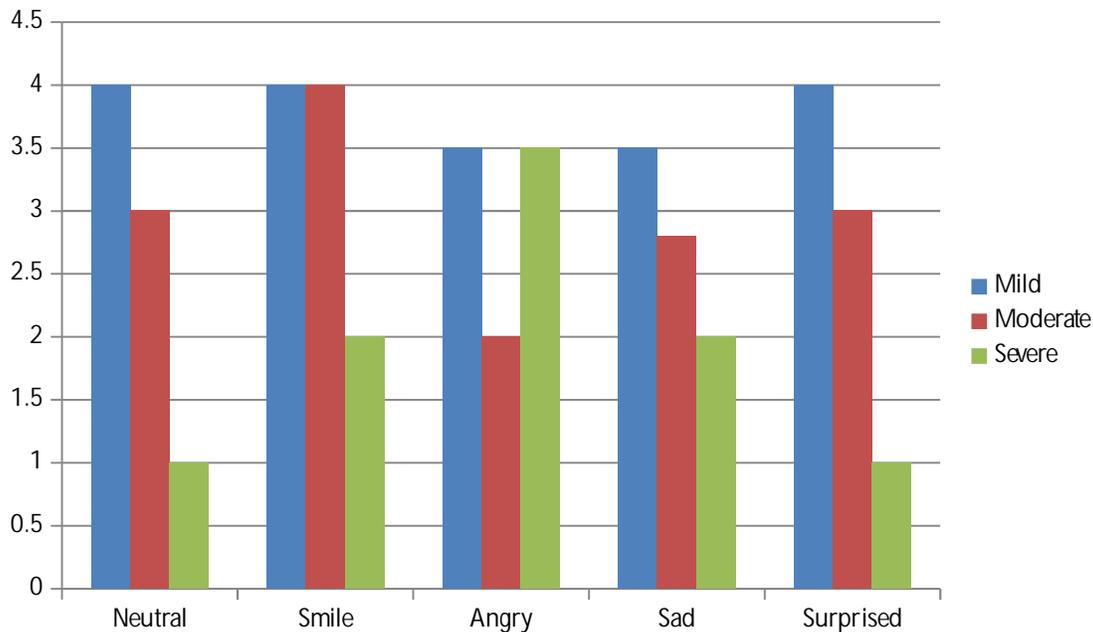


Figure 3 Autistic Children express their Emotions in Different Rating according to CARS Diagnostic Tool

VI. SYSTEM DESIGN

A. Virtual Reality in Autism

VR offers particular benefits for children with autism. It provides a context free environment in which many children with autism feel comfortable and therapist, teachers can use VR tools such as head mounted display, standard desktop computer to simulate real (or) imaginary environments moreover teach life skills and social skills. VR may be particularly useful for child with cognitive and perceptual impairments because the technology can assist in problem solving, planning, management of behavior and offer powerful communicative facilities for children with limited expressive language .virtual environment could be particularly helpful for children on the autism spectrum because the use has active control over their participation.

B. Experimental Setup

The VR environment focuses the level and the number of non-verbal features of communication can be easily controlled and manipulated. The VR task was presented using a 24'' flat LCD panel monitor. An experiment was performed in a laboratory with two rooms separated by one-way glass windows for caregiver observation. In the inner room, the subject sat in front of the task computer. The caregivers sat in the outside room. A therapist was present in the inner room to monitor the process. The task computer monitor was also routed to the outer room for caregiver observation during training session. The session was video recorded for the whole duration of participation

C. Architectural Design

When an image is captured by a web camera; it can be further processed to identify different kind of facial expressions such as surprise, smile, sad, angry, neutral etc .In skin tone detection, it can isolates the presence of faces, arms, hands and gestures of the autistic child. Skin detector typically transforms a given pixel in to RGB color space and then uses skin classifier to label the pixel whether it is skin or non-skin pixel there by confirm face acquisition through common features on the face. RGB color space eliminates the influence of varying illumination to the best extent. Then face clipped image is further processed by texture descriptor known as Weber's local descriptor (WLD) exploits textual nature of human face as well as relationship between component features via eyes, nose and mouth to detect face patterns and reduce the dimension of the feature space. This descriptor makes facial features darker for efficient feature extraction. Then feature extraction module partition the image in to constituent parts to extract facial features.

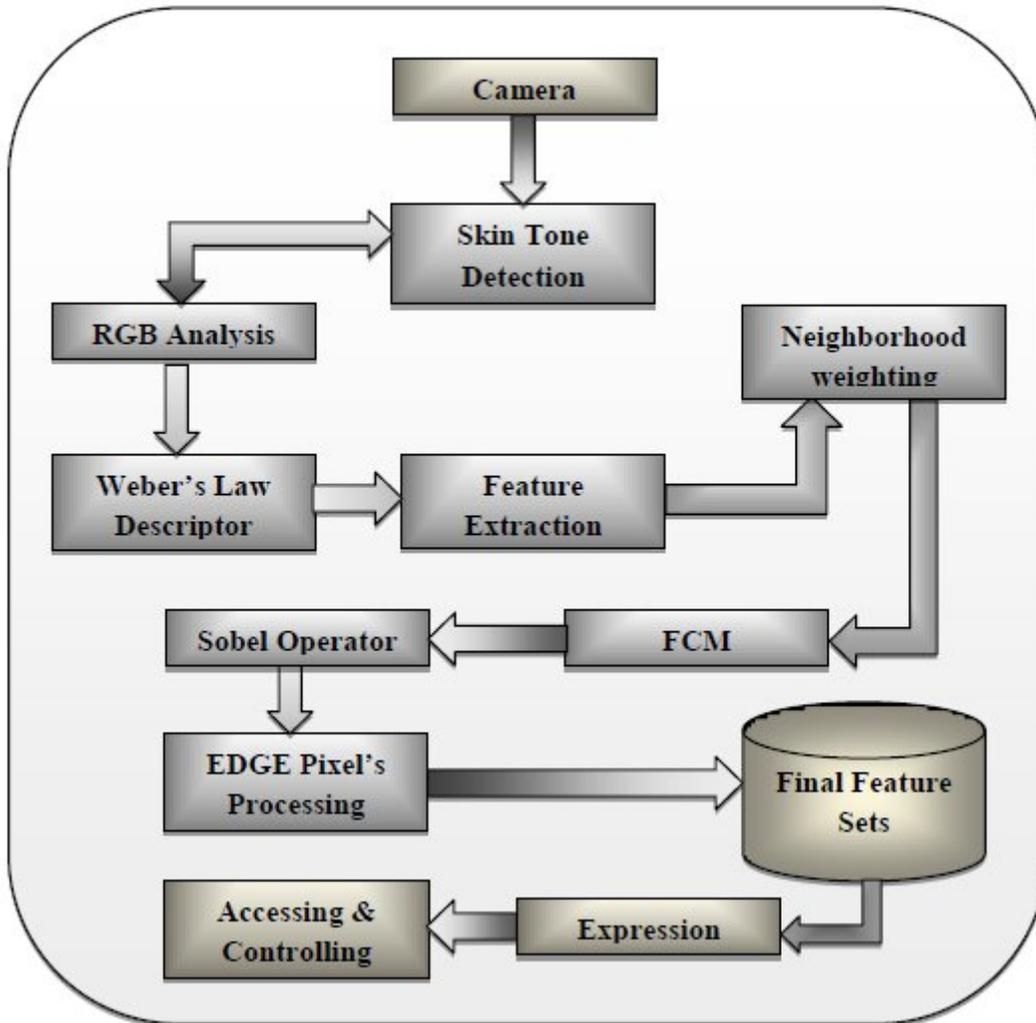


Figure 4 VR-based facial expression recognition system

The end result of extraction task is a set of features commonly called feature vector which constitutes a representation of the image. Feature vector can be coarsely classified in to transient features (cheeks, nose, and ears) and intransient features (eyes, eyebrows, mouth) which are analyzed by neighborhood weighting. After that feature selection is used to reduce the feature space which improves prediction accuracy and minimizes computation time. The goal of feature selection is to choose only a subset of intransient features by eliminating unnecessary features. The selected intransient features are used for finding out the facial expression vectors by calculating their difference from average image of the facial feature. Then image representation can be done based on fuzzy c means clustering (FCM) algorithm by assigning labels to an object based on information provided by descriptors (or) pertinent features. Feature filtering is done via sobel operator to detect edges of intransient features that significantly reduce the amount of data and filters out useless information while preserving the important structural properties in an image. After edge detection, edge pixels are processed to maintain final feature set. Based on final feature set analysis different kinds of facial emotions is identified

using classification technique called decision tree. Finally, a smart real time audio application is played corresponding to the emotion present on the autistic child face. For a happy mood, some hearty songs are played to maintain it and for a sad mood some rejuvenating ones are played.

VII. SYSTEM IMPLEMENTATION

A. Skin Tone Analysis

The inspiration to use skin color analysis for initial classification of an image into probable face and non face regions stems from a number of simple but powerful characteristics of skin color. Firstly, processing skin color is simpler than processing any other facial feature. Secondly, under certain lighting conditions (i.e. illumination), color is orientation invariant. The major difference between skin tones is intensity e.g. due to varying lighting conditions and different human race. The color of human skin is different from the color of most other natural objects in the world. An attempt to build comprehensive skin and non-skin models has been done. Automatic face recognition is a process of identifying a test face image with one

of the faces to isolate or segment facial regions to be fed to a face recognition (FR) system. Though human beings detect/track faces with some effort, but it is not easy to train a computer to do so because robustness and computation complexity plays major role during face recognition task. In pattern recognition, human face is a complex pattern. Different poses and gestures of the face accentuate complexity. The detection scheme must operate reliably and flexibly regardless of the background clutter in the image, lighting conditions, multiple faces in the image, and variations in face scale, pose and expression [2]. Hence, a robust system that detects and tracks a face is necessary. Skin tone color detection is a technique that can isolate the presence of faces, arms, hands and gestures. After isolation, skin-colored pixels and regions in an image are identified then converting the image into

RGB color space in which skin pixel can be clustered as compact as possible as well as eliminate the influence of varying illuminations to the best extent.

Summary of the method

- Normalize colors on the image to eliminate background clutters
- Mark the pixels on the image using an established skin color model
- Remove regions that are unlikely to represent faces
- Confirm face acquisition by examining common features on face

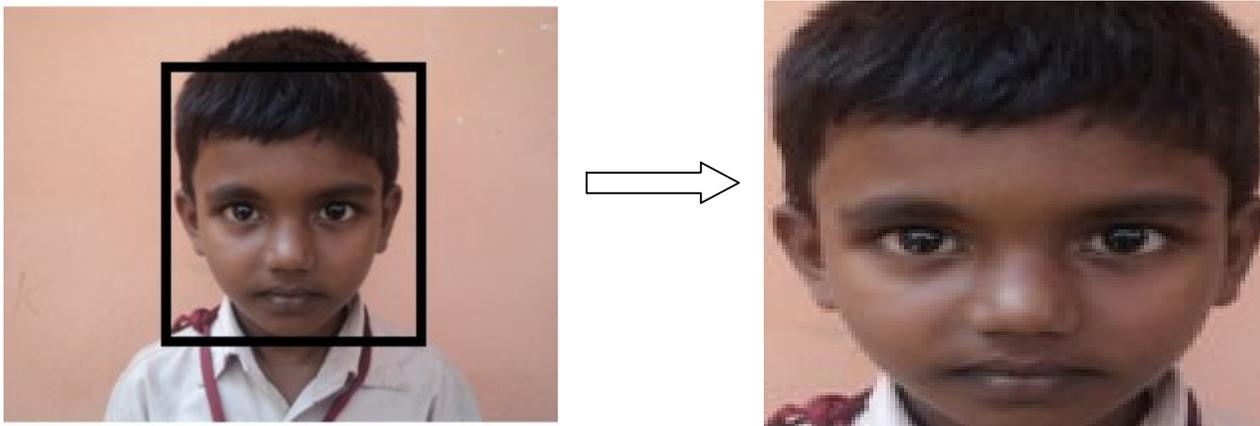


Figure 5 Face Acquisition is examined using RGB Color Space

B.Feature Extraction

The feature is defined as a function of one or more measurements, each of which specifies some quantifiable property of an object, and is computed such that it quantifies some significant characteristics of the object. The extraction task transforms rich content of images into various content features. Feature extraction is the process of generating features to be later used in the selection and classification tasks to determine an appropriate result that may be features, pattern identification or representation of that image [9]. Application dependent features such as human faces, fingerprints, and conceptual features. These features are often a synthesis of low-level features for a specific domain. Feature selection helps us to reduce the number of features provided to the classification task. Those features which are selected are likely to assist in discrimination and also used in the classification task. Features which are not selected in the extraction task are discarded. Of these three activities, feature extraction is most critical because the particular features made available for discrimination directly influence the efficacy of the classification task. The extraction task transforms rich content of images into various content features. The end result of extraction task is a set of features commonly called Feature vector which constitutes a representation of the image. This feature vector is further classified as transient (wrinkles, cheeks and nose) and intransient features (eyes, mouth, eyebrows) to reduce the dimension of the feature space as well as computational complexity. Features such as shape, texture, color etc. are used to

describe the content of the image. Image features can be classified into primitives [7].

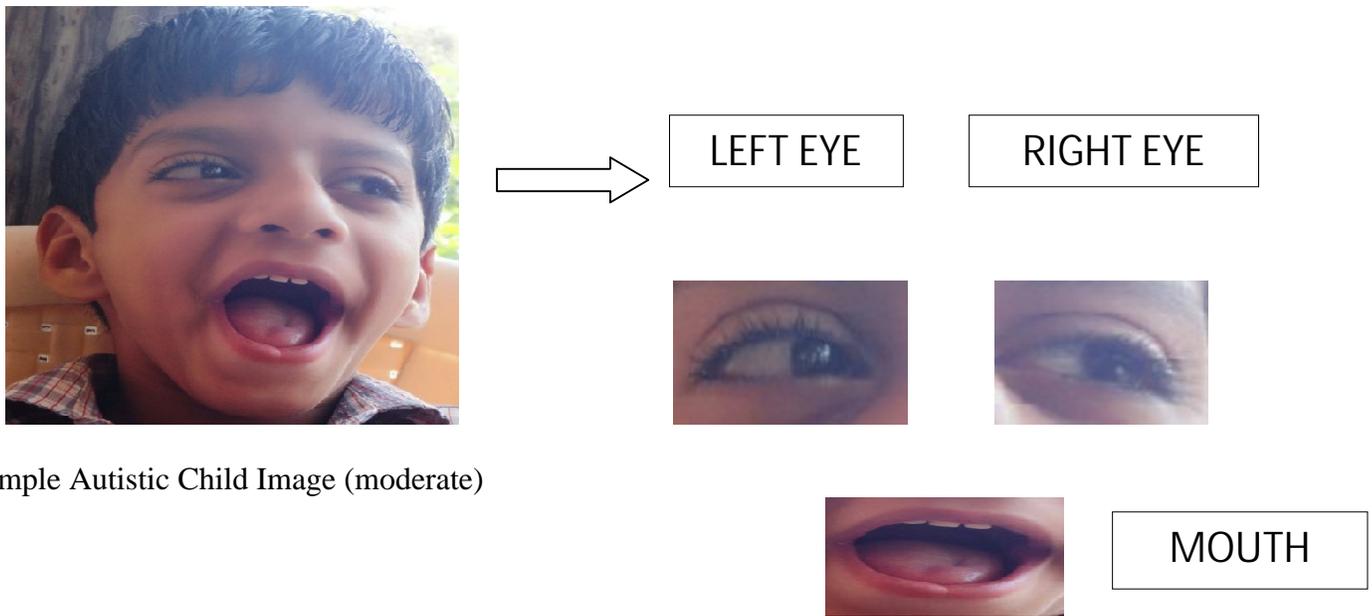
Weber's local descriptor (WLD) act as a texture descriptor plays an important role as it exploits textural nature of the human face via human visual system (HVS) as well as relationship between component features(eyes, nose and mouth) to detect and recognize faces [3].WLD descriptor based on Weber's law. According to this law "the ratio of the increment threshold to the background intensity is constant". this descriptor represent an image as a histogram of differential excitation and gradient orientations and has several interesting properties like robustness to noise and illumination changes ,powerful image representation etc. finally, facial features become darker and used for feature extraction analysis.

C. Feature Selection

After feature extraction, selection helps to reduce the feature space which improves prediction accuracy and minimizes the computation time. This is achieved by removing irrelevant, redundant and noisy features i.e. it selects a subset of available features by eliminating unnecessary features therefore it considers only intransient features. Feature selection can be done based on FCM clustering which is frequently used in pattern recognition [6]. Once feature selection is analyzed information gain on a per emotion class basis is used (e.g., the features for the class of anger differed from those of happiness). Information gain describes the difference between the entropy of the labels in

the dataset (e.g., “happy”) and entropy of the labels when the behavior of one of the features is known (e.g., “happy” given that the distance between the mouth corner and nose is known). This feature selection method permit as ranking of the features by the

amount of emotion class related randomness. The top features were selected for the final emotion-specific feature sets. It can be done based on clustering process.



Sample Autistic Child Image (moderate)

Figure 6 Feature Extraction, Selection & Labeling Intransient Features

D. Feature Filtering

Facial features can be filtered out using edge detection technique. Edges detecting an image significantly reduce the amount of data and filters out useless information while preserving the important structural properties in an image. There are extremely large numbers of edge operators available each designed to be sensitive to certain types of edges variables involved in the selection of edge detection operator include edge orientation, noise environment and edge structure. Edge detection is a very important area in the field of Image processing. Edges define the boundaries between regions in an image, which helps with segmentation and object recognition. Edges are significant local changes of intensity in an image. Edges typically occur on the boundary between two different regions in an image. The main problem is that different edge detectors work differently. Some takes more time with respect to other, while some finds more edges (works deeply) with respect to other. The detection of edges in an image depends upon illumination, blur, noise, intensity, objects. There are problems of false edge detection, missing true edges, edge localization, high computational time and problems due to noise etc.. According to an edge detection variable, an efficient edge detection algorithm “**Sobel operator**” is chosen for its simplicity and fast processing [10]. The result of the Sobel operator is either gradient vector or norm of its vector and convolving the image with a small, separable and integer valued filter in horizontal and vertical direction and relatively inexpensive in terms of computation. Sobel operator also integrates smoothing and gradient calculation. The result of the Sobel operator is either gradient vector or norm of its vector.

VIII. RESULT

We have developed a VR-based controllable facial expression recognition system that was able to collect facial features data while the subjects were involved in emotion recognition tasks. Specifically, we developed controllable levels of facial expressions of emotion based on normative patterns of children and further comparative study between normative child and autistic child has been done for understanding the behavioral patterns. Subsequently, a usability study involving typical controls was performed to evaluate the efficiency of the system as well as to study behavioral pattern differences in how individuals processed different valences of these expressions. Although, this particular study did not employ direct interaction between the user and the system, the study is a precursor to a more interactive adaptive multimodal VR social platform that is under development. Such capabilities are expected to be useful in understanding the underlying heterogeneous deficits individuals with ASD often display in processing and responding to nonverbal communication of others. In turn, such a system will hopefully contribute to the development of novel intervention paradigms capable of harnessing these technological advancements to improve such impairments in a powerful, individually specific manner. The system successfully collected the synchronized facial features of autistic persons. Future extensions will : (1) identify different kind of facial emotions from Sobel filtering (2) final feature set was determined for each emotion class (3) play smart audio player corresponding to the face emotions to break the dependency in modern environment

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IMPACT OF WORLD BANK, INTERNATIONAL DEVELOPMENT ASSOCIATION AND INTERNATIONAL FINANCE CORPORATION ON THE NIGERIAN ECONOMY (1990-2010)

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Abstract- This study has examined the impact of World Bank, International Development Association and International Finance Co-operation on the Nigerian economy for the period 1990 to 2010. The study uses unit root test to determine the stationary state of the variables using the Augmented Dickey-Fuller Test. It also employs the Johansen Co-integration and Error Correction Model (ECM) statistical techniques to establish both short-run and long run dynamic relationship between the endogenous and exogenous variables. The findings indicate one period lag of World Bank loan enhanced the Nigerian economy; International Development Association Grants and International Finance Co-operation positively influenced the economy of Nigeria in the period observed; though they were not all statistically significant. Premised on this, it is therefore recommended that the Nigerian government put stringent measures/policies to ensure the assistances from these bodies are well utilized to positively enhance the Nigerian economy.

Index Terms- Real GDP, World Bank, International Development Association and International Finance Co-operation

I. INTRODUCTION

The international Development Association (IDA) is an international financial institution, which offers concessional loans and growth to the world's poorest developing countries. The IDA is one of the members of the World Bank Group with Headquarters in Washington DC, United States. The IDA's stated aim is to assist the poorest nations in growing more quickly (Moss, Standley & Birdsall, 2004). Accordingly, the association holistically shares the World Bank mission of reducing poverty and aims to provide affordable development financing to countries whose credit risk is so prohibitive that they cannot afford to borrow commercially or from the Bank's other programme (World Bank, 2012). According to Coppola (2011), the international finance cooperation and International Development Association are collectively generally known as the World Bank in that they follow the same executive leadership and operate with the same staff as well aims not too far apart from each other.

The International development Association has issued a total of \$238 billion USD in loans and grants since its launch in 1960. The IDA offers grants and loans with maturity ranging from 25 to 40 years, grace periods of 5 to 10 years and interest rates of 2.8% or 1.25% depending on whether the borrower is a blend country and to which degree it is eligible (www.wikipedia.com). As noted by Dreher (2009) because African countries face some of the most severe poverty and underdevelopment, and because 37 of those countries are the IDA's poorest member states, the Association allocates approximately half of the IDA's resources toward financing projects in those countries. Although, the positive outcomes of the IDA's efforts in Africa had been historically slow, the large allocation of funding to African countries led to positive outcomes particularly within agricultural and infrastructural development efforts (Burki & Hicks, 2008). IDA still falls far short of being a successful mechanism for financing for development. The 2009 Review of IDA Internal Controls by the Independent Evaluation Group (IEG)¹, carried out at the request of donors during IDA 14, identifies several weaknesses of IDA. Unless the World Bank urgently implements the overdue recommendations of the IEG and puts into practice the reforms required for it to become a credible development bank, European governments should not replenish IDA beyond IDA 15 levels. Instead, IDA donors should seriously consider alternative, more effective channels to fund poverty reduction and sustainable development.

Nigeria is one of the countries relapsed to the eligibility for IDA lending and has not yet re-graduated. Hence, Nigeria can better be referred to as a blend country. This implies that it suffers from the trail lending activities of the International Development Association. As such, the effect may intuitively not be obvious positive and significant over the years. This informs one of the reasons this study evaluates the IDA in relation to the Nigeria economy.

Similarly, the World Bank can simply be referred to as the world's source of long-term lending financial body whose functions are all encompassing in the global areas. It checkmates affairs of every sector in every country's economy and makes reports. It assists in financial and non-financial matters/projects. For example, the World Bank could sponsor series of projects ranging from agricultural

development projects to roads infrastructure, hospitals, extending loans/grants to needing countries. Nigeria as a country has benefitted from the World Bank by way of debt borrowing and projects sponsorship supports. Nigeria has also benefitted from World Bank sponsored agricultural Development project. As noted by Chukwuemeka and Nzewi (2011), the World has championed agricultural development programme in Nigeria and form of foreign aid. They posit further that the World Bank has not also performed so well in the project preparation, appraisal and supervision. Similarly, the problem is made worse by late delivery of aide memoirs. The World Bank aide-memoirs, which ought to help in programme implementation, have not been delivering for example to the Agricultural Development programme on good time in Nigeria (Chukwuemeka & Nzewi, 2011). Further, the frequency of supervision and intensity of supervision during the programme cycle has however not been very good in Nigeria and other African countries (ENADEPICR, 2005).

The World Bank also renders support to developing countries in the area of health and education. A European Civil Society Statement (2010) reports that the World Bank recently funded a private health insurance project in Nigeria at a cost of approximately 60% per head, – 6 times the current government expenditure on health. They also reported that the World Bank commitment to basic education have slipped in recent years in Nigeria. Against these backdrops, this study attempts to evaluate the impact of World Bank, International Development Association and International Financial Co-operations on the Nigerian economy for the period 1990 to 2010. The rest of this paper is structured into section two, review of related literature, section three, the methodology, section for analysis and discussion of findings and section five conclusion and recommendations.

II. REVIEW OF RELATED LITERATURE

Nigerian Economic Growth

Nigerian economic statistics reveal a puzzling contrast between rapid economic growth and quite minimal welfare improvements for much of the population. Annual growth rates that average over 7% in official data during the last decade place Nigeria among the fastest growing economies in the world. This growth has been concentrated particularly in trade and agriculture which would suggest substantial welfare benefits for many Nigerians. Nevertheless, improvements in social welfare indicators have been much slower than would be expected in the context of this growth. Poverty reduction and job creation have not kept pace with population growth, implying social distress for an increasing number of Nigerians.

According to official statistics, the Nigerian economy exhibited strong GDP growth over the last decade that averaged over 8%. This implies that the size of the Nigerian economy is 170% times larger today than at the beginning of the decade. Furthermore, in contrast to the boom-bust cycles of earlier years, Nigeria experienced no general macroeconomic crisis over this period, and the pace of annual GDP growth never fell below 6%. Growth in 2012 slowed somewhat relative to the recent past, registering at 6.6% by preliminary estimates, as opposed to 7.4% in 2011. Growth weakened, in particular, in oil, trade, and agriculture. Slower growth in trade and agriculture likely reflects a combination of fallout from the national strike in January, higher energy prices (tariffs), poor conditions (flooding), and growing security challenges in some parts of the North.

World Bank and the Nigerian economy

During the Abacha regime, the World Bank had essentially closed its operations in Nigeria; it provides no new loans and engaged in limited analytic work (Adepoju, Salau & Obayelu, 2007). They posit that with the return of democracy particularly in the President Obasanjo era, the Bank undertook a major effort to identify and approve new investment loans to support the development of key sectors. Due to the nature of corruption prevalent in the country, in 2004, disbursements were slow and a high proportion of the Bank lending programme was rated as being at risk; and reform efforts proceeded at a slow pace during President Obasanjo's first term, and there was a great deal of frustration both in the country and an opportunity for progress was being lost (Faraji & Makame, 2013).

With President Obasanjo's reform team in place, the Bank geared its activities to support government efforts. The World Bank made changes in its management of the lending programme to speed disbursement and obtain improved results. According to Folorunso and Felix (2012), an important government objective was to secure debt relief and the Bank assisted with analytic work demonstrating to Nigeria's creditors that the level of debt servicing Nigeria was required to undertake was not consistent with its achievement of the MDGs. They stress that this contributed to the decision to write off 60 percent of Nigeria's debts. The World Bank also supported the efforts of the reformers with a substantial loan for economic governance that provided support for the budget reforms and the steps being taken to reform the country's civil service (Ekperiware & Oladeji, 2012. Ejigayehu (2013) reports that disbursements on Bank loans began to pick up, and the percentage of all portfolio at risk fell from 79 percent in 2003 to 26 percent in 2006. This no doubt, has a way of affecting or stunting the Nigerian economy. Premised on this, we hypothesized that the World Bank had not affected the Nigerian Economy positively.

International finance co-operation and the Nigerian Economy

Chenevy and Strout (2014) aver that international financial co-operation (IFC) has been moderately effective in carrying out its mandate in Nigeria. They stress that despite a broad set of stated objectives across a range of sectors in the country assistance strategies (CASs), IFC's investment were concentrated in the financial sector. Although, IFC achieved significant results with these investments, the poor environmental and social effect rating for the financial sector projects was of particular concern (Aluko & Arowolo, 2010). They opine that a focused, programmatic and well-articulated country strategy is becoming increasingly necessary in

light of the size of IFC's operations in Nigeria and their impact on IFC's effectiveness in Africa. Over the review period, IFC's main contribution was the provision of long-term financing and improvement in the corporate governance practices of Nigerian financial institutions. In addition to the financial sector, IFC achieved development impacts in the telecommunications, but it had limited or no presence in infrastructure, agribusiness and manufacturing. Failures to develop projects in infrastructure and agribusiness in the past could be explained by the distorted and uncertain policy environments as well as by the dominance of government parastatals, particularly in the infrastructure sector. However, in the future, IFC is expected to focus its efforts in infrastructure on the power sector, which has been a major source of concern to all Nigerians. Given the intervention of this international body, - IFC, it is imperative to empirically ascertain how it has affected the Nigerian economy in the period under consideration. Thus, we hypothesize that International financial co-operation has not significantly affected the Nigerian economy.

International Development Association and the Nigerian economy

The International Development Association (IDA) is the part of the World Bank that helps the world's poorest countries. Established in 1960, IDA aims to reduce poverty by providing loans (called "credits") and grants for programs that boost economic growth, reduce inequalities, and improve people's living conditions. IDA complements the World Bank's original lending arm—the International Bank for Reconstruction and Development (IBRD). Since its inception, IDA has supported activities in 112 countries (Aluko & Arowolo, 2010). Annual commitments have averaged about \$18 billion over the last three years, with about 50 percent of that going to Africa of which Nigeria is inclusive. For the fiscal year ending on June 30, 2014, IDA commitments reached \$22.2 billion spread over 242 new operations. 12 percent of the total was committed on grant terms (Ayadi, 2013).

The IDA lends to countries with the aim to finance projects that will develop infrastructure and improve education, health care, access to clean water and sanitation facilities, and environmental responsibility. It is considered to be the soft lending window of the World Bank, while the IBRD is considered to be the hard lending window. The association offers grants and loans with maturities ranging from 25 to 40 years, grace periods of 5 to 10 years, and interest rates of 2.8% or 1.25% depending on whether the borrower is a blend country and to which degree it is eligible. Regular IDA-eligible borrowers may take advantage of no-interest loans. Financial resources are allocated to eligible countries based on their success at implementing pro-growth and poverty-reducing domestic policies. The IDA uses the World Bank's Country Policy and Institutional Assessment (CPIA) development indicator to determine each country's place in a resource allocation index. It then prioritizes its lending to those countries, which are indicated to be most promising in terms of favorable policies and aide effectiveness. The IDA adopted the Crisis Response Window in 2007 to enable the rapid provision of emergency financing in response to crises. The association adopted the Immediate Response Mechanism in 2011 to provide IDA borrowers with immediate access to withdraw undisbursed portions of their loans, should a crisis arise that meets the mechanism's criteria.

III. METHODOLOGY

The focus of this study is to examine the impact of World Bank, International Development Association and International Financial Cooperation on the Nigerian economy for the period, 1990-2010. Annual data set for the period 1990-2010 were extracted from the Central Bank of Nigeria Statistical Bulletin and World Bank Data Bank. The statistical technique employed in this study includes the error correction model (ECM) and the ordinary Least Squares (OLS) multivariate regression. Prior to estimation of the model; stationary tests are conducted to test for its stochastic properties in order to avoid estimating spurious regressions results since estimating regressions using non-stationary variables based on ordinary least square lead to spurious and inconsistent results (Aiyedogbon, 2012). The stationarity properties of the time series data are investigated in this study using the Augmented Dickey-Fuller (ADF) test. According to Nelson and Plosser (1982), Chowdhury (1994), there exist unit roots in most macro -economic time series data. While dealing with time series, it is necessary to analyze whether the series are stationary or not since regression of non-stationary series on other non-stationary series leads to what is known as spurious (bogus) regression causing inconsistency of parameter estimate. The null hypothesis of the existence of unit roots is rejected against the alternative if the ADF test statistic is greater than the critical value, otherwise, the test fails to reject the null hypothesis at 5% level of significance. Johansen and Juselius (1988) approach is utilized in examining the presence or absence of long -run relationships among the variables.

Model Specification

The model employed in this study is of the form: $RGDP = F(\text{World Bank loan, IDA GRANT, IFC LOAN})$. The model above is in a deterministic form. However, it is stated in a stochastic form as

$$GDPGR_t = \beta_0 + \beta_1 WBL_t + \beta_2 IDAG_t + \beta_3 IFCL_t + \beta_4 EXR_t + u_t$$

Where:

$\beta_1 - \beta_4$ are coefficients of parameters to be estimated.

$GDPGR_t$ = represents gross domestic product growth rate, and is the endogenous variable,

WBL = World bank loan extended in form of loan to Nigeria..

$IDAG$ = International Development Association Grants.

$IFCL$ = International financial cooperation loan.

EXR = Exchangerates

ut = is the error term

t = represents the time period

β_0 = the intercept term

An apriori expectation in this study is $\beta_1 - \beta_4 > 0$. This portends that the set of explanatory variables are expected to positively relate to the GDP growth rate over the period.

IV. PRESENTATION AND EMPIRICAL RESULTS

Data Description

YEARS	RGDP	WBL	IDAG	EXR	IFC
1990	472648.4	33438924000	3335543000	8.03	233333345
1991	545672.4	33527205000	0	9.9	0
1992	875342.5	29018714000	2414572000	17.29	0
1993	1089679	30735623000	0	22.06	567432777
1994	1399703	33092286000	1871671000	21	0
1995	2907358	34094442000	0	21.89	0
1996	4032300	31414751000	2228630000	21.88	0
1997	4189250	28467541000		21.88	0
1998	3989450	30313711000	1331989000	21.88	0
1999	4679212	29368025000	1072055000	92.33	0
2000	6713575	31581804000	0	101.69	0
2001	6895198	30031742000	2524307000	111.23	0
2002	7795758	29918232000	1476880000	120.57	0
2003	9913518	34113665000	0	129.22	234217899
2004	11411067	36689358000	1710307000	132.88	0
2005	14610881	20475927000	0	131.27	0
2006	18564595	4065417000	0	128.65	0
2007	20657318	3862818000	1010498000	125.8	213332144
2008	24296329	4143915000	0	118.54	0
2009	24794239	6847795000	432345000	148.9	0
2010	33984754	7271144000	315097000	150.29	0

SOURCE: EXTRACTED FROM WORLD BANK

DATA BASE

This section is concerned with the econometric results based on time series used. To undertake a fundamental and rigorous empirical estimation of the model, the long-run estimation of the model was first done using ordinary least squares. Thereafter, the unit root test of all the variables was carried out for the purpose of detrending. Johansen co-integration and parsimonious error correction model (ECM) were used to establish both the long-run and short-run relationships among the variables in the construct. The results are presented below:

TABLE A: ORDINARY LEAST SQUARES REGRESSION RESULTS INDICATING THE LONG-RUN RELATIONSHIPS AMONG VARIABLES

Dependent Variable: RGDP
 Method: Least Squares
 Date: 09/06/15 Time: 23:40
 Sample (adjusted): 1991 2010
 Included observations: 20 after adjustments
 Convergence achieved after 13 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
WBL	-3.68E-05	5.14E-05	-0.714622	0.4851
IDAG	9.57E-05	0.000159	0.601751	0.5558
EXR	-21929.48	19871.57	-1.103560	0.2861
AR(1)	1.166640	0.033858	34.45725	0.0000
R-squared	0.976249	Mean dependent var		10167260
Adjusted R-squared	0.971796	S.D. dependent var		9579517.
S.E. of regression	1608790.	Akaike info criterion		31.59672
Sum squared resid	4.14E+13	Schwarz criterion		31.79587
Log likelihood	-311.9672	Hannan-Quinn criter.		31.63560
Durbin-Watson stat	2.192578			
Inverted AR Roots	1.17			
	Estimated AR process is nonstationary			

SOURCE: E-VIEW 7.0

The result above indicates that the model explained about 97% systematic variation in the dependent variable RGDP. After adjusting for the degree of freedom, the adjusted R-squared Bar coefficient of determination accounted for 97%; leaving 3% unaccounted for due to the presence of stochastic error terms. Using the individual coefficient, it can be observed that a unit change in World Bank loan brings about (-3.68) unit decrease in the Nigerian economy and is statistically insignificant at 95% level. A suggestion that the loans from World Bank to Nigeria over the years have not improved the economy. This may be due to the poor political leadership and the ascendancy of corruption as well as constant embezzlement, which over the years have increased capital flights. A unit change in International Development Association Grants (IDAG) was observed to improve the Nigerian economy under the period considered with (9.57); though is statistically insignificant at 95% level. Similarly, a unit change in exchange rate leads to a (-219) unit decrease in the Nigerian economy. This indicates that the exchange rate has not really aided the impact of these assistants from the international bodies on the Nigerian economy. The Durbin-Watson statistic value of 2.19 points out the presence of serial autocorrelation in the result is unlikely, thus making it useful for policy perspective.

Summary of the Unit Root Test at 5%

Variables	ADF Statistics	T-Critical Values	Remark
RGDP	-4.957404	-3.673616	Stationary at First difference
INBL	-3.931510	-3.690814	Stationary at First difference
IDAG	-4.215697	-3.690814	Stationary at First difference
EXR	-4.144840	-3.673616	Stationary at First difference
IFC	-6.922861	-3.673616	Stationary at First difference

Source: Author's Computation, 2015.

The above table shows that all the variables are stationary at first difference. This advance stage was made after the initial unit root test at level using the Augmented Dickey-Fuller test statistics compared against the McKinnon critical values at 5%. Since all the variables are stationary at their first difference, it therefore creates a good avenue for the application of the Johansen co-integration procedure to examine whether a long-run stable relationship exists among the variables so as to use the error correction model.

The Johansen co-integration test

Table B: Johansen Co-integration result

Date: 09/08/15 Time: 10:12
 Sample (adjusted): 1992 2010
 Included observations: 19 after adjustments
 Trend assumption: Linear deterministic trend
 Series: RGDP WBL IDAG EXR IFC
 Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.948824	115.8010	69.81889	0.0000
At most 1 *	0.809733	59.32374	47.85613	0.0029
At most 2	0.552566	27.79649	29.79707	0.0836
At most 3	0.465345	12.51618	15.49471	0.1338
At most 4	0.032087	0.619652	3.841466	0.4312

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.948824	56.47731	33.87687	0.0000
At most 1 *	0.809733	31.52724	27.58434	0.0147
At most 2	0.552566	15.28031	21.13162	0.2697
At most 3	0.465345	11.89653	14.26460	0.1146
At most 4	0.032087	0.619652	3.841466	0.4312

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Examination of the results above indicates that both the trace and maximum Eigen value statistics depict there are at least two co-integrating variables in the relationship between Real Gross Domestic Product and all the independent variables. The meaning of this is that there exist a long-run relationship between World Bank, International Development Association (IDA) and International Financial Co-operation and the Nigerian economy.

Parsimonious ECM

The parsimonious Error Correction Model (ECM) as it is generally known restrict the number of parameter estimates into a regression model. The basic function of the ECM is to combine short-run dynamics with long run equilibrium in a broad econometric framework. In this empirical estimation, the ECM is estimated using the first difference of the variables. The results are contained on the table below.

Table C: Parsimonious ECM

Dependent Variable: DRGDP

Method: Least Squares

Date: 09/08/15 Time: 10:37

Sample (adjusted): 1993 2010

Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	576817.1	891864.8	0.646754	0.5311
DRGDP(-2)	1.067534	0.439201	2.430625	0.0334
DWBL(-1)	3.09E-05	0.000144	0.214378	0.8342
DEXR	-11304.41	32690.94	-0.345796	0.7360
DIDAG	0.000121	0.000344	0.352004	0.7315
DIFC	0.000971	0.002745	0.353658	0.7303
ECM(-1)	0.011139	0.273805	0.040684	0.0003
R-squared	0.758982	Mean dependent var		1839412.
Adjusted R-squared	0.687002	S.D. dependent var		2212734.
S.E. of regression	2148743.	Akaike info criterion		32.28397
Sum squared resid	5.08E+13	Schwarz criterion		32.63022
Log likelihood	-283.5557	Hannan-Quinn criter.		32.33171
F-statistic	1.171270	Durbin-Watson stat		1.923850
Prob(F-statistic)	0.000491			

SOURCE: E-VIEW 7.0

The adjusted R-squared value of 0.75 shows that about 68% of the variation in the dependent variable, RGDP is collectively explained by the included regressors, leaving the remaining 32% unexplained due to presence of the disturbance terms. It is crystal clear that the estimated model is robust. The f-statics at 1.17 with p-value of 0.004191, shows that at 5% significant level, we cannot reject the alternative hypothesis which connotes a systematic relationship between the dependent variable and all the exogenous variables employed in the construct.

An examination of the coefficient of each independent variables shows that a period lag of World Bank, IDA and IFC loan/grants assisted Nigeria to enhance the economy with a value of 3.09%, 0.000121, 0.00097 unit increase; though not statistically significant at 95% level. While exchange rate was observed to decrease the Nigerian economy in the period observed. The ECM value of 0.011139 showed that any temporary deviation from the long-run equilibrium between DRGDP and the regressors can be restored at the rate of 1.11%. Finally, the Durbin-Watson statistics put at 1.92 which can be approximated shows the absence of first-order serial dependence.

V. SUMMARY, CONCLUSION AND RECOMMENDATION

This paper has examined the impact of World Bank, International Development Association and International Financial Co-operation on the Nigerian economy, from 1990 to 2010. The impact of these international bodies through project supports is supposed to engender the performance of the Nigerian economy over the years. It appears, the reverse is the experience. Weak institutional framework and corporate governance structure in the country have exacerbated the refusal of these international bodies to positively impact on the Nigerian economy. The empirical estimation made points to this assertion. The result shows that they have positively contributed to the economy; their impact has not been significant.

This calls for a major concern by the current administration of General Buhari and Professor Osinbajo led government to radically tackle the loop holes that have adversely affected the impact of these international bodies against the Nigerian economy.

Premised on this, it is therefore recommended that the Nigerian government put stringent measures/policies to ensure the assistances from these bodies are well utilized so as to positively enhance the Nigerian economy.

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A Conceptual Solution for Consumers' Data Security Protection in the U.S. General and HealthCare Industry

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Abstract- The purpose of this paper is to define and explain the importance of cyber security and the impact cyber data breaches have on the consumer. This paper also tries to explore several different methods to help protect data while also using real-world examples of some data breaches that have occurred in recent history as well as in the US healthcare industry.

Index Terms- Networks, Data Security, Data Breach, Hacking, Remote Connectivity, Personally Identifiable Information, Data Encryption, Electronic Health Records

I. INTRODUCTION

We live in a world of ever-changing technology, which has its advantages and disadvantages as well as challenges and issues that must be addressed. When it comes to the business industry, organizations must consider a consumers' privacy and security concerns. By changing from paper to electronic business data records consumer's information is vulnerable to security breaches. It is important to have confidentiality, integrity, and availability of all electronic data records. Creating a comprehensive security system is the key to avoiding data breaches and gaining a consumer's trust in your security system. To make adequate changes, the country as a whole must ban together and passes legislation that creates standards for all business organizations to follow.

For any company looking to offer flexible data accessibility options to their employees, the primary goal should always data security. Not only does this protect the company from the embarrassment and financial backlash of a data breach, but it also protects the company's clients from having their own data compromised – knowingly or unknowingly. For perspective, Target is rumored to be paying over \$100 million in settlement claims to Visa and MasterCard and even more in legal fees, fines, and credit monitoring (Sidel, 2015) in the aftermath of the data breach that occurred in 2013. If a company as large and successful as Target is susceptible to a data breach, how limited are the alternatives for firms to strike a balance between data accessibility and data security?

A GALLUP poll shows that telecommuting in the US has climbed to 37% in 2015; up 7% from a decade ago (Jones, 2015). Given that more and more jobs are offering telecommuting as a benefit for employees this percentage will likely continue to increase over time. There is also an inherent benefit to companies looking to cut overhead expenses by maintaining a cyber-workforce, so-to-speak. When companies allow employees to telecommute, however, they also open themselves up to potential data breaches by hackers. Having the proper network security

features in place may not fully protect a company from a breach, but it can at least act as a strong deterrent to keeping hackers at bay.

2.1 WHAT IS CYBER DATA SECURITY

Often referred to as information technology, cyber security is the act of protecting computers, networks and data from unauthorized access. [7] For years, as consumers, we have been warned of viruses penetrating our personal computers and corrupting our files and rendering our computers useless. Every aspect of business now a day, collects and stores large amount of data. Data on customers may include credit card information, mailing addresses or it could be healthcare patients' sensitive medical information. This massive collection of information is not just stored on networks but oftentimes are transmitted over the web, shared with other entities. As Government, businesses, healthcare systems and families collect, store, process and transmit all this data, the data could become vulnerable to access by unwanted persons. In a March 2013 Senate session, a warning from the Nation's top intelligence officials claimed cyber-attacks and digital spying are the top threat to national security, surpassing terrorism. [7]

2.2 TYPES OF CYBER DATA ATTACKS

There are several types of data breaches. This section will give examples of the most common and most dangerous types and define each one. [9]

- A virus is when a computer or a system gets infected by an infected download. Sometimes a victim will click on a non-suspecting link or open an email from an unknown source. Once that happens, the "virus" is now inside your computer and can "infect" the system by either slowing down or shutting down the security features. Many times the person is unaware that the system has been affected. A virus can be introduced via what is known in the industry as a "Trojan Horse". Like the story of Troy, the virus hides behind something that looks legitimate to gain access and once inside can do damage or steal information. These viruses are sometimes called malware, short for malicious software. It is any software used to disrupt computer operations, gather sensitive information, gain access to private computer systems, or display unwanted advertising. Malware is defined by its malicious intent, acting against the requirements of the computer

user, and does not include software that causes unintentional harm.

- Physical Theft accounts for about 20% of all large data breaches overall. Most occur within the healthcare system, accounting for over half of physical data theft. The largest to date physical data theft occurred when a laptop was stolen from a vehicle that belong to a Veterans' Administration Health System employee. Thousands of sensitive patient information was compromised through this theft.
- Skimming is a way of collecting credit card information. Criminals will put a card reading device over the original card reader of an ATM machine, a gas pump machine or any other self-service physical point of sale device. After a consumer uses the machine, the criminal then goes in after, removes the skimming device then downloads the financial information of the stolen cards. They either use these cards to make unauthorized purchases or sell the card information to a larger criminal operation.
- Phishing is a form of fraud in which the attacker tries to learn information such as login credentials or account information by masquerading as a reputable entity or person in email, IM or other communication channels. Often time masquerading as a bank, an email will be sent to a customer requesting to reset your account information, asking for pertinent information like social security numbers, PIN numbers and other Personally Identifiable Information.
- Social engineering is a type of psychological manipulation of people to divulge confidential information, gain system entry or initiate a cyber-attack. [6]

2.3 PERSONALLY IDENTIFIABLE INFORMATION (PII)

Personally identifiable information is a broad term used in the cyber industry and refers to any information that could be used to identifying a person. [5] This information could be a credit card or bank account numbers, which are referred to dynamic PII. Or the information is classified as fixed PII. This would include information such as social security number, date of birth or place of birth. Dynamic PII, once compromised can be changed. For example, if your bank card information has been breached, your bank will issue you a new bank card with a new account number. Although damage may or may not have been done due to this type of breach, the issuance of a new account number stops any further compromises to that account. On the other hand, Fixed PII is a person's permanent information and cannot be re-issued if breached or stolen. This type of information is critical to protect because there is no remedy once stolen.

2.4 RECENT SECURITY BREACHES [3]

- December 2013 – Target; Hackers stole credit and debit card information as well as email and mailing addresses of 70 million customers.
- July-August 2014 – JP Morgan Chase; Hackers gained access to JP Morgan Chase's database and stole customer information of some 83 million households and small businesses. They claim only home addresses and email addresses were stolen and no sensitive information was compromised.
- October 2014 – Staples; Hackers were able to get into the company's system and stole credit card information of 1.6 million consumers.
- November 2014 – Sony Picture; The salary lists, contracts, emails film budgets and Social Security numbers were stolen from Sony Pictures, leading to the cancellation of a big movie release. It was feared that North Korea was the culprit, though it was never proven as retaliation to the movie "*The Interview*" which was a parody comedy about a fictional assassination attempt on the North Korean leader Kim Jong-un.
- February 2015 – Anthem BCBS; The nation's largest health insurer claimed the records of as many as 80 million current and former customers as well as employees. Information that was stolen comprised of Social Security numbers, birthdays, addresses, income data and employment information.
- June 2015 – United States Government, Office of Personnel Management (OPM); Information on up to 18 million current, former and retired Government workers' and any person who may have dealt with a background check of employee's personal information was stolen by Chinese hackers. Social Security numbers, addresses, fingerprints and background checks were compromised.
- July 2015 – Ashley Madison: An online dating site that came to be known as the cheating site was hacked and the information of users was stolen and used to blackmail people. Some notorious people were outed as users of the site from politicians, pro athletes to movie stars.
- July 2015 – Army National Guard; Unrelated to the OPM breach, The Army National Guard's computer network was hacked and the sensitive information of all current and former National Guardsmen's was compromised.

2.4. HOW TO PROTECT YOURSELF

Consumers have to be advocates for their own cyber safety, not just at home with personal computer use but with the amount of information is shared and with whom. Listed below are some ways individuals can protect themselves [6]

- Build a better password.
- Install virus protection software and update it as necessary.
- Never open email attachments from unknown sources, go directly to website by typing URL versus clicking on a link.

- Do not store payment information on retailer sites. It may take a few extra moments during checkout to re-input your credit card number but if their system is hacked, your credit card number is not stored. Opt for checkout as visitor.
- If transmitting sensitive information via email, choose to encrypt content. Send the recipient the pass code in a separate email, never in the same email.
- Be cognizant of the amount of personal information shared on social media. Criminals are constantly looking on social media for easy targets.
- Shred personal papers that contain PII.

2.5 ORGANIZATION RESPONSIBILITY

Organizations that hold consumer information have a huge responsibility to their customers. By recognizing that cyber security is a real threat, not just to the company but to their customers and suppliers and investors, an organization has taken the first step for taking responsibility. Prioritizing IT in the business model will ensure safety to the company's data safety and to the customers PII protection. Companies must establish a data loss protection plan and a protocol to follow in the event that a data breach occurs. [8]

The cost associated with cyber-attacks continue to grow. As technology continues to grow so will the need for more investment in improvements in security to thwart future data breaches. [2] Unfortunately, as more companies purchase cyber insurance, these newly incurred costs are trickled down through pricing and passed onto the consumer. [2] However, the value to the customer for building consumer trust with good security will more often than not take precedence over price increases. Organizations can leverage data privacy and security as a competitive advantage. [1]

2.6. Network Security Protection

2.6.1. Cloud-Based Storage and Usage

A company's choice to move their data to the cloud comes with an array of factors to consider; including but not limited to cost of the service, data security and accessibility of the data for employees. From a cost perspective, maintaining internal servers comes at the cost of space, hardware, and IT support. Many proponents of cloud-base business argue that it is a cheaper alternative, but "some industry analysts estimate the break-even point of leasing versus buying the software at about three years" [11].

From a data security perspective, the increased risk of confidential information being breached is one of the primary concerns. J. Carlton Collins, CPA and Technology Consultant, argues the opposite, however. "Cloud-based accounting systems don't actually store your data in a vapor mist in the sky; rather your accounting data are stored in world-class data centers with fortified concrete walls, steel doors, retina scans needed for entry, world-class firewalls, state-of-the-art anti-virus technology, continuous backups, and often a mirrored backup of the entire data center" [12].

Assuming Collins' argument holds true, companies are actually benefitting from the security cloud-based services can provide. It should go without saying, however, that the level of security will differ from the various services. In the aftermath of

the Target data breach, executives eventually disclosed that "security software detected potentially malicious activity, but its staff decided not to take immediate action [16]." Hindsight is always 20/20, but perhaps Target would have benefitted from having a third-party security company monitoring their networks.

2.6.2. Establishing a Virtual Private Network Connection

A good balance of data accessibility and data security comes in the form of a virtual private network (VPN) connection. "Using VPN software to encrypt information while it is in transit over the Internet in effect creates private communication channels, which are accessible only to those parties possessing the appropriate encryption and decryption keys" [10]. Using this alternative, data that lives on secure servers within the company's infrastructure could still be accessed directly by employees on the go. To establish the VPN connection, the employee would be required to authenticate their credentials before gaining access to the network.

With confidentiality being paramount in when client credit card information is involved, a two-factor authentication would be recommended. For example, an employee attempting to access the network remotely would first be prompted for their username and password. Once provided, a randomized and expiring pass code would be sent to them via text or email. Once entered, a VPN connection would be established and the employee could gain remote access to their typical network drives and programs.

In Target's data breach, the security credentials for the HVAC company may not have been enough to access the network had there been a two-factor authentication process in place. According to one source, "Only the vendors in the highest security group — those required to directly access confidential information — would be given a token and instructions on how to access that portion of the network. Target would have paid very little attention to vendors like Fazio (the HVAC company), and I would be surprised if there was ever even a basic security assessment done of those types of vendors by Target [17]."

2.6.3 Network Segmentation

If Target's payment systems had been properly isolated from other systems – a process called network segmentation – the data breach never would have happened [15]. Through network segmentation, systems containing credit card information would have been isolated from non-payment systems. When Target was hacked, the initial access point was through the HVAC system, but because the network was not segmented, the hackers were able to work through the network until they were eventually able to gain access to the payment systems.

One way of breaking a larger network into smaller sections is by implementing virtual local area networks (VLANs) [18]. Each VLAN can act independently while also remaining connected to the overarching network of the company. This process does come with its own set of risks, however. According to security experts, if a single port on a network is not configured correctly, intruders can break through from one virtual network to another [15]. As the network becomes more and more complex, the margin for error grows proportionally along with the potential for security gaps.

II. PRIVACY DATA SECURITY PROTECTIONS IN THE U.S. HEALTHCARE INDUSTRY

In the last five years, there have been numerous security breaches in the cyber world. From financial breaches of a retailer's credit card databases to sensitive medical information of patient of a healthcare network to the personal information. New technology continuously improves the ease with which the world communicates with and connects with each other, and with this ease and convenience comes potential dangers that we as consumers must be aware of.

3.1. U.S. Healthcare Information Technology Legislation

We live in a world of ever-changing technology, which has its advantages and disadvantages as well as challenges and issues that must be addressed. When it comes to the healthcare industry, organizations must consider a patient's privacy and security concerns. By changing from paper to electronic health records patient's information is vulnerable to security breaches. It is important to have confidentiality, integrity, and available of all electronic health records. Creating a comprehensive security system is the key to avoiding data breaches and gaining a patient's trust in your security system. To make adequate changes, the country as a whole must ban together and passes legislation that creates standards for all healthcare organizations to follow.

3.1.1. American Recovery & Reinvestment Act

On February 17, 2009, President Barack Obama signed the American Recovery and Reinvestment Act. He wanted the American people to understand that this was only the beginning by stating, "The road to recovery will not be straight. We will make progress and there may be some slippage along the way. It will demand courage and discipline. It will demand a new sense of responsibility that's been missing." [25]

The American Recovery and Reinvestment Act, also known as the recovery act, addressed numerous different areas of concern including the economy, education, renewable energy, and governmental programs that provide assistance to many Americans. The act also addressed healthcare. The goal was to find a way to provide affordable healthcare to all citizens and to use today's technology as a tool to provide doctor's with accurate and up-to-date information regarding their patients. In order to do this, organizations were required to increase access to informational technology with better methods of storing, analyzing, and sharing any and all health information.

3.1.2. Health Information Technology for Economic & Clinical Health Act

In an effort to promote health information technology, the Recovery Act included the Health Information Technology for Economic and Clinical Health Act, or HITECH. The ultimate goal was to create an infrastructure that allowed health care workers including hospitals, physicians, and other treatment centers, the ability to share information quickly and accurately. In order to ensure that healthcare organizations followed all laws, standards, and other mandates, the Recovery Act also formally established the Office of the National Coordinator, or the ONC, to oversee health information technology. In conjunction with the ONC, the Health Care Authority monitors HITECH grant

programs to ensure that all standards are being met on a state level as well. [22]

3.1.3. Health Insurance Portability Act

Another legislative act passed that coincided with the American Recovery and Reinvestment Act is the Health Insurance Portability and Accountability Act. The Portability and Accountability Act requires all healthcare organizations to protect the interest of their patients. The act was first passed in 1996 by President Bill Clinton but was later readdressed in an effort to maximize today's technology. It was back in 1996 that healthcare organizations were required to meet certain national standards when they were transmitting health data electronically.

As you can see many initiatives have been created in the health information technology field to ensure patient privacy and security when healthcare organizations collect and store patient information electronically. These acts are just the tip of the iceberg when it comes to the number of laws created in this field, but there is still more work that needs to be done and, in turn, more legislation that will need to continue to expand as technology reaches new heights.

3.2. Paper Records vs. Electronic Health Records

For many years, physicians and other members of the healthcare family kept all medical records on paper. This meant that every time a patient came to the office someone would have to find that file and provide it to the physician. Overtime, as the number of patients, files, and file sizes grew so didn't the required storage space and personnel needed to maintain all of them. With this system if a patient called in and had a question about their medical history it could take a long time for the staff to locate the file and sort through all the paperwork to locate the correct information. This was not only costing an employee's time, but also financial costing more for the physician or healthcare organization.

Thirty years ago, this was the norm and people didn't think twice about it, but now we have access to quickly growing technologies that we can utilize to make the healthcare profession more efficient and, in turn, provide better service to their patients.

In 2001, we began to see healthcare practices utilizing information technology by creating electron health records or EHRs. Organizations saw the benefits of streamlining their records into one system that made file cabinets full of files obsolete. Electronic Health Records allowed physicians to quickly access a patient's medical record and provided the most up-to-date information on their medical history at their fingertips. Doctors therefore, could see more patients as they were not trying to sort through a potentially large file with their entire medical history. An electronic record allowed a doctor to locate specific information quickly and avoid irrelevant data.

3.3. Security Components for Electronic Health Records

Multiple components are necessary to have adequate security of all electronic health records. Without each component, an organization is leaving itself wide open for numerous different securities breaches. Like an intricate clock, all components are required for a system to function properly.

These items include hardware, software, updated procedures, and properly trained personnel.

Hardware has the capabilities to provide an organization with three things that a human cannot: speed, accuracy, and storage capabilities. Their speed allows them to complete requested tasks quicker. Using a computer increases accuracy when compared to humans. Creating safety measures that help reduce the probability that users enter incorrect data not only increases accuracy but provides an additional safe guard for patient records. Finally, a computer's hardware provides storage capabilities that allow users to save large quantities of data while still being able to retrieve data almost instantly.

A single computer can store data equivalent to a large storage warehouse filled with filing cabinets of patient records. To some people a computer's hardware can seem simplistic when it comes to maintaining electronic health records but many components are so common that people may forget they exist. A computer's hardware is more complicated than connecting a tower to a monitor, inside that tower is many parts that power that computer and the structure once you plug it into a power outlet. For example, inside each tower is a hard disk drive which handles all the storage needs necessary for that device. One hard drive may be divided into different sections called partitions. Regardless of how a hard drive is physically constructed it still controls a computer's software, which is another component in creating an adequate security system on a computer. [21]

Without software to utilize a computer's hardware, the hardware is essentially useless. A computer's software is all the programs that run in the background and provide a system with such tasks as deleting unnecessary data and maintaining stored files. Healthcare organizations utilize application software which performs specifically designed tasks to meet their needs. The problem arises with the lack of standards and policies in the construction of records management software, but last October a step was made in the right direction.

In October 2015, twelve of the leaders in electronic health records developers agreed to "a set of objective measures of interoperability and ongoing reporting" [24]. The reporting will help track differences between vendors and how that affects patients Information gathered will also be used to send general reports to governmental agencies to demonstrate changes in the market. The push for standards comes after many developers faced criticism over the months prior to the meeting in regards to the lack of interoperability of medical records after the government invested \$31.5 billion federal dollars. [24]

Lastly, a security system must have updated procedures to ensure that access is only granted to certain users and that data is remaining confidential. One procedure that is common before someone is granted access is running a background check on the individual. This can help filter out individuals that may create a security risk for an organization. Furthermore, creating a policy that requires a user to sign in and out of a workstation if they leave their workstation for even a minute is another policy that should be enacted. This warrants against any unauthorized users from obtaining confidential information. In order to make sure that they are followed, an organization's administration must select adequate personnel that will value a patient's privacy and the value of the information located on their computer systems.

3.4. Confidentiality, Integrity, and Availability

Three of the most important aspects of network and computer security are confidentiality, integrity, and availability, also known as the CIA triangle. To meet confidentiality measures the rule is straightforward; a system must not allow any information to be disclosed. In the healthcare industry most if not all of the information collected from patients is considered confidential. The integrity portion of the CIA triangle states that accurate data must be used within the system. This includes making sure that authorized or unauthorized users are not making inaccurate changes to any files. Lastly, available means information can be easily accessed in a system and that there are enough workstations so that any authorized user can access the system without having to wait for someone else to finish. Availability also means that a system can quickly be recovered if there is a system failure. [20] All three components are essential in creating a top notch system to store electronic health records.

3.5. Data Encryption

Data encryption occurs when data is encoded in a way that is unable to be deciphered by unauthorized users. However, interception is not prevented with data encryption; it just means the receiver of the data will be unable to read the contents. Even with the legislation that has been passed over the last fifteen years, those collecting and storing sensitive health information are not required to encrypt their data. The Health Insurance Portability and Accountability Act only encourages the use of encryption.

One well-known example occurred just last year with the second largest health insurer in the United States, Anthem. Anthem's security breach allowed hackers to gain access to over 80 million Americans information that included some former members as well as nonmembers, as Anthem managed paperwork for small independent insurance companies. The problem with Anthem's securities system is that the failed to encrypt a large amount of personal data they stored, that most victims were unaware they kept that information on files. When investigated, it was believed that the hackers collected credentials to at least five employees that had high-level IT clearance through phishing.

The major problem is the hacker was able to phish multiple high-level IT employees without being detected by their security software or by other employees. Due to the lack of security in guarding confidential information it meant that in this instance an employee who was the one to eventually detect the breach. Anthem claims that they believed the breach went on for weeks, which could of potentially have been prevented if a comprehensive security system was in place, which included encrypted data. [26]

Even after the security breach at Anthem occurred, there still has not been legislation passed that requires all electronic health records be encrypted. Just this month the Federal Trade Commission sued Henry Schein Practice Solutions who sells software for dental practice management for "allegedly misrepresenting its level of encryption for patient data". [20] However, the Federal Trade Commission was not suing because of a data breach, but rather because the software was misrepresented.

The company's Dentrax G5 software claimed that it utilized industry-standards encryption when it actually used an inferior method. This was determined by the Advanced Encryption Standards, which are recommended by the National Institute of Standards and Technology. [20] This move by the Federal Trade Commission is a move in the right direction but, more needs to be done to regulate data encryption in healthcare.

3.6. Patient's Control over Electronic Data

In order to operate a success healthcare organization, that organization must gain and maintain a patient's trust. Studies have shown that due to the advances being made in technology that some patients have failed to seek treatment or they do not disclose all necessary information required to adequate treat them. One reason this occurs is because patients have a lack of trust in the way their confidential information is collected and stored. Many patients are seeking to have greater control over their personal information.

We are starting to see a shift towards patients having control over their medical records through online websites associated with healthcare organizations. Patients use their username and password to log into the website and can access their personal information, send a message to their physician, request medication refills, and set up appointments. [23]. However, these types of websites are new to the medical field and, therefore, are structured differently since there are currently no standards to monitor them. These types of systems can be found in larger organizations, but we have a long way till we see them in all organizations as they systems are costly to create and maintain.

III. CONCLUSION

As technology continues to evolve, so does the threat. As a society, we cannot afford to become complacent and lazy. We cannot rely on the technology itself to protect us. It is our responsibility as individuals and organizations to be vigilant and ever evolving with the changing times. The connectivity of the World Wide Web is an amazing function, but it opens up a world of vulnerability. It is possible to enjoy the fruits of innovation as long as we stay informed, educated and aware. Take the IT discussion seriously, view the training offered by employers as an opportunity to increase your cyber competency. With safety as a forefront, consumers and business alike can expect to experience a rewarding existence in the cyber world.

As anticipated, steps have been made to improve the way we use technology in healthcare, but were still years away from creating a more secure and interoperability system. The problem lays in the lack of standards and legislation behind electronic health records and the corresponding software. Also, more needs to be done to ensure the security of confidential information so that customers/patients feel comfortable sharing information with business/medical workers.

In more details of medical industry, creating a cohesive system to store medical records that patients can trust will hopefully one day mean that patients will be willing to be involved in different research in order to cure and possibly prevent certain diseases and conditions. Ultimately, the software

behind electronic medical records needs to place patients first and foremost.

Even with all the security out there, the sad reality is that network protection is usually a step behind the hackers. If a hacker group wants data bad enough they will most likely be able to find a way to crack the system assuming they have enough knowledge to do so. Nonetheless, security companies continue to adapt and build security systems that help to ward off hackers and protect the data of their clients.

In the case of the Target data breach, one could argue it was the company's own hubris and/or stupidity that eventually resulted in the breach. The system in place was properly alerting their security team of malicious behavior but those involved chose to ignore it. The result is millions of dollars in fines and damages that the company must now pay.

Coincidentally, many hackers groups are not driven by the monetary aspect but rather, the ability to impose change within big businesses. A hacker group may acquire confidential data from a company and make demands while threatening to expose the data to the public. This holds true with the data breach of the online dating service, Ashley Madison. The group has claimed two motivations: First, they've criticized Ashley Madison's core mission of arranging affairs between married individuals. Second, they've attacked Ashley Madison's business practices, in particular its requirement that users pay \$19 for the privilege of deleting all their data from the site (but, as it turns out, not all data was scrubbed) (Hackett, 2015).

In closing, the internet is not showing signs of going away anytime soon. It is a gift and a curse that the internet allows us to stay connected. On one hand the internet allows us to communicate with family members across the globe, or access the world's knowledge with one click. On the other hand, a hacker could have remotely accessed my desktop and is watching me type each and every word of this paper without my knowing. For better or worse, we just try to tell our self that our life is boring enough that a hacker wouldn't want anything to do with us anyways, so we just try and go about my life as if we are immune to it all. As they say, ignorance is bliss.

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Influence of economy and development in the Capital Market of Lybia

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Abstract- The changing economic environment both in the market system to follow the central planning or vice versa if it in any organizational change necessary to emerge from interactions highlight the new institutions in accordance with this change In contrast disappear other institutions were playing an active role under the old system , which becomes a role under the new system is an actor, even though their presence may cause an obstacle to activate the new institutions and creator orientation , and financial markets is one of the most important economic developments and secretions that because of their great role and impact on the national economy .

Yet widening the activity of these markets and their integration into a global reach stage financing investment activity range to put a radical solution to the problem of excess liquidity for the financing of investment so that these markets are able to create investment opportunities for the units surplus and provide sufficient liquidity for the units of the deficit any access to the stage and there is a market for securities to finance investment , a product logical evolution of financial naturally in harmony with a changing international environment dictated by the need for internal matured normally .

Index Terms- market, economy, investment, integration, financing

I. INTRODUCTION

The changing economic environment both in the market system to follow the central planning or vice versa if it in any organizational change necessary to emerge from interactions highlight the new institutions in accordance with this change In contrast disappear other institutions were playing an active role under the old system , which becomes a role under the new system is an actor, even though their presence may cause an obstacle to activate the new institutions and creator orientation , and financial markets is one of the most important economic developments and secretions that because of their great role and impact on the national economy .

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II. RESEARCH PROBLEM

Characterized by institutions of the banking sector -based weak performance due to the control of public ownership of the majority and the lack of the spirit of competition among themselves as well as the narrow scope of the business areas in the national economy and the lack of investment opportunities in general inability of the sector to find sources of the use of devastating back , so the limited areas of investment on the one hand, and a high risk of employment on the other hand, which led to the high volume of bad debts and non-performing both caused other is the use of a credit policy is rational .

Research objectives

The research aims to the following:

- Identify the extent of the impact of the Libyan stock market on the banking sector investments .
- Identify the types of investment before the banking sector and determine the effect on the profitability of the sector by linking the risks faced by the banking sector funds .

Research hypotheses

The main hypothesis

Null hypothesis : There is no statistically significant relationship between the risk of financial and market information, and among commercial banks for financing projects and economic development.

The second hypothesis

Null hypothesis : There is no statistically significant relationship between constraints and financial market risks , and the appropriate returns and capital to the size of the investment risks .

Third hypothesis

Null hypothesis : There is no statistically significant relationship between constraints and financial market risks , and the effectiveness of the investment policies of commercial banks .

III. FINANCIAL MARKETS

The stock markets play vital role in the economies of the modern world , they are used as an effective tool in the states to assess the economy, and contribute to increasing the awareness of investors , then they are a mirror that reflects the real situation of companies , projects and clearly show the strengths and weaknesses of its financial position , and therefore judged a

success or failure, is reflected in the share prices of the company or the source project for these securities.

These markets have the capacity of financing huge, where it is on its way flow of capital large, so as to establish and create various development projects, including through funding non-traditional, and has been reaping the investors depending on the fruits of these markets, which are in large profits, and give them greater flexibility in choice of funding sources.

Definition of the stock market

Financial market is a place that combines units has cash surpluses, and between units deficit need these surpluses, shows the role of the market is evident in being a liaison between these units, as the capacity traded in this market securities ranging in maturity to open the door modules deficit to choose sources of funding that are commensurate with ability and ambition and average duration, and all this under the provision of sufficient flexibility to choose, and in return you get units for use surplus cash surpluses.

Types of financial markets

Is usually distinguished between two types of financial markets, namely:

- 1 - capital markets.
- 2 - exchange markets.

Functions of financial markets and Importance of the stock market

Lead financial markets and the important function is that it works as a liaison between the two groups in the community, the class with cash surpluses do not have the ability and know-how and competence including positioned to engage in the areas of investment, and the class has the ability and efficiency to invest these cash benefits, and that the benefit and cost-effective for everyone.

It is noteworthy to mention that the stock market performs many functions that can be listed in the brief statements as follows:

- Directing the savings to invest in securities;
- Facilitate the purchase and sale of securities, and thus improve the investment operations and raise the standard of living in the community;
- Determine fair prices for securities and has been working to maintain this.

The nature of the activity

Since its inception, the Bank has to provide banking services to its customers, as has funded many of the institutions and public and private companies, both productivity or service of the country.

The bank's private banking business is in all commercial banks, and so on, whether the domestic or international level, and can be summed up the following points.

- 1) accepting deposits of various kinds, and the granting of various credit facilities.
- 2) version and re- discount and securities trading business.
- 3) foreign exchange.
- 4) the issuance of letters of guarantee and letters of credit.

- 5) representation of various banking facilities, whether at home or abroad.
- 6) securities and valuables; rental lockers and private funds.
- 7) providing all banking facilities and other operations directly in the banking field.
- 8) regulating public offerings, and immediately all acts relating to securities.
- 9) buying, selling and ownership of the shares of companies contributing to the organization in Libya or outside the boundary conditions prescribed by the law.
- 10) services swift, and transfer of funds across the world, as well as advisory services.

Pursuing the bank's policy expansion and spreading inside Libya, where the number of branches 46 and agencies distributors across Libya until the end of 2007, in order to accomplish various services for different customer segments, as well as the Bank's large network of correspondents abroad are more than 450 correspondents around the world. The bank seeks to follow the developments of modern banking and methods of application, for the betterment of the bank to a high degree would enable it to compete with other banks locally and globally, through the introduction of mechanization, and preparation systems for all departments and branches of banks. Take the bank's legal form in the form of a Libyan company contribution registered in the Commercial Register under number), has been the evolution of the bank's capital since the decision of nationalization to become the (21) million. In 1995, and (63) million. In 2000, and 126) million. in 2005, and the longer it became of money the bank until the end of the fiscal year 2007 amounts of \$(252) million, and with respect to fiscal 2008, despite the stability of the capital of \$ 252 million. For, however, the total budget for this year (11) billion an increase of 4 billion an increase of 62.42% than it was located in the year 2007, and perhaps the most important reasons for this increase is the high volume of deposits in various types, which amounted to 8 billion after it had been (5) billion in the year 2007, which reflected the impact directly in improving the uses and sources of profits. In the context of the modernization of the banking sector and the financial and gradual opening in front of foreign institutions and technological expertise in the world, announced the Central Bank of Libya in the context of their ongoing quest to develop the banks and re- structure in order to achieve competitive reflected on the efficient use of resources, which is reflected in its impact on the provision of banking and financial services distinct it been selling 19% stake in Sahara Bank to Bank (BNP) French, that have the right to increase the stock owned to 51% during the period ranging from three to five years. It will contribute to the bank BNP Paribas in cooperation with the Sahara Bank in the following:

- Participation his knowledge in the areas of retail banking.
- Assist in the modernization and support tasks included management of information technology and risk management.
- To participate in the upscale and advanced training to the staff of the Sahara Bank.

Goumhuriya Bank:

It is the company's contribution to a Libyan, was established according to the provisions of the Libyan commercial law, where it was previously known as the (Barclays Bank), one of the bank branches English which came to Libya with the forces of the British occupation in 1943, where he opened several branches in several the most important cities of Tripoli and Benghazi to monopolize the banking business and banking services, and the completion of all transactions of the British authorities, and alone on the validity of the issuance of cash on behalf of the British authorities, and at independence on behalf of the Libyan government until the month of April 1956. After the al-Fateh Revolution in September 1969 in the issuance of the decision to foreign banks, which compelled all banks that take the form of companies Libyan contribution, and that the share of the Libyans of not less than 51% of its capital, then these efforts culminated in the National issuance of Law No. (153) for the year 1970, on the nationalization of all foreign stakes in banks, were nationalized foreign equity (Bank Parkes) adult (49%) of the bank's capital, bringing the bank owned by the people of the Libyan Arab in the name Goumhuriya Bank.

IV. RESULTS AND RECOMMENDATIONS

This research provides a summary of the most important findings and recommendations reached by the researcher, which was the outcome of what has been hurt him in the previous chapters, if it contains a profile on the Libyan stock market has been the exposure of the banking sector in Libya, its resources and its uses, and the impact of stock market investments sector banking, in a serious step to stand on the most important difficulties faced and overcome to reach the desired results.

Results:

During the process of study and field, and after analyzing the data collected from this study, it has been reached on a set of results can be listed as follows:

Main findings:

1 - Through the analysis turned out to lack the impact of the risks and constraints of the financial market to finance projects, and that there is an inverse relationship is very weak by simple regression results, which means rejection of the alternative hypothesis and accept the null hypothesis.

2 - Through the analysis turns out the presence of a trace of constraints and the risk of financial market on the appropriate yield and capital to the size of investment risks, and that there is a direct correlation is very strong between the risks and constraints of the financial market and the appropriate returns and capital to the size of the risk by the results of simple regression, which means rejection null hypothesis and accept the alternative hypothesis.

3 - Through the analysis turns out the presence of a trace of the risks and constraints of the financial market on the effectiveness of the investment policy of commercial banks, and that there is a direct correlation is very strong between the risks of the obstacles the financial market and the effectiveness of the investment policies according to the results of simple regression, which means rejection of the null hypothesis and accept the alternative hypothesis.

4 - Available at commercial banks in excess liquidity and this shows clearly in surplus liquid assets, and the reason for this is attributed to a combination of the most important variables limited the areas of employment and the lack of guarantees that encourage banks to grant more credit.

5 - Notes the increasing resources banker study largely in the form of deposits of all kinds, and this increase that has shown anything, it shows the magnitude of the operations of the two banks and increase the ability of banks to attract deposits, and also reflects the increasing customer demand to deal with the banks which reflected its impact on the uses of funds in banks.

6 - Notes that the use of the funds to a bank in the study are moving in the beginning years of study toward lending more than other investments, as well as the provision of investment is almost non-existent, and is attributable to a decrease that was not non-existent liquidity source that there is no stock market, while in the last years of the study and, has tended uses of funds in banks around item investments at the behest of the Central Bank of Libya, the Libyan stock market was not ready to absorb the investment banks short-term, although it has doubled investment banks by more than the increase in loans and advances, which, if anything it shows how the impact of the Libyan stock market investments on the banking sector despite the recent inception.

Sub-results:

1 - The results of the study mimic the sound of qualifications for leadership positions or administrative in both banks, and increases qualified for appointment to positions of leadership in the category of Higher Diploma or equivalent, where the percentage of 65%, 72.2% in the Sahara bank and Goumhuriya Bank.

2 - Results of the study showed that the category of 5-10 years experience make up the majority of the Goumhuriya Bank, reaching 42.5% and that the class experience less than 5 years constitute a majority in the deserts where the bank stood at 36.1%.

3 - Results of the study showed that the questionnaire may have included levels of planning and supervisory functions of the beginning of the Director of branches and ending with the directors of departments of the branches of the bank.

4 - Results of the study showed that the staff of the Sahara Bank more approval and the homogeneity of the staff of the Goumhuriya Bank of the phrases regarding the appropriateness and effectiveness of the investment policies.

5 - Results of the study showed that the staff of the Sahara Bank and the approval more homogeneous than the staff of the Goumhuriya Bank of the phrases on the importance of the constraints and risks of the financial market.

Recommendation:

1 - Must be distributed to commercial banks and investment through the application of the principle of distribution in investment by not only rely on lending.

2 - Commercial banks must invest surplus liquidity in the fields of employment created as a market securities, which leads to a reduction of the risks involved with traditional areas of employment.

3 - To pursue a policy of rational make banks able to invest in the capital market.

4 - The market for Libyan financial ability to grow once the adoption of effective working mechanism .

5 - To expand investment in the capital market (securities) makes banks to achieve high profits and varied.

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Implementation of Secured Embedded Web server on FPGA

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Abstract- The implementation of web server using Altera Nios II embedded IP core makes best solution for conventional heavy weight web server can be replaced by substituting FPGA based web server providing high speed, Low power consumption, reduced cost. The web server hosts the pages, scripts, programs, and multimedia files and serves them using TCP/HTTP designed to send files to web browsers. In Nios II soft processor approach, designers can make a perfect fit in terms of processors, peripherals, memory interfaces, performance characteristics and cost. ECC (Elliptic Curve Cryptography) is integrated with in the source code of web server to achieve secure communication. ECC is particularly useful in applications where memory, bandwidth and/or computational power is limited.

Index Terms- HTTP/TCP, NIOS II , FPGA, ECC

I. INTRODUCTION

A web server is a computer that delivers web pages to other computers in the network. Every web server has a unique IP address and possibly a domain name. Any computer can work as web server by installing server software. Web server can communicate with the web browser through TCP/HTTP. The web server accepts requests from web browsers and returns the appropriate documents. The web server hosts the web pages and serves them using Hyper-Text Transfer Protocol (HTTP), designed to send files to web browsers protocols.

World Wide Web (WWW) is the user-friendly interface, in which that image, formatted text, video, and audio are available. Users can access their equipment from any browsers. One of the most popular protocol suites is [TCP/IP](#)[13] which is the heart of Internetworking communications. The Internet Protocol [13] is responsible for addressing hosts and routing datagram's (packets) from a source host to the destination host across one or more IP networks. TCP/IP is responsible for breaking data down into IP packets before they are sent, and for assembling the packets when they arrive. The IP, the Internet Protocol, is responsible for exchanging information between routers so that the routers can select the proper path for network traffic, while TCP/IP is responsible to ensure the data packets are transmitted across the network reliably and error free.

A microcontroller with an embedded TCP/IP stack called an "Embedded Web Server" [9] sends pages over a physical layer connection to a remote computer with a browser. The browser reads the Hyper-Text Markup language (HTML) formatting and displays a page in the browser window. The user can send data to the Server stack through a form on the web page, the form data is

sent over the physical connection and is received by the TCP/IP stack in the remote microcontroller.

Field Programmable Gate Array (FPGA) is the only solution for satisfying all the requirements from user side in (a) Speed (b) Stability (c) Economic (d) Flexibility. If the FPGA is chosen according to its high performance, the web server becomes more effective. By considering this a newly evolving FPGA platform Nios II processor[1] kit supports of 25000 logic elements from the ALTERA vendor is prescribed in this research to achieve maximum reliability using soft core processors. A soft core processor is a microprocessor fully described in software, usually in HDL, which can be synthesized in programmable hardware, such as FPGA.

II. NIOS II SYSTEM

The proposed web server is implemented on NIOS II embedded processor. The Nios II processor is a general-purpose RISC processor with embedded peripheral architecture. The Nios II processor system is equivalent to a microcontroller or "computer on a chip" that includes a processor and a combination of peripherals and memory on a single chip. A Nios II processor system consists of a Nios II processor core, a set of on-chip peripherals, on-chip memory, and interfaces to off-chip memory, all implemented on a single Altera device. The Quartus II software and is available to all Altera customers. It automates the task of integrating hardware components into a larger system. It can specify the system components in a graphical user interface (GUI), and generates the interconnect logic automatically

The Nios II processor and the interfaces needed to connect to other chips on the DE2 board are implemented in the Cyclone II FPGA chip. These components are interconnected by means of the interconnection network called the Avalon Switch Fabric. Avalon Interface: It simplifies system design by allowing easily connection for several components in an FPGA. The Avalon switch fabric enables multiple, simultaneous data transactions for unmatched system Throughput.

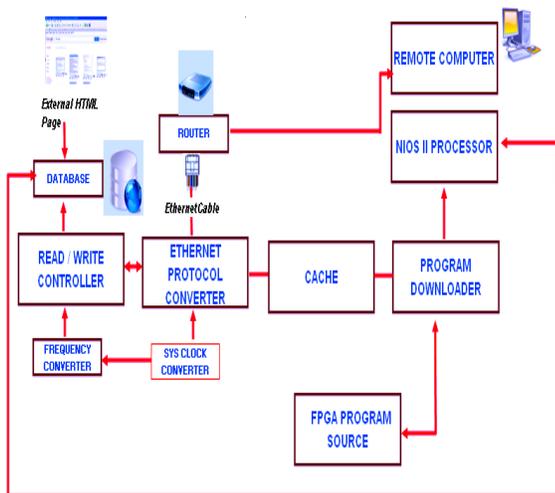


Figure 1: System Circuit diagram

The memory blocks in the Cyclone II device can be used to provide an on-chip memory for the Nios II processor. The SRAM, SDRAM and Flash memory chips on the DE2 board are accessed through the appropriate interfaces. Parallel and serial input/output interfaces provide typical I/O ports used in computer systems. A special JTAG UART interface is used to connect to the circuitry that provides a Universal Serial Bus (USB) link to the host computer to which the DE2 board is connected. This circuitry and the associated software are called the USB-Blaster. Another module, called the JTAG Debug module, is provided to allow the host computer to control the Nios II system.

It makes it possible to perform operations such as downloading programs into memory, starting operations and stopping execution, setting breakpoints, and collecting real-time execution trace data. Since all parts of the Nios II system implemented on the FPGA chip are defined by using a hardware description language (HLD).

III. CRYPTOGRAPHY AND ALGORITHM

The Cryptography is the science of using mathematics to hide or protect information from unauthorized users, which aims to provide all of the services known as confidentiality, integrity and authentication, access control, non- repudiation.

Encryption and Decryption

The process of making the information unreadable is called encryption or enciphering. The result of encryption is a cipher text or cryptogram. Reversing this process and retrieving the original readable information is called decryption or deciphering. To encrypt or decrypt information, an algorithm or so-called cipher is used.

A Cryptographic algorithm is controlled by a secret key, sometimes called password. Only those who are authorized to read the information know the key. Without knowing the key, it should be impossible to reverse the encryption process, or the time to attempt to reverse the process should required take so much time that the information would become useless.

Elliptic Curve Cryptography (ECC)

For the purpose of cryptography, an elliptic curve can be thought of as being given by an affine equation of the form $y^2 = x^3 + ax + b$, where a and b are elements of a finite field with pn elements, where p is a prime larger than 3. (The equation over binary and ternary fields looks slightly different.) The set of points on the curve is the collection of ordered pairs (x, y) with coordinates in the field and such that x and y satisfy the relation given by the equation defining the curve, plus an extra point that is said to be at infinity. The set of points on an elliptic curve with coordinates in a finite field.

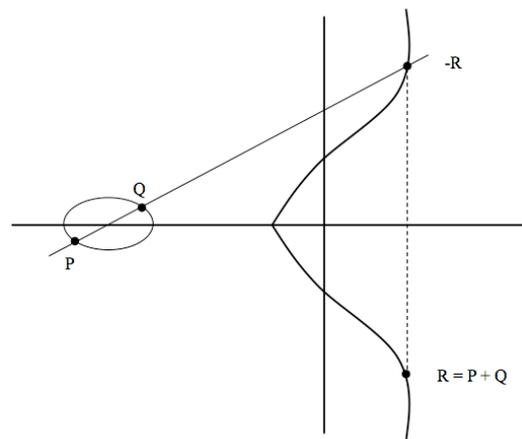


Figure.2.Group law on an Elliptic Curve

Elliptic Curve Cryptography (ECC) has been regarded mature to provide robustness for secure data transaction. Compared with RSA, ECC can supply equivalent level of security with a much smaller key length. Therefore, ECC has become an attractive alternative cryptosystem and many designs have been proposed in recent years among them, there are dual-field ECC implementations that support both binary field $GF(2^m)$.

The primary advantage is that ECC is based on either integer factorization or the discrete log problem in the multiplicative group of a finite field in the absence of a sub exponential-time algorithm.

- ECC uses smaller key size as compared to RSA. As a result it achieves greater speed and less storage.
- Key pair generation is much faster than other algorithm.
- Greater flexibility.

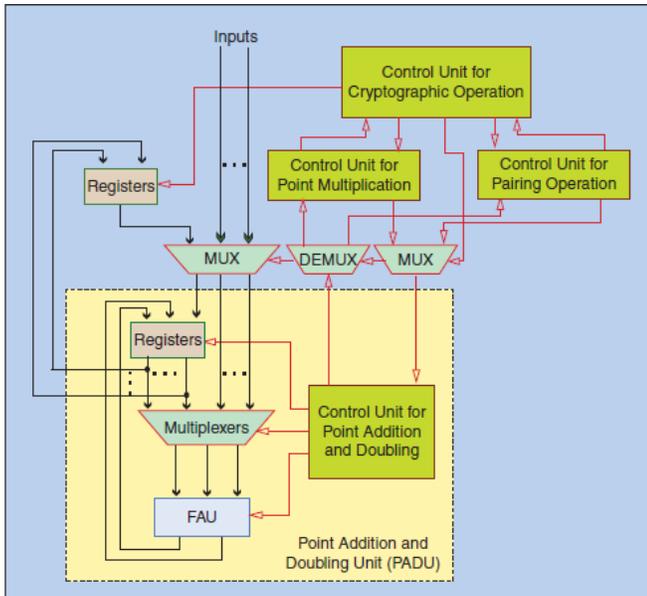


Figure 3. Block diagram of ECC

The following table to demonstrate the key size relationship between ECC and RSA

Table 1. ECC VS RSA Comparison

ECC Size	Key	RSA Key Size	Key-Size Ratio
163		1,024	1:6
256		3,072	1:12
384		7,680	1:20
512		15,360	1:30

Since the ECC key sizes are so much shorter than comparable RSA keys, the length of the public key and private key is much shorter in elliptic curve cryptosystems. This results into faster processing times, and lower demands on memory and bandwidth. ECC[12] is faster than RSA for signing and decryption, but slower for signature verification and encryption. ECC is particularly useful in applications where memory, bandwidth and/or computational power is limited (e.g., a smartcard) and it is in this area that ECC use is expected to grow.

ALGORITHM

Input: A point P = (x, y), an l-bit integer k = (kl-1, . . . , k1, k0).

Output: Q = kP.

- 1: $X_1 = x, Z_1 = 1, X_2 = x^4 + \beta, Z_2 = x_2.$
- 2: for $i = l-2$ to 0 by -1 do
- 3: if $k_i = 1$ then
- 4: $(X_1, Z_1) = \text{Madd}(X_1, Z_1, X_2, Z_2), (X_2, Z_2) = \text{Mdouble}(X_2, Z_2)$
- 5: else
- 6: $(X_2, Z_2) = \text{Madd}(X_1, Z_1, X_2, Z_2), (X_1, Z_1) = \text{Mdouble}(X_1, Z_1)$
- 7: end if
- 8: end for
- 9: $Q = \text{Mxy}(X_1, Z_1, X_2, Z_2)$
- 10: $\text{Madd}(X_1, Z_1, X_2, Z_2)$ // Point Addition
- 11: $Z_3 = (X_1 \times Z_2 + X_2 \times Z_1)^2, X_3 = x \times Z_3 + (X_1 \times Z_2) \times (X_2 \times Z_1)$

- 12: $\text{return}(X_3, Z_3)$
- 13: $\text{Mdouble}(X_1, Z_1)$ // Point Double
- 14: $Z_1^2 = Z_1^2 \times X_1^2, X_1^2 = X_1^4 + \beta \times Z_1^4$
- 15: $\text{return}(X_2, Z_2)$
- 16: $\text{Mxy}(X_1, Z_1, X_2, Z_2)$ // Coordinate Conversion
- 17: $X = X_1 / Z_1, Y = (x + X) \times (y + x^2 + (X_2 / Z_2 + x) \times (X_1 / Z_1 + x)) / x + y$
- 18: $\text{return}(X, Y)$

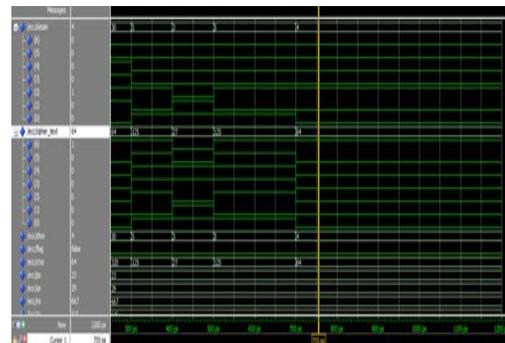
HARDWARE AND SOFTWARE TOOLS

- Modelsim
- Altera’s Quartus II software and SOPC Builder
- Nios II IDE
- The Nios Development Board, Cyclone II

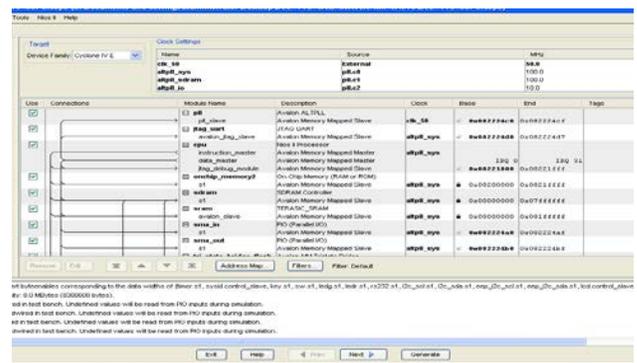
SIMULATION RESULT

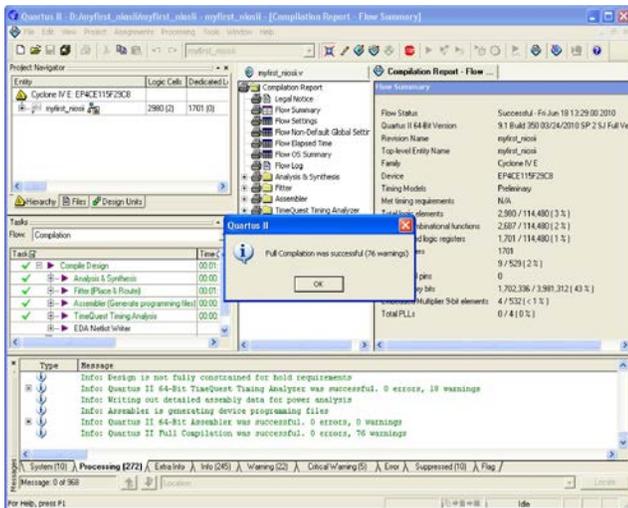
The web server is implemented using NIOS II altera board provides area and power consumption. The web pages can be shared with registered clients also the security achieved through ECC

SIMULATION RESULT FOR THE ENCRYPTION&DECRYPTION

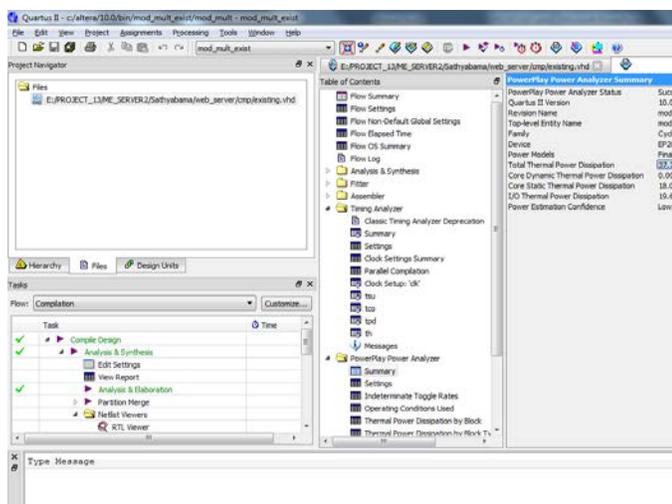


SYNTHESIS REPORT FOR NIOS II PROCESSOR AND PERIPHERAL GENERATED

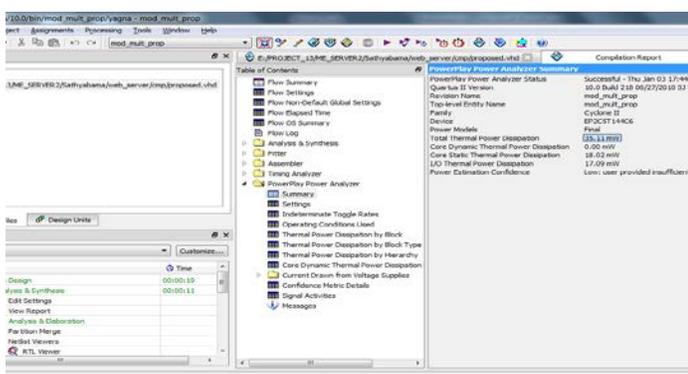




SYNTHESIS REPORT FOR ECC:



SYNTHESIS REPORT FOR MONTGOMERY ECC:



IV. CONCLUSION

Implementing Nios II processor on FPGA allows more flexibility on both hardware and software. ECC provides time as well as power consumption too. This makes it an ideal choice for portable, mobile and low power applications. It can be a very secure and useful replacement of already being used cryptosystems for key exchange, key agreement and mutual authentication After downloading the VHDL software program

to the FPGA Hardware the synthesis report from the Kit supporting software is tabulated by means of (a) speed (b) logic elements used (c) power consumption .The web pages can be shared with registered clients via Ethernet cable by issuing a TCP/IP request. The web pages are filtered according to the authorization of the end user.

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Strategic Framework for Managing Forces of Continuity and Change in Pharmaceutical Industry

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Abstract- Pharmaceutical industry has undergone unprecedented changes ever since the onset of globalization and liberalization era. This prompted us to review the literature as to how the industry is balancing the change with the existing continuities. The paper, thus, presents a review of the forces of change and continuity affecting the pharmaceutical industry, in general, and India in particular.

Drawing from the Flowing Stream Strategy framework, which seems to be a dominant approach for managing continuity and change in the existing literature, an expert survey was undertaken to verify the change and continuity forces affecting the pharmaceutical industry in India. Further these forces were mapped on the continuity and change matrix to ascertain the extent of force of change or inertia faced by this industry. In the end, a flexible strategic framework for managing the change and continuity forces in the pharmaceutical industry is suggested.

Index Terms- Managing Change and Continuity, Flexibility, Forces of Change, Forces of Continuity, Flexible Strategic Framework and Pharmaceutical Industry.

I. INTRODUCTION

Since beginning change is always associated with various areas like technology, structure, culture, government legislation etc. According to Kanter (1999), today's need of organization is to serve the social sector and gain competitive advantage. For the success of an organization, communal acceptance of innovations especially technological changes is a must. According to the resource-based perspective, thriving organizations have exclusive competence or resources that tender them an advantage over their competitors. Gersick (1994) has found that these resources are valuable when they are rare, inimitable and non-substitutable. Consistent with resource-based view it has been reported that organizations has to be competitive with the ever changing environment and must have strategic view to cope up with change coming in the way of functioning.

Historically, the dominant perspective in the study of organizations has been an adaptation perspective. According to this standpoint, organizations and dominant coalitions, scan the significant organizational environment, devise strategic responses to environmental changes, and effort to adapt to changing environmental situation in order to ascertain the performance and inexorable survival of organizations March and Simon,(1958); Cyert and March, (1963); Thompson, (1967); Lawrence and Lorsch, (1967); Pfeffer and Salancik, (1978). According to R. Coombs and J. Metcalfe (2002) since 1980s the

pharmaceutical industry underwent a period of transition that witnessed its evolution from a fragmented industry to a global oligopoly. Moving ahead from an chronological base of largely organic growth, the industry has seen a high level of merger activity, including several 'megamergers' such as the creation of GlaxoSmithKline P. Allen, R. Ramlogan and S. Randles (2002) and the desertion of smaller biotechnology firms as they have either been acquired or failed to survive. Even though there appears to be agreement that the pharmaceutical industry has to undergone a process of consolidation it is not at all universally accepted that the pharmaceutical industry has a high level of concentration at the global level R. Coombs and J. Metcalfe (2002).

Organizations ever hardly formulate major adaptive changes and that changes among organizations are troublesome Hannan (1977); Freeman, (1984). As a consequence, environmental selection is a more appropriate approach than adaptation to explaining change among organizations. Organizations that fit in the environment survives, whereas others are selected out of the organizational population, and change occurs more because of selection and replacement than organizational transformation Hannan, (1977);Freeman, (1984) .

The epoch of competitiveness, an organization have to identify forthcoming opportunities and threats very early and incorporate them into strategic planning on time for example the changes in the pharmaceutical industry structure influence strategy evolution in incumbent firms Bain (1956);Mason (1959) and that those strategies in turn shape industry structure. For example, merger and acquisition activity can be linked to industry consolidation and strategies such as cross-border co-operative arrangements in turn shape industry globalization. Scherer (1980), moreover the concept of scenario management was suggested, which is based on systems thinking, future open thinking and strategic thinking which results in organization success Fink and Schlake, (2001).

An important supposition underlying the initial statement of population ecology theory Hannan and Freeman, (1977) was that organizations usually have high levels of structural inertia and are unable to make changes easily due to a variety of internal and environmental constraints (Hannan and Freeman, (1977); Aldrich and Auster, (1986). But, afterwards, Hannan and Freeman (1984) have put forward a customized position in which structural inertia is seen as a consequence of selection processes rather than a precursor to them. They have also elaborated the structural inertia concept in relative and dynamic terms like in pharmaceutical firms initially focused on the simplest, i.e., mono-genetic, molecules, the knowledge and resources required

for future discoveries needs to adapt to the increased complexity of what is next to be discovered Schwartzman(1976).

Changes in individual countries as well as the particular market and investment opportunities pay for by liberalizing economies to foreign multinationals Gillespie and Alden, (1989), there is a growing interest in understanding the competitive strategies of firms from these economies as they respond to institutional transitions and begin to compete in global markets OECD, (2006); Business Week, (2006); BCG, (2006). As in the Indian pharmaceutical industry policy environment toward both technology and FDI underwent considerable changes during 1960-1990. Largely, policies were quiet liberal in the 1960s, but made very rigid in the 1970s, attempts at liberalization were made in the 1980s, and then real liberalization took place in the early 1990s. Afterwards, the policy environment was typified by discretionary control and a short of transparency. These environmental changes have had reflective effects on the investment and research activities of both MNCs and domestic pharmaceutical firms in India Kumar, (1994).

Continuity and changes is characteristic feature of strategic thinking. Earlier, when the environment was quiet steady, various strategies were come into existence largely surrounding the issue of 'continuity'. Several significant strategies in this regard are 'continuity' and 'logic Incrementalism Sushil (2005), Quinn (1978, 1980).

The concept of continuity and change had been recognized earlier Nasim and Sushil (2011), According to field theory Lewin (1947) the change and continuity are correlated concepts; group life is never without change, and merely differences in the amount and type of change exist. According to Mintzberg et al. (1998) , after discovering the wilderness of literature of strategic management admitted that inspite of all existing issues about change still not all organizations need to change every time. Mintzberg (1988) proposed that creation of strategy is both 'deliberate and emergent' and therefore requires being designed inspite just to plan further he stated that the problem of strategy creation is that to bring together the forces of continuity and change. On the other hand to spotlight efforts to gain operating efficiencies, yet to adjust and continue with a changing external environment Mintzberg, (1988)

II. LITERATURE SURVEY

Managing Continuity and Change in Pharmaceutical Industry:

Since 1980s and 1990s large pharmaceutical corporations faced fundamental challenges of longer development times, a tremendous increase in R&D expenditures, a multiplication of technological approaches and the entry of new actors into the industry (Zeller.C,2002). Increase in global competition and the emergence of a North Atlantic oligopolistic rivalry set the large pharmaceutical companies under additional pressure to win 'innovation races'.

Extreme competition and rivalrous environment among and even within the firms exist in many industries. There is always a severe competition among biotechnology and pharmaceutical firms for access to technologies and for patent rights Pisano, (1991); Valle and Gambardella, (1993) which forced the same companies to enter into collaborations in other fields. A most

important challenge for firms is to deal with ambiguity on the part of its survival Zeller.C, (2002). Firms attempt to address these problems. Because uncertainty varies over the stages of the product life cycle, the choice of an appropriate structure will depend on which stages producers and users are at Robertson and Langlois, (1995).The molecular biological revolution and the emergence of the biotech industry increase uncertainty for the pharmaceutical companies. They are forced to produce new technologies internally and/or can be outsourced by acquiring well tested technology from other organizations Sushil, (2005).Consequently they tend to combine their classical vertical integration with new forms of internalization of knowledge and technologies externally produced by the biotech newcomers Nightingale, (2000).

Beneath the pressure of slowed innovation expressed in new active substances, longer development times and increasing R&D costs, as well as limited market growth, companies increased their research efforts and their marketing expenditures even more so Schweitzer, (1997); Drews,(1998); Phrma,(2001) due to the heavy capital investment it demands economy of scale. Therefore, products have to be launched in many markets simultaneously. Basically, the globally active corporations try to introduce innovations as quickly as possible and as broadly as possible. The arrangement, contractual and informal conditions geographically in order to amortize their increasing R&D costs Bartlett and Ghoshal, (1990); Pearce and Singh, (1992); Gassmann, (1997); Gerybadze and Reger, (1999).

These propensities favors mergers and acquisitions and boost the internationalization process Andreff, (1996), Chesnals, (1997); Drews, (1998); Zeller, (2001). During the course of this process, global oligopolies came out which could be identified 'as spaces of rivalry' between the rivals in the global triad Chesnals, (1995, 1997). The extent of concentration could be enormously high, particularly in individual therapeutic areas Taggart, (1993). With a global switching and global focusing of their international productive network, they now attempt to use the internal advantages of a tight integration of research, development and manufacturing while profiting from elements of the external environment Howells and Wood, (1993). Immense rationalization efforts have contributed to reducing development times and costs in recent times Dimasi, (1995); Drews, (1998); PhRma, (2001)

The escalation of worldwide competition and the appearance of North Atlantic oligopolies in most therapeutic areas have forced pharmaceutical companies to increase innovative capabilities, to speed up processes and accelerate the circulation rate of capital, and therefore to increase profitability and to expand more than the major rivals Zeller.C,(2002).

Including the necessary financial contribution, increasing learning capabilities is the major motivation for biotech companies to start collaborations Powell, (1996). Such competition includes various forms of collaborative strategies. In technologically intensive fields such as biotechnology, firms rely on collaborative relationships to improve their technological potential Powell (1998). However learning happens in a highly competitive or even rivalry-ridden environment. To put up entry barriers and to strive for technological advances in order to skim off technological rents is a major goal of corporate strategies. Pharmaceutical industries in the developed world are typically

associated with high entry barriers in the form of stringent patent laws. In contrast, patent laws for pharmaceutical products in many developing countries have historically been weak, often enabling local firms in these countries to market drugs that were still under patent protection Dutta (2009).

The pharmaceutical industry is facing the challenge of surviving in the environment that has become more intricate and uncertain, and that is distinguished by hasty developments in science and technology, and organizational change. To account for technological change, various neo-technological models of international trade have been postulated Grossman and Helpman,(1991); Krugman, (1979); Noland (1997); Posner, (1961); Vernon,(1966) .According to Vernon's (1966) product cycle theory identifies four stages in the life cycle of a product including innovation and saturation in the domestic market followed by foreign investments.

The world pharmaceutical market has undergone fast, unprecedented, tremendous and complex changes in the last several years. The pharmaceutical industry is today still one of the most inventive, innovative and the most lucrative of the world so-called 'high-tech' industries World Review (2007). Pharmaceutical companies invest on average around 16% of their sales into research and development and even more, around 25% or even more, into marketing and sales activities Kesic (2006).

The role of change has all the time been a theme around which the existing strategic management literature revolves Ginsberg, (1988). How an organization change and adopts clearly guides the firm's survival, long-term success and the alignment of strategy with the environment Smith and Grimm, (1987); Cameron *et al.*, (1988); and Haveman, (1992).

Angell (2004) suggests that while the pharmaceutical industry was a good business from 1960 to 1980, from 1980 to 2000 it was 'a stupendous one' as prescription drug sales tripled and 'profits skyrocketed'. With hindsight 2000 may however, mark another turning point in the industry's history, the year that things began to go wrong as the industry began to face a convergence of interrelated challenges, the most significant being the cost of R&D and the decline in R&D productivity, competition from generics, health care costs and product liability .R&D is the lifeblood of the pharmaceutical industry as evidenced by data from CMR International which shows that the industry spent US\$60 billion in 2006, up from US\$35–40 billion in the 1990s Anon (2007). For bringing a new molecule entity (NME) to market rather than a incremental modification of an existing drug, it has been suggested that 'the era of the billion dollar new drug has arrived Anon (2007).

Although the decline in R&D productivity is a contentious one, recent reports by both the US Congressional Budget Office and the Government Accountability Office arrive at the same conclusion, namely that the productivity of research and development investments has declined since the mid-1990s (Congressional Budget Office 2006; US Government Accountability Office 2006). The estimated cost of developing a generic drug is around US\$1 million, a fraction of that of a branded drug; consequently they are sold at 20–80% below the price of equivalent branded drugs and regulatory agencies are increasingly encouraging their prescription Trombetta (2005); Jackson (2003); Balaban *et al.* (2003).

Meantime manufacturers of generics are becoming more aggressive as evidenced by recent challenges of the patents on Prozac (Eli Lilly) and Lipitor (Pfizer) by Barrs and Ranbaxy respectively. Thus among the firm level empirical studies capturing strategic behavior, transformation and change in the context of emerging economies undergoing economic liberalization, institutional reforms and upheavals Appiah.Adu, (1999); Child and Lu, (1996); Lukas *et al.*,(2001); Luo and Peng, (1999); Luo *et al.*, (1998); Suhomlinova, (1999), there has been an overwhelming dominance of the observation that firms either adopt defensive strategic orientation, exit or fail. It is often argued that emerging economy firms suffer from many handicaps and therefore tend to choose the first two options. Decades of protection weakens their abilities to compete in a highly competitive market economy and face international competition both in the domestic as well as global markets

III. OBJECTIVES

The main objective of the study is to understand the strategic management of continuity and change forces in pharmaceutical industry in general, and India in particular.

Understanding how the different companies are actually managing these existing forces of continuity and change to provide the competitive quality of drugs to the customers.

Identify and study the factors affecting forces of continuity and change influencing the pharmaceutical industry in general, and India in particular.

Strategic Framework for Continuity and Change Forces in Pharmaceutical Industry:

Organization's capability of adaptation relies on its tendency to change, and adaptive capability is a dynamic capability Miles and Snow, (1978); Chakravarthy, (1982); Hooley *et al.*, (1992); Sanchez, (1995); Camuffo and Volpato, (1996); Farrant and Flynn, (1999); Rindova and Kotha, (2001); Staber and Sydow, (2002); Alvarez and Merino, (2003); and Wang and Ahmed,(2007). If the firm show evidence of higher capabilities of adaptation then it also has higher dynamic capabilities Teece *et al.*, (1997).During 2001 India's pharmaceutical industry became the focus of public debate when Cipla, the country's second-largest pharmaceuticals company, offered an AIDS drug to African countries for the price of USD 300, while the same sample preparation cost USD 12,000 in the United States. This was achievable because the Indian company manufactured a generic pill which contains all three substances mandatory in the treatment of AIDS. This sort of production is a great deal for other countries as the patents are held by three different companies. Ultimately, the price slump was a result of India's lax patent legislation. In 2005, patent legislation was tightened, so India's pharmaceutical sector had to amend. Uwe Perlitz, Deutsche Bank Research (2008), Daneels, (2002, March (1991).

Continuity and Change Forces

Sushil (2005), Gupta (2010) identified the following factors for forces of continuity and change that need to be studied in better details to build up a flexible strategic framework .A

continuity force is a set of forces keep on dragging the organization to be stucked to the current business and also in the manner they are running their business while change force are the pushing forces that guides the organization to make each and every effort for change.

Continuity Forces

Customer Base

The crucial objective of an organization is to increase its market share in its operating arena. Higher the market share higher would be its customer base Sushil (2005).The main objective of an organization is to attain maximum heights in terms of growth. But higher the organization go up on the growth curve, higher would be its inertia for it to cling with the current products and services and its delivery mechanisms. The increasing size of customer base flywheel creates higher inertia to maintain continuity According to Handy (1994), it is a paradox that a starts sliding down due to changed business situation. As in the pharmaceutical sector it was mainly the big firms such as Hoechst, Zeneca and Glaxo that were in headlines, a total number of 334 mergers and acquisitions were completed in 2001 and this was only seven less than the number completed in 2000, IMS Health (2001) This consolidation trend was fuelled by a number of factors such as achieving economics of scale, getting access to and operating in important geographic and therapeutic markets, reducing surplus capacity and concentrating market share Javalgi & Wright (2003) In 2000 the top 20 companies, in terms of revenues, were responsible for 64.6 per cent of global sales.

Technology

Technology is a most important strategic driver influencing the victory of any organization Sushil (2005).Similarly in pharmaceuticals; technology is one of the most important factors determining international trade flows. The worth of goods and services that countries trade resides in their intellectual content, technology, R&D, and human creativity that is sought to be protected by intellectual property rights (IPRs). Beneath the new international order advocated by the World Trade Organization (WTO), IPRs are fast budding “global currency for power” (Zimmerman & Dunlop, 1994). For the very first time in international law, TRIPs (the Agreement on Trade Related Aspects of Intellectual Property Rights) sets out the procedures that governments must give under their domestic law so that IPRs can be efficiently and successfully imposed.

Today's demand is technological learning to compete with in the competitive arena defined through the strategies of technological acquisition: to develop and/or acquire technology externally (Caves & Uekusa, 1976). Given the reduced level of R&D and the weak innovation productivity of their companies, developing countries cannot use their own technological efforts alone to reduce the technological gap (Basant & Fikkert, 1996).2 The options for these companies are to acquire technology transfer (TT) non incorporated, including tacit knowledge transfer, such as technological licenses of patented products and/or industrial processes; purchase consulting services and training for the use of technologies, thus allowing the development of technical and technological skills; and subcontract R&D and services both for the improvement of

products and industrial processes and for the adaptation of technologies (clinical trials).

Core Competencies

According to Richard Langlois and Nicolai Foss ‘begun self-consciously referring to their work as lying within the confines of a ‘capabilities,’ ‘dynamic capabilities,’ or ‘competence’ approach (Langlois, 1992; Langlois and Robertson, 1995; Kogut and Zander, 1992; Foss, 1993; Dosi and Marengo, 1994; Teece and Pisano, 1994)’ (1997: 13). A major connotation of the capabilities perspective as it relates to economic organization is that, in the terminology of G. B. Richardson (1972), the arrangement of complementarities and similarity among the various capabilities in the economy influence the prototype of organization (including the firm-market boundary) in ways not fully understandable in terms of the costs of transacting. Indeed, the ability to transact (and therefore the cost of transacting) is itself a capability (Winter 1988), which suggests a blurring of the boundary between production and exchange.

Giovanni Dosi and Teece recently explain the competence perspective as follows (1998: 284; emphasis in original):

“A firm’s *distinctive competence* needs to be understood as a reflection of distinctive organizational capabilities to coordinate and to learn. By ‘organizational capabilities’ we mean the capabilities of an enterprise to organize, manage, coordinate, or govern sets of activities. The set of activities that a firm can organize and coordinate better than other firms is its distinctive competencies. Posed differently, a distinctive competence is a differentiated set of skills, complementary assets, and organization routines which together allow a firm to coordinate a particular set of activities in a way that provides the basis for competitive advantage in a particular market or markets.”

The influential article by C. K. Prahalad and Gary Hamel on ‘The Core Competence of the Corporation’ (1990) helped to move the idea of core competence onto the agenda by ascribing greater core competence to Japanese than American corporations during the decade of the 1980s—especially contrasting the American firm GTE and its Japanese counterpart NEC. Whereas GTE plodded along, NEC moved ahead vigorously.

David Teece, Gary Pisano, and Amy Shuen ‘define those competences that define a firm’s fundamental business as core. Core competences must accordingly be derived by looking across the range of a firm’s (and its competitors) products and services’ (1997: 516). Prahalad, Hamel and Teece et al. concepts of core competence are expansive and elastic. The ideas that firms possess both strengths (competences) and weaknesses (disabilities) and that they are engaged in intertemporal competence

According to Teece *et al.*(1997) ‘Eastman Kodak’s core competence might be considered imaging, IBM’s might be considered integrated data processing and service, and Motorola’s untethered communication’: 516, n. 4).

Selznick (1957) and Penrose (1959), and have suggested that inimitable firm heterogeneity, or the possession of unique ‘competencies’ or ‘capabilities’, may be an important source of enduring strategic advantage (Lippman and Rumelt, 1982; Wernerfelt, 1984; Barney, 1986; Rumelt, 1991, Peteraf, 1993; Amit and Schoemaker, 1993; Dosi and Teece, 1993).

Supply Chain Network

Coordination is defined as managing dependencies or joint efforts of members towards common goals (Malone and Crowston, 1994). Supply chain management is the management of flow of inventory, information, and money between the different members of supply chain (Mentzer et al., 2001).

In recent years, however, global pharmaceutical supply chains are facing growing and challenging risks Enyinda.C.I, Mbah.C.H.N and Ogbuehi. A, (2010). The pharmaceutical supply chain represents the conduit through which essential pharmaceuticals are delivered to the ultimate end-users at the right quality at the right place at the right time Enyinda & Tolliver, (2009). Supply chain coordination is an effective approach to streamline operations/processes between the dependent supply chain members Chopra and Meindl, (2003).

Pharmaceutical companies are undergoing major changes to cope with the new challenges of the modern economy. The globalization of the business, the diversity and complexity of new drugs, the increasing tightness of capital, and the diminishing protection provided by patents are some of the factors driving these changes. All stages of the business value chain are affected: from the development of new drugs to the management of the manufacturing and marketing networks L.G Papageorgiou, G.E Rotstein and N.Shah (2001)

The rise in the pharmaceutical supply-chain risks and the accompanying pressure from regulatory bodies, changing legislation, customers, and cutthroat competition are forcing many forward-looking pharmaceutical organizations to implement supply-chain risk management. Some of the merits associated with supply-chain risk management are gaining sustainable competitive advantage Enyinda, Ogbuehi, & Briggs, (2008), fewer surprises, better decision making, achieving an improved balance between opportunity and threat, enhanced competitive position, and managing suppliers more effectively O'Brien & Joyce, (2007). Therefore, to ensure pharmaceutical supply-chain resiliency and continuity, it is imperative to effectively assess risks and develop a comprehensive mitigation approach Srividhya & Jayaranman, (2007).

The development has shown the use of innovative efforts to reduce cost, manage shorter product life cycles, resource globalisation, cope with increased demand for customisation, and intensive quality initiatives Taylor, (2004).

Indeed, in recent years, the relevance of uncertainty and risk in the supply chain has received an avalanche of attention from academics, practitioners Barry, Cavinato, Christopher & Lee, (2004); Harland, Brenchley, & Walker, (2003); Hendricks & Singhal, Kleindorfer & Saad, (2005); Spekman & Davis, (2004); Towill, (2005); Zsidisin, Ellram, Carter, & Cavinato, (2004)

Supply chain management incorporates logistics as a key supply chain focused function and effective supply chain management and purchasing practices are associated with competitive capabilities of the firm and it has more significant effect on firm performance Carter and Narasimhan, (1996).

Performance

Each organization intends to boost up its business performance in terms of profitability, growth, customer satisfaction and other business objectives Sushil (2005). With a view of organizing, performance of an organization can be

treated as tools to achieve certain goals, as suggested by Perrow (1986). As tools, it should be kept and maintained because it is for certain motive and should be replaced and dropped as and when required Weick, (1996).

The international pharmaceutical industry is ruled over by firms in the United States, UK and Switzerland – rather than those from Japan. Japan's largest and most profitable pharmaceutical firm, Takeda, ranked only sixteenth in global pharmaceutical sales in 2005. The sales of Japan's top three pharmaceutical firms are a fifth of the size of leading global firms Barral (1996), PJB Publications (2006), and JPMA (2007).

Mostly developed economies used to spend a considerable amount on health care and on medicines. In 2005, for example, OECD countries spent an average 8.9 per cent of GDP on health care, of which 13.8 per cent was spent on prescription drugs. In Japan, health-care spending accounted for 8.2 per cent of GDP, of which 17 per cent was spent on prescription drugs OECD (2008b) between 2000 and 2005, the global pharmaceutical market grew more than 1.6 fold IMS (2010).

Lutz and Talavera (2004) support the argument and proved that the firm exports are regarded as the sign of comparative advantage. Rob and Vettas (2003) found that given the demand uncertainty and irreversibility, firms both exports their products and undertake FDI. Interestingly, Aulakh et al. (2000) observed that multinational corporations build plants in those countries where they can produce goods and services for exports at lower costs. This intern helps in improving the exports through preferential access to markets in the multinational enterprise home country. In case of multinational enterprises from developing economies, Mathews (2006) found that unlike first wave of multinational enterprises, the second wave of multinational enterprises are to be required in pull factors that draw firms into global connections, rather than push factors which drove them as stand-alone players in the first wave.

It was viewed that multinational enterprises are likely to be more outward oriented. They are provided with more competitive technology, efficient management techniques and marketing skills in a globalised world Aggarwal, (2002). Firm-level studies in Malaysia and Thailand found that foreign ownership participation had transformed the local environment in facilitating the manufacturing exports in technological industries Rasiah, (2003). On the contrary, Abdel-Malek (1974) found that there was no significant difference in export performance between foreign and Canadian owned firms. In the case of Vietnam, Mai (2001) found that FDI facilitated in making use of the countries comparative advantage in terms of cheap labour and rich natural resources in producing export products.

Change Forces: Globalization

As the concept of globalization has started to grow over the past few decades, multinational pharmaceutical companies have initiated to attempt to boost their sales in some of the safe and sound global market. The pharmaceutical industry is undergoing growth phase, forced by burst of new diseases, rising population and an increasing desire to improve the health standards of the people all over the world. The end of the 1980s India has been exporting more pharmaceuticals than it imports. Over the last ten

years the export surplus has widened from EUR 370 m to EUR 2 bn. At 32% in 2006, the export ratio was about twice as high as in 1996 and will likely rise further in the coming years (Germany: 55% at present) Deutsche Bank Report (April 2008)

It is evident that there is a disproportionate amount of pharmaceutical sales in some parts of the world when compared with other parts, like the population of India and China combined is almost 39% of the world population Pimentel and Wilson, (2004) but the pharmaceutical sales in these countries are a portion of the 8% sales coming from Asia (excluding Japan), Africa, and Australia Anonymous, (2004).

Bhalla and Ramu (2000) firm's political leverage depends upon the ability of the firm to offer host government a continuous viewpoint of future, employment, exports, new investment and new technology or other valued contributions favorable of a type not duplicated by domestic firms. Haley and Chin-Tiong (1999) stated that the strategic planning in South and Southeast Asia has developed into a process, which is temporary and highly reactive, highly customized and distinctive to the leader, and which uses relatively limited environmental scanning. With the passage of time the competitiveness has been added on as an important driver of globalization within the industries Yip, (1989). In the latest years, troubles of hit of low cost generics and reduction in health care budgets have created challenges for pharmaceutical companies that they are putting their efforts to get some control on by strengthening their position so that they remain stay competitive.

Mergers and acquisitions, Strategic alliances recreating their strategies and trying to adopting innovative measures to maintain their bottom lines have been some of the strategies that have been adopted by some pharmaceutical companies in the global market arena. In the battle for emerging markets as argued by Dawar and Frost (1999) big multinationals alone do not hold all the advantages and state that two parameters that strength of globalization pressures in an industry and the company's transferable assets guide strategies of domestic companies.

With the increase in the drug discovery cost, the industry has exploring opportunities to get optimal value from R&D budget. China and India both have large talent pool and are offering width of preclinical and clinical services at considerable savings of 30–80% against the cost in the USA. Many large pharmaceutical companies and global contract research organizations (CROs) have set up or are trying to create research centers in China, India and Singapore, Ish Khanna (2012).

New Opportunities

An innovative organization can be looked and perceived in terms of its products life cycle which are its life blood Lafnez, Schaefer, Reklaitis (2012). Exterior stresses and basics of uncertainty range from those in product demand, input pricing, actions of competitors, actions of governmental bodies, bargaining power of suppliers and buyers, threat of new entrants in the field and global economic dynamics (Porter, 1980).

The pharmaceutical industry is an exceptional illustration of the competitive forces that Porter laid out and its unique characteristics. Internal uncertainties can include the risk of failure of R&D activities, among them unanticipated technical challenges. The increased availability of enterprise information and rapid escalation in computing power have made it possible to

deploy decision support tools, including simulations and optimization frameworks which can facilitate informed decisions that take into account the interdependencies among the functional units and the necessary integration of decision levels. Varma, Reklaitis, Blau, & Pekny, (2007) Grossmann, (2005).

Investments in drug discovery or new product development are the focus of attention in the pharmaceutical industry and the investor area; there are considerable opportunities for generating economic value that are found in improvements on the operational supply chain side. Enhancements in SCM could provide a gain of \$65 billion to the pharmaceutical industry if the productivity of the lowest performers could be brought to the level of supply chain productivity of the top drug-makers, Hunt, Manson, and Morgan (2011). According to Sundaramoorthy and Karimi (2008) who proposed a multi period, continuous-time, MILP model that addresses the introduction of new products into existing manufacturing facilities. This addressed pharmaceutical plants which employ multiple parallel production lines, operated in campaign mode and producing products with multiple intermediates and could avail the opportunities of demanding environment.

The rate of success is low with less than 1 in 1000 discovered compounds undergo successful clinical stage and only one of five that experience clinical trials achieving commercialization Tollman, Morieux, Murphy, & Schulze, (2011). The high failure rate imposes considerable challenges in planning under uncertainty so that resources are effectively assigned and then redeployed as failures occur. So it reveals that with every failure an opportunity is associated.

Pharmaceutical business is intrinsically worldwide with some 80% of sales in North America, Europe and Japan but rapid growth on the rest of the world IMS Institute, (2011). A number of companies in China and India are also investing in R&D, despite the fact that they are still on the high risk line. With signing of patent treaty, these markets are rising with new partnering and business deals in R&D, manufacturing, clinical trials and marketing Ish Khanna (2012)

Competition

Selznick (1957) and Penrose (1959) have suggested that unique firm heterogeneity or the ownership of unique 'competencies' or 'capabilities', may be an important source of enduring strategic advantage Lippman and Rumelt, (1982); Wernerfelt, (1984); Barney, (1986); Rumelt, (1991), Amit and Schoemaker, (1993); Dosi and Teece, (1993); Peteraf, (1993);. This point of view guarantees to be a significant complement to the strategic management field's more recent focus on industry structure as a determinant of competitive advantage Porter (1980).

Studies of the evolution of capability at individual firms have greatly enriched our understanding of the nature of particular competencies Iansiti, (1993); Leonard-Barton, (1992), Burgelman, (1994) but by and large these insights have not been incorporated into studies of aggregate firm behavior or systematic studies of competition. The idiosyncratic research capabilities are likely to be a particularly important source of strategically significant 'competence' in science- and technology-driven industries Dierickx and Cool, (1989).

According to Barney, (1986); Wernerfelt, (1984); Peteraf, (1993) it is impossible to buy or sell in the available factor markets at less than its true marginal value; and it must be complicated or costly to reproduce. Whereas a wide variety of feasible basis of heterogeneity fit these criteria, numerous authors have recommended that exclusive capabilities in research and development are particularly reasonable sources of competitively important competence Dierickx and Cool, (1989); Nelson, (1991). It is confirmed that there are considerable and constant differences among firms in their ability to perform research and to discover or develop new products Henderson (1993); Clark and Fujimoto (1991); Leonard-Barton (1992); Tabrizi and Eisenhardt, (1994). According to Leonard-Barton (1992) the implicit knowledge developed by skilled engineers with a certain production process over a period of time may become a source of advantage for the firm. Within the context of pharmaceutical research, there are two dimensions along which firms might develop strategically important local competencies.

In the first position, firms may obtain unique disciplinary expertise for example one of the roots of Merck's recent success may be a legacy of excellent medicinal chemistry that dates back to Max Tishler's leadership at the firm Allen, Lee and Tushman (1980). And the second aspect along which firms may be able to develop strategically important component competence is in particular disease areas For example Eli Lilly has been a leader in the field of diabetic therapy over a hundred years, and Hoffman-La Roche developed expertise in anti anxiety drugs following its discovery of the tranquilizer Valium Cockburn and Henderson, (1994)

IV. RESEARCH AND DEVELOPMENT

Every organization aims to enhance its business this could be possible only through discovering new products according to the requirement of market. Similarly in the most pharmaceutical companies in India expend around one-tenth of their revenues on R&D Perlitz, (2008), and there research costs are 60% the costs in Western countries Price Waterhouse Coopers, (2007). A number of the companies like Ranbaxy have been granted special marketing rights for the generic versions of successful drugs as like Pfizer's Lipitor and Merck's Zocor, which has annual sales of worth \$12.7 billion and \$4.6 billion in 2007(<http://iqmercury.com/pharma-trend>). Since the price of generic drugs falls with the entry of new entrants, only cost-effective firms can break into the export markets. According to the Pharmaceutical Export Promotion Council, pharmaceutical exports grew by 16% to reach \$6.68 billion in 2007–2008. Indian generic drugs have been able to pierce the highly synchronized markets of North America, Western Europe, Japan, and Australia (<http://www.healthdatamanagement.com>). Technological innovation has become progressively more significant for firms as they made great effort to achieve and sustain competitive advantage. Movements such as globalization, fast product-cycle times, greater competition, product commoditization, and technology union have only added to this importance.

Introduction of fewer drugs and enhanced R&D expenditures, increased popularity of generic substitutes, increased foreign competition, an increased number of significant drugs coming off patent protection, and increased health care

reform have concurrently squeeze profit margins and limited the selection of drugs made available to consumers through health plans, Ravenscraft and Long (1999), Taggart (1993). All these elements have put a premium on managing R&D processes in an effective and efficient manner.

Recent research has suggested that because of different levels of uncertainty and complexity, a contingency approach should be taken to organizing for innovation Duncan (1976) Keller (1994), Dewar and Dutton (1986), McDonough and Leifer (1983). The management of formal R&D efforts or the R&D function have received less attention. Second, this study is one of only a handful that have examined the effects of structural control on both incremental and radical innovations Dewar and Dutton (1986), Ettl et al. (1984), Kaluzny et al. (1974), Nord and Tucker (1987).

Incremental innovations represent changes to existing technology concerning small advances based on a recognized base of knowledge Roussel et al. (1991). The pharmaceutical sector's core product centers on a molecule Henderson (1994). Therefore the radicalness of drug innovation is a function of the innovative technological and scientific knowledge embedded in the drug Abernathy and Clark (1985). Thus Radical innovations represent major changes in technology involving the discovery of new knowledge, substantial technical risk, time, and cost Roussel et al. (1991).

The new drugs come into existence would be considered as radical innovations. Drug development involve combinations of existing drugs, new indications, new dosage forms and formula changes, which would be considered as incremental innovations Freeman (1982), Abernathy and Clark (1985), Roussel et al. (1991), Banbury and Mitchell (1995),

Customer Needs

One more chief change force is customers themselves. The customers are becoming extra aware, wide awake about and demanding Sushil (2005). In a more competitive surrounding, customer orientation is becoming the success's mantra. The requirements and preferences of customers are changing which are stimulated by the variety of competitive alternatives available in the market arena. These are also administered by new product characteristics and options available with technological innovation in the industry. The pharmaceutical industry has particular unique characteristics that dictate the development of new products. It is highly regulated by governments, spends much more than the average of all industries on research and development and new product development is largely determined by the discovery of new clinical entities. The focus of product assessment has also undergone a significant shift towards consumer acceptance. On the one hand, this is the result of better-informed consumers who accept responsibility for decisions concerning their health and medical care. On the other hand, pharmaceutical companies now understand the genetic composition of patients and this enables these companies to segment patients on the basis of pharmacogenomic descriptions. Terblanche(2008).

New Technology and Innovations

The expansion and progress of a firm depends on the ability of firm to introduce new products over the time Dougherty and

Hardy, (1996); Penrose, (1995). According to Schumpeter (1934) this twin significance of invention and innovation, a firm may have great technological and inventive potential but sometimes relatively futile in the commercialization of its products' (Fleming, 2002: 1064).

Constant with respect to recent strategy research, it was found that firms could be considered as a collection of strategic assets that combine to produce and deliver a nascent set of products (Barney, (1991); Levinthal, (1995); Montgomery, (1995). These include the technological knowledge that derives from a firm's research and development activities Teece, (1982), and the ability to combine knowledge elements into precious new combinations Kogut and Zander, (1992). The complementarity between the technological and product-market knowledge may also smoothen the progress of the more valuable technological combinations. In other words, a firm's combinative capability is increased if it has technological and product-market experiences both. It is apparent that pharmaceutical firms depend on the success of their new product introductions as they seek to manage competition and improve financial performance Schwartzman, (1976). Indeed, pharmaceutical firms regularly introduce new products in their efforts to sustain superior financial performance over time Roberts, (1999). Given this importance, a number of researchers examine drug companies from the product-market side, looking at the factors that influence new product performance. Gatignon, Weitz, and Bansal (1990), examine the initial market performance of a small amount of new pharmaceutical products introduced between 1978 and 1982 and come across that the performance of new pharmaceutical products improves with 'the familiarity of the firm with similar markets and technologies.'

The knowledge and assets that develop in tandem with a firm's technological and product-market experience are significant determinants of its competitive successes and failures Winter, (1987). A firm's accumulated experience and different other sort of experience lead to the development of different types of technologically innovated assets Barnett *et al.*, (1994); Baum and Ingram, (1998); Ingram and Baum, (1997).

Mergers and Acquisitions

As the markets are growing, the industries are getting consolidated and hence mergers and acquisitions are becoming a main drive of change. Secondly introduction of the deregulatory policy measures and competition policies in particular since 1991 have a considerable rise in the number of mergers and acquisitions in Indian corporate sector Roy, (1999); Venkiteswaran, (1997); Chandrasekhar, (1999); Khanna, (1997); Basant, (2000); Das, (2000); Kumar, (2000); Agarwal, (2002); Dasgupta, (2004); Beena, (2000, 2004 & 2008), Mantravadi and Reddy, (2008) Mishra, (2005); Agarwal and Bhattacharya, (2006);. While most of these agreements are horizontal in nature Khanna, (1997); Beena (2000 & 2008); Mishra, (2005), the number vary across the industries Das, (2000); Basant, (2000); Dasgupta, (2004); Mishra, (2005) Agarwal, (2002);. The broad industry groups that experienced a large number of MA include financial and other services, chemicals including drugs and pharmaceuticals, electrical machinery, electronics and beverages including spirits and vinegars, Das, (2000); Basant, (2000); Agarwal, (2002), Mishra, (2005).

The most significant merger and acquisitions to illustrate the current situation for a better understanding of mergers Kesic (2003):

- ❖ In the group of inventive companies the several acquisitions of the Pfizer (Warner Lambert, Pharmacia), the merger of GlaxoWellcome and SmithKlineBeecham to create GlaxoSmithKline, the merger of Astra and Zeneca to create AstraZeneca, the merger of Ciba Geigy and Sandoz to form Novartis.
- ❖ In the group of generic companies the leading Israeli company Teva has performed over 15 big acquisitions in the last decade, having acquired the U.S.A generic company Ivax as the last one; as well Swiss Sandoz, which is a generic group, owned by Novartis, has acquired likewise several generic companies worldwide, including Lek in Slovenia, Hexal from Germany and Eon Labs. from the U.S.A ; in the year 2006 the Barr Pharmaceuticals acquired the Croatian pharma company Pliva and recently the U.S.A major generic player Mylan acquired the German generic entity Merck Generics.

There are two big theories explaining why firms acquire other firms or merge with other firm. The theory of monopoly postulates that the firms use the merger and acquisition to increase their market power Steiner, (1975), Chatterjee, (1986), while, according to the efficiency theory, mergers and acquisitions are the planning which is executed to reduce costs by achieving scale of economies Porter, (1985); Shelton, (1988). Several studies Healy *et al.* (1992); Waldfogel and Smart, (1994); Grabowski *et al.*, (1995); Switzer, (1996); Vander, (1996) support the suggestion that mergers and acquisitions may direct the better financial performance of the organizations. On the contrary to this, there are also several studies Mueller, (1985) Dickerson *et al.*, (1997); Ravenscraft (1987) Scherer, (1987); Ghosh, (2001) that accounts that the result of mergers and acquisitions are not always lead to raise its financial performance.

Government Policies

The economic liberalization (1991) and the intellectual property reforms (1995) can be considered as the exogenous shock that bring institutional reforms which changed the rules of game Peng, (2003) in the Indian pharmaceutical companies. The pharmaceutical industry in India has been a story of success for the development of an indigenous and self-reliant industry. Since independence, India inherited the Patents and Designs Act 1911, which provided product patents for all inventions including foreign inventions. Although, to decrease its reliance on imports for bulk drugs and formulations and promote the indigenous pharmaceutical industry, the government of India has introduced the Patents Act 1970, which abolished product patents for pharmaceuticals.

Review of Economic Studies, (58, 277–297) in the areas of food, pharmaceuticals, and agricultural chemicals. The lack of protection for product patents in pharmaceuticals resulted in

“reverse-engineering” Arellano, Bover (1995). The liberalization era that began in 1991 brought with it policy changes for the pharmaceutical industry with lower price and production controls. Moreover, India being a signatory to TRIPs was required to amend its Patent Act 1970 to meet the minimum standards regarding patents for pharmaceuticals. The effective IPR protection is seen by the pharmaceutical industry as critical to recoup large R&D expenditures Kale, Wield (2008). Patents have the ability to provide strong appropriation and profit maximization by conferring limited monopoly rights on inventors. So the strength of the patent regime plays an important role in pharmaceutical firms’ strategic decision making. Of the five most significant UK drug companies undertaking R&D in the late 1930s, May & Baker (then a subsidiary of the French company, Rhne-Poulenc, a fact it did not advertise) took out the largest number of patents over the six-year period 1936–41. These numbered 40, more than half of the total number of patents (78) for all five companies in the period; Glaxo ranked second with 13 patents, Boots third with 12, followed by British Drug Houses (BDH) with seven and last came Burroughs Wellcome with six Slinn (2008). The Patents (Amendment) Bill 1999, which was enacted in 2002, lengthened the patent term to 20 years. It also allowed pre-market testing of generics during the patent term so that they could be marketed immediately upon expiration of the patent. This pro-patent shift culminated in India’s accession to the Paris Convention and the Patent Cooperation Treaty.

Finally, product patents were introduced for pharmaceuticals and agricultural chemicals with the enactment of the Patents (Amendment) Act, 2005. Thus, the option of imitating patented drugs is no longer available to Indian pharmaceutical firms, and they have to invest in basic research in order to compete in international markets Chadha, (2009). Unlike the global pharmaceutical industry, the Indian industry has been largely fragmented, but is now witnessing some restructuring with a trend toward consolidation. There has been a significant rise in inflows of foreign direct investment (FDI) with the pharmaceutical industry being recognized as a sunrise industry by the government of India. Thus, Indian firms were free to use a different process of production to make the same products developed by foreign MNCs, which were then sold at much lower prices.

There is a requirement to study the impact of above factors of continuity forces and change forces in Pharmaceutical Industry and come out with a flexible strategic framework for their survival and growth in this highly competitive fast developing patron obsessed era.

Information Technology and E-Business

Progress on the frontage of information technology has directed towards the emergence of a new business paradigm, that is, e-business for example in pharmaceutical sector healthcare portals were introduced. Portals can be defined as web-based, personalized and integrated systems which offer access to applications, content and services Osterle.H.(2000). If these portals support entire customer processes they are referred to as process portals Osterle, H.(1999).

Healthcare portals transfer the traditional customer’s healthcare process on the Internet. Electronic marketplaces, such

as SAP marketplace and MarketSite.net, primarily focus on the integration of reciprocally exchanged services and ignore the customer process orientation. Process portals on the other hand are characterized by the integration of services for one specific customer process. This view is provided by the concept of the Customer Resource Life Cycle (CRLC) which aims at supporting all customer needs at all stages Puschmann, T, Alt,R. Ives., B., Learmonth, G.P.,(1984). This means that a customer is supported during the whole life cycle of possessing a product starting from information through buying and up to the disposal of that product.

The customer’s process of obtaining information about, buying and possessing medical devices and the accompanying services which are provided by Neforma.com [www.neoforma.com], a US healthcare portal. Neoforma.com offers the four core services Resources, Plan, Shop and Auction for doctors, hospitals and other organizations in the healthcare sector.

Secondly Information portals offer information about diseases, symptoms, medicines, etc. for professional users and patients. A typical example of this category is the company Intellihealth [www.intelihealth.com]. The company was founded in 1996 and is a joint venture of Aetna U.S. Healthcare and the John Hopkins University and Health System.

Sales portal is another portal which transfer s traditional sales processes to the Internet are referred to as sales portals. In the case of healthcare portals these sites are also called online pharmacies. Companies such as Drugstore.com or PlanetRx.com are examples for this category of portal.

Integration portal in the pharmaceutical supply chain involves a variety of participants who are in permanent interaction with one another. At the moment, most of these interactions are still paper-based. DeNelsky et al. estimate that in the USA more than 30 percent of the costs in healthcare are wasted due to system inefficiencies such as redundancies, unnecessary treatments and the like. Other countries have a similar proportion. The reasons for this are paper-based administrative processes, handwritten medical reports and diagnoses, etc. These costs can only be lowered if all processes between all participants are replaced by an integrated, electronic process. This is the service which companies aim to provide by offering integration portals

V. METHODOLOGY ADOPTED FOR THE STUDY

Research Design

The research design adopted for the study is Exploratory Research Design.

- Collection of the Primary Data using a detail questionnaire to be filled by the people working in the field/area of the research, i.e. pharmaceutical industry.
- Collection of Secondary Data, by taking the reference from the previous researches in the field of management of continuity and change in the pharmaceutical sector.

Scope of the Study

A Study of managing forces of continuity and change in selected five pharmaceutical firms from the pharmaceutical industry operating in India.

Indian and MNC Companies in Pharmaceutical Industry Studied

The five major companies in this study are:

- 1- Abbott
- 2- Glenmark
- 3- Glaxo Smith Kline
- 4- Ranbaxy
- 5- Cipla

VI. METHOD OF DATA COLLECTION

•From Published Secondary Data, Internet Databases and companies websites.

•Focused discussion and interviews of regional managers, area business managers, sales managers and territory business manager of selected companies in Pharmaceutical Industry in India, using a structured questionnaire.

Research Findings from this Study

A detailed survey of the above five companies was carried out through study of their continuity and change forces, focused discussions and personal interviews with key personnel. A structured questionnaire was used at each of the above companies to capture their views on various factors which affect the forces of continuity and change as outlined in this paper. Six pharmaceutical personnel from each of the select company were interviewed and questionnaires were filled up as per convenience sampling. Findings of this study have been summarized below:

Table 1: Summary of Research Finding (Values are on a scale of 1-5)

Pharmaceutical Companies	Average Scores for	Average Scores for
	Forces of Continuity	Forces of Changes
Company 'CO1'	4.00	4.00
Company 'CO2'	3.81	3.84

Company 'CO3'	4.02	3.92
Company 'CO4'	3.33	3.87
Company 'CO5'	3.83	3.67

Average score has been computed for forces of continuity and forces of change by taking an average of all the responses (on a scale of 1 to 5) to 25 research questions for factors affecting forces of continuity and 33 questions for factors affecting forces of change administered to six experts for each of the above pharmaceutical company.

Analysis and Suggested Strategies

A survey based on focused discussions and interviews of pharmaceutical companies personnel using a structured questionnaire on continuity and change factors. Based on our study of the above organizations it has come out clearly those organizations which focus too much on continuity forces and ignore the forces of change in pharmaceutical sector tend to lose on the flexibility and sometime lead to obsolescence and losing to the competition. On the other hand organizations focusing only on forces of change with little regard for the forces of continuity find themselves in difficult position to sustain the business.

In pharmaceutical sector each of the above factors has to be kept in view to survive in the competitive era. It is evident that the forces of continuity would affect the business and strategy adopted by the organization.

On the other hand the forces of Change have a direct impact on the existence of an organization For example, in the pharmaceutical sector the new IPR regime involved a fairly dramatic overhaul of existing institutions, many countries were granted transitional periods to implement the new policy. Each organization studied needs to consider the above forces of change and continuity and to construct the value of pharmaceutical firms in the pharmaceutical sector so that not at any point they are archaic and continue their operations in accordance with change in environment whether it is customer requirement or government legislations.

Flexible strategic framework for managing forces of Continuity – Change combinations in pharmaceutical firms operating in Indian Pharmaceutical sector

Continuity and Change Matrix (Figures 1 and 2) clearly delineates the forces of continuity and change of above five organizations. Depending upon the position of an organization on the C-C Matrix, the organization can take steps to shift towards Synthesizers (Flow Stream) (Figure 1), so that the pharmaceutical firms can avail maximum benefits at the point of high change and high continuity.

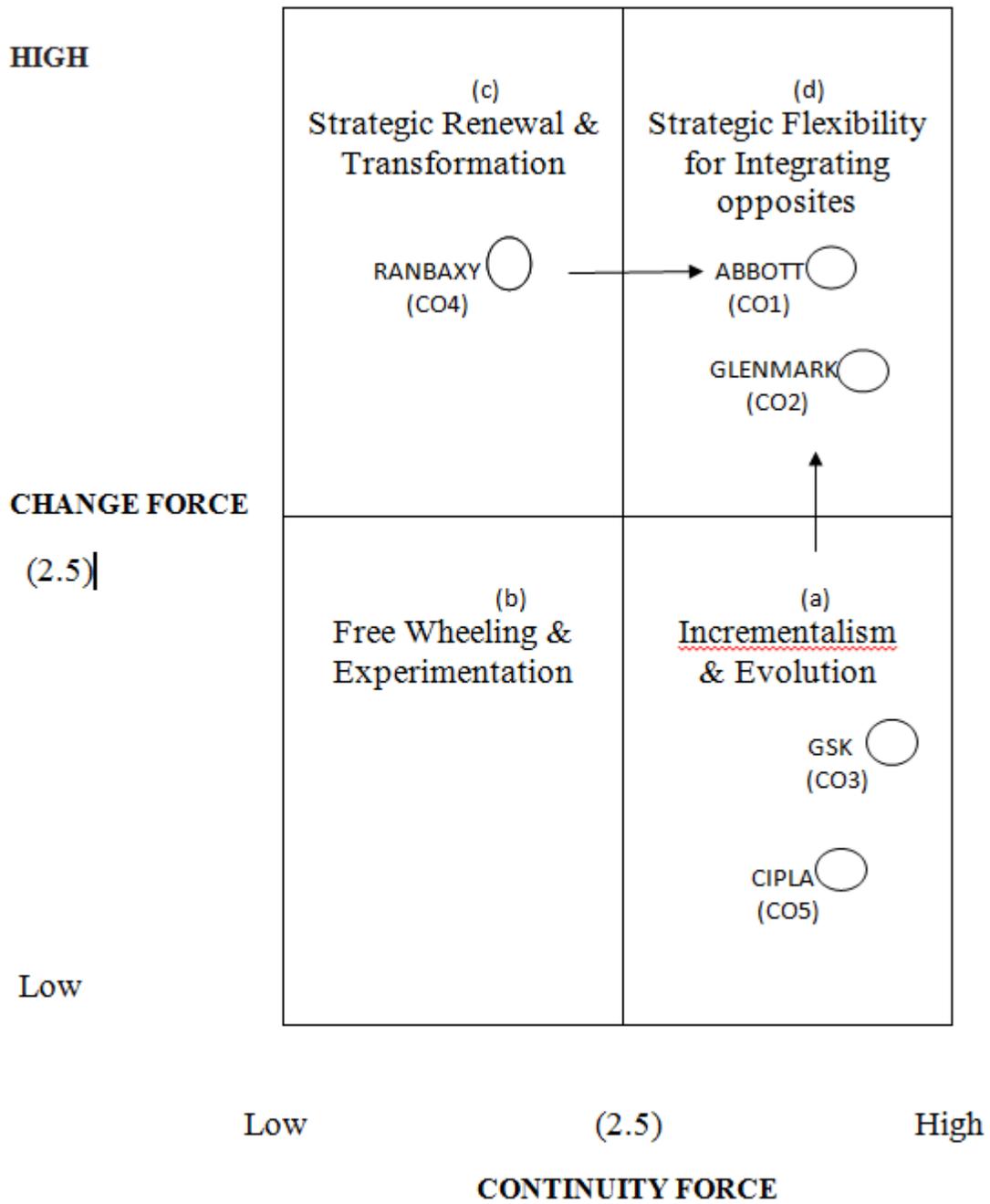


Figure 1: Flexible Strategic Matrix (Sushil, 2005)

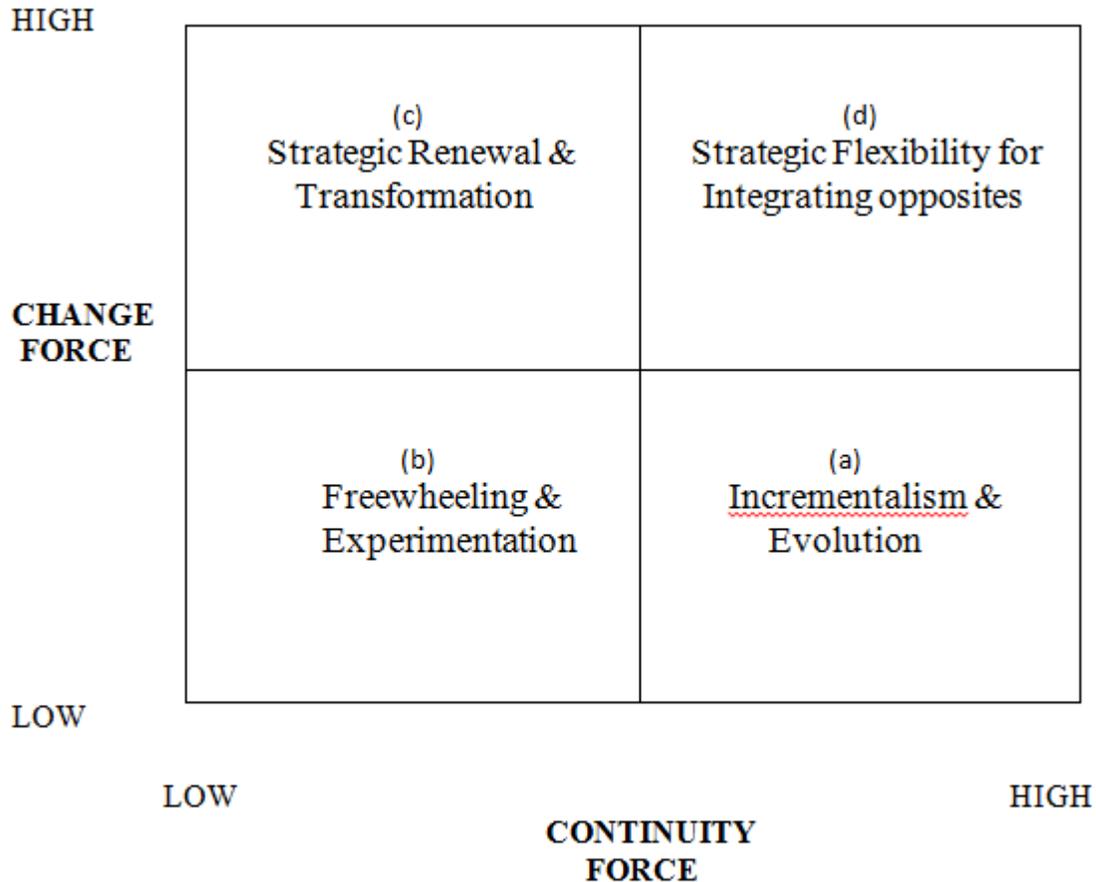


Figure 2: Flexible Strategic Matrix (Sushil, 2005)

For company ‘CO3’ and ‘CO5’ C-C matrix suggests that the forces of continuity are high whereas forces of change are low. Here pharmaceutical companies (CO3 & CO5) needs to focus on changing external environment requirements (customer needs, competition etc) so that the company can be in flow stream strategy. Companies ‘CO1’ and ‘CO2’ are high on continuity forces and also high on forces of change; even though it can strengthen its position by focusing uniformly on factors affecting forces of continuity and forces of change. Company ‘CO2’ needs to get better as compared to company ‘CO1’ while company ‘CO4’ is high on forces of change but low on forces of continuity in order to stay alive and grow it needs to focus more on its factors affecting forces of continuity.

VII. CONCLUSIONS

The above research has undoubtedly verified that the flexible strategic framework for managing forces of continuity and change in pharmaceutical industry has given explicit strategic direction to each company studied depending upon its average score for each factor on Continuity and Change Matrix developed.

Aim of any organization existing in the market is to ensure long term growth of the organization through continuity and change. The above paper brings out clearly the path suggested for the above five different organizations to make a significant contribution to the survival and growth. The continuity and change matrix provides a flexible framework for an organization by managing factors affecting forciers of continuity and change, as an integral part of the organizations overall strategy.

Limitations and Scope of Further Research

The above research was limited to study of five pharmaceutical companies due to the paucity of time. A bigger sample could have enriched the logic depicted in the model .The above study can be extended to study of various other companies operating in the pharmaceutical sector which could also give a more comprehensive application of the above flexible strategic framework proposed in this paper.

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Performance Evaluation of Web Application Security Scanners for More Effective Defense

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Abstract- With more and more people becoming Internet users there have been great increase in using Web in all areas of life, including communication, education and shopping. And as a result of these changes the security concerns have also grown. The web application vulnerability scanners help reduce these security concerns in Web-based applications. In today's market a large number of web scanners are available. Although these tools are available in the market but question is how efficient they are to address security concerns in WEB applications? The primary objective of the paper is to study the effectiveness of the scanners and to try to identify common types of vulnerabilities in web services environment. Also, one of the prominent objectives is to provide defense measures, which secure the application significantly.

To compare vulnerability detection rate of different scanners, it is important to have an independent test suite. This paper describes a web application, which is intended to be used to evaluate the efficiency of Netsparker and Acunetix web application vulnerability scanners. For several vulnerabilities presented in this application, we also explain defense measures, which secure the application significantly. The results of web application evaluation identify the most challenging vulnerabilities for scanner to detect, and compare the effectiveness of scanners. The assessment results can suggest areas that require further research to improve scanner's detection rate.

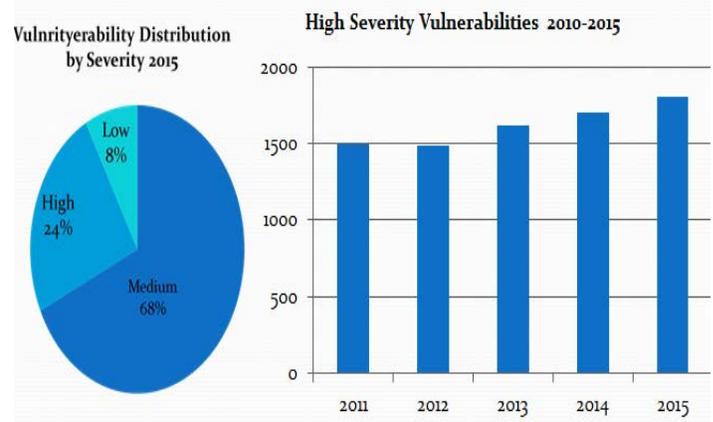
I. INTRODUCTION

Today's Web applications contain dangerous security flaws. The global distribution of these applications makes them prone to attacks that uncover and maliciously exploit a variety of security vulnerabilities [1]. ISO 27005 defines vulnerability as "a weakness of an asset or group of assets that can be exploited by one or more threats where an asset is anything that can has value to the organization, its business operations and their continuity, including information resources that support the organization's mission" [2]. According to National Vulnerability Database (NVD) [3] the number of vulnerabilities has approximately three times increased since 2011. This is shown in Figure 1.



Figure: Number of Vulnerabilities 2010-2015

Although OWASP's 2012 report indicated that investment in security was increasing but NTA Monitor's 2014 Web Application Security Report demonstrated that Web security had actually decreased compared to the previous year. In fact, Web application vulnerabilities represent huge problems for companies and organizations. According to WhiteHat Security's most recent [Website Security](#) Statistics Report, 63 percent of assessed websites are vulnerable, each having an average of six unsolved flaws [4]. These vulnerabilities create and feed an underground economy based on attacking and stealing data and resources. Figure 2 shows the vulnerability distribution by severity of the year 2015.



The web application vulnerability scanners help reduce these security concerns in Web-based applications. In today's market a large number of web application-scanning tools are available, e.g. Acunetix, Netsparker, Appscan etc. Although

these tools are available in the market but question becomes how efficient they are to address security concerns in WEB applications? To compare vulnerability detection rate of different scanners, it is important to have an independent test suite. Web vulnerability scanners are often regarded as an easy way to test applications against vulnerabilities. In fact, vulnerability scanners provide an automatic way to search for vulnerabilities avoiding the repetitive and tedious task of doing hundreds or even thousands of tests by hand for each vulnerability type. Most of these scanners are commercial tools (e.g., IBM Rational AppScan[5] and HP WebInspect[6]) but there are also some free application scanners (e.g., Acunetix[7], Netsparker[8], Burp Suite[9], Foundstone WSDigger[10] and Wsfuzzer[11]) with limited use, as they lack most of the functionalities of their commercial counterparts.

This paper describes a web application, which is intended to be used to evaluate the efficiency of Netsparker, Burp Suite and Acunetix web application vulnerability scanners. The application implements real life scenarios for OWASP Top Ten Security Risks [12]. For several vulnerabilities presented in this application, we also explain defense measures, which secure the application significantly.

1.1 OWASP Web Application Security Risks

The OWASP security community has released its annual report in 2015 capturing the top risks in web application development as a combination of the probability of an event and its consequence [12].

The list of the top risks in web applications is as follows:

- A1 Injection
- A2 Broken Authentication and Session Management (XSS)
- A3 Cross Site Scripting (XSS)
- A4 Insecure Direct Object References
- A5 Security Misconfiguration
- A6 Sensitive Data Exposure
- A7 Missing Function Level Access Control
- A8 Cross Site Request Forgery (CSRF)
- A9 Using Components with Known Vulnerabilities
- A10 Unvalidated Redirects and Forwards

The two most common risks in the Web environment are SQL injection, which lets attackers alter SQL queries sent to a database and cross-site scripting (XSS). Injection attacks take advantage of improperly coded applications to insert and execute attacker-specified commands, enabling access to critical data and resources. XSS vulnerabilities exist when an application sends user-supplied data to a Web browser without first validating or encoding that content.

In web application described in this paper, we implement OWASP top vulnerabilities A1, A2, A3 and A5.

In this paper we used two free web application vulnerability scanners to identify security flaws in web application. Our main objective is to study the effectiveness of the scanners and to try to identify common types of vulnerabilities in web application environments. In summary, our practical experiment report focuses on the following three questions:

- What is the coverage of the vulnerability scanners tested when used in a web services environment?

- What is the false-positive rate of the web vulnerability scanners tested when used in a web services environment?
- What are the most common types of vulnerabilities in web services environments?

II. EXPERIMENTAL DETAILS

In Broad our experimental study consisted of five steps:

- i. **Web Application:** Design a web application that implements all the vulnerabilities from OWASP Top Ten report also select publically available web application services.
- ii. **Vulnerability Scanner:** Select the free web application vulnerability scanners.
- iii. **Execution:** Use the vulnerability scanners to scan the services to identify potential vulnerabilities.
- iv. **Verification:** Perform manual testing to confirm that the vulnerabilities identified by the scanners do exist (i.e., are not false positives).
- v. **Analysis:** Analyze the results obtained and systematize the lessons learned.

There are several existing web applications to demonstrate common web application vulnerabilities such as “HacMe” series [13] and “WebGoat” [14]. “WebGoat” is mainly used in educational purposes. But we want to implement vulnerabilities from OWASP Top Ten report, which is not possible with these web applications. Because of these drawbacks of available applications, there is a need to have an independent Web Application, which implements OWASP Top Ten vulnerabilities, to be used to test these web scanners. We design a web application (“shopatujjain”) to simulate the steps a regular user goes through while using a dynamic web page and replicates the behavior. The availability of source code and the control over server results provides better evaluation of web application scanners.

Main functionalities of the application are:

- First a user creates an account and provides his/her personal data including shipping address and credit card details.
- Second he/she selects the product and stores his selection in personal shopping cart.
- Later when the user decides to make the purchase an invoice is placed in queue for further processing.
- In addition to that the user can add reviews to products and read other customer’s opinions, newsletters and subscribe to mailing list.

III. METHODOLOGY

The “shopatujjain” Web Application is PHP based application, which is deployed on Apache Tomcat Server. It uses database on MySQL to store the data for the web site in its tables. The application uses PHP to present the user interface. It also uses HTML, CSS, JavaScript, and AJAX technologies. The presence of such technologies as AJAX and JavaScript in our

web application gives additional opportunities. JavaScript is widely used in modern web applications and it is important to analyze the behavior of tools and their ability to parse JavaScript code.

The web application developed is based on OWASP Top Ten report of 2014. In this section we go over the characteristics of vulnerabilities presented in the Web Application.

1.1 SQL Injection Vulnerability

User has provided his/her credentials, username and password via web application. Web application has stored the user data to the SQL server. An attacker crafts HTTP requests that are sent to the web server to inject commands to the SQL server in order to gain system level access [15]. The vulnerable web application allows this malicious code to be placed on an SQL server, thus making it possible for the attacker to use SQLI commands to get user account credentials.

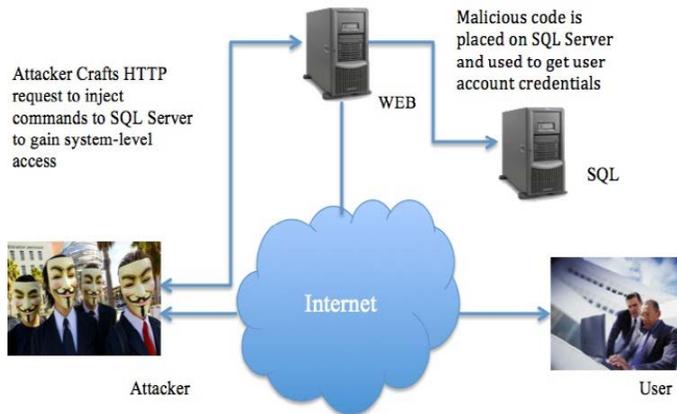


Figure Hacking Strategy of SQLI

Exploiting SQLI vulnerability: During SQLI Attack, a malicious string is used as an input to a function that calls an SQL query, which is executed immediately. In this way, the injection result is reflected right away, thus the vulnerability is called Reflected SQLI vulnerability.

For example, recoverPassword function is intended to recover the user's password based on his/her answer to a security question.

```
String recoverPassword( String emailAddress, String answer){
```

```
...
String query = "SELECT Password FROM v_UserPass WHERE
(v_UserPass.EmailAddress = " + emailAddress + " AND
v_UserPass.Answer = " +
answer + ") ";
...
}
```

Payload:
emailAddress=test%40test.com%27%29 -- &answer=anycolor
 In recoverPassword function, concatenation is used to create dynamic SQL query. An attacker can easily impersonate a site user and recover a victim's password by commenting out the part of the query using '--' single-line comment indicator [15].

1.2 Broken Authentication and Session Management Vulnerability

The user authentication on the web typically involves the use of a user's ID and password. When the authentication

mechanism does not provide enough protection, an attacker can try to obtain credentials by using different techniques or some other combination. Simple password recovery mechanisms can become victims of a social engineer who manipulates a user into revealing confidential information.

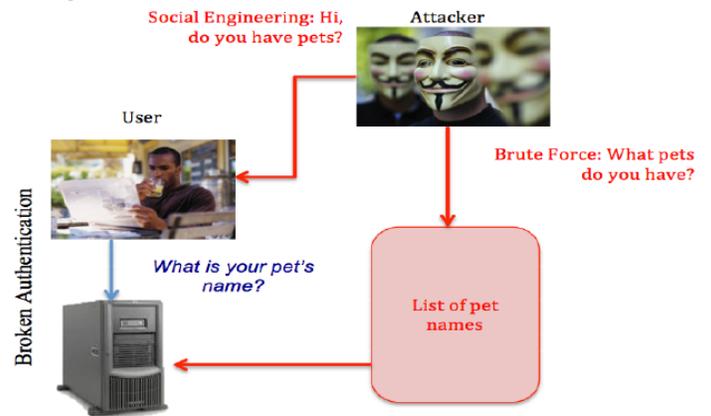


Figure: Two ways to bypass Broken Authentication

Exploiting Broken Authentication Vulnerability

The password recovery mechanism is based on a secret question and answer. A user provides the name of the city, when he/she was born and his/her password is immediately displayed on a web page without further verifications. Using social engineering, an attacker can guess the country. Then by using a dictionary method, the attacker finds the city and obtains the victim's credentials. Brute force attack is widely used to obtain log-in credentials, session identifiers, and credit card information with the help of brute force tools [9]. Attackers can use these tools and proxy applications such as BurpSuite to access a user's private information.

Brute force attack is very simple:

1. The intercepted request is sent to the Intruder application
2. The parameter, which is supposed to be brute forced, is selected.
3. The payloads are formed and configured to be used in the task.
4. The attack begins.

1.3 Cross Site Scripting Vulnerability

Cross Site Scripting (XSS) vulnerability occurs when there is a possibility of injection of malicious code in web application. Thus, the XSS flaw is as a result of not validated or sanitized input parameters. There are three types of XSS: Non-Persistent, called Reflected XSS; Persistent or Stored XSS; and Document Object Model (DOM)-based [16].

- **Non-Persistent XSS Vulnerability:** This vulnerability occurs when a web application accepts an attacker's malicious request that is then echoed into the application's response in an unsafe way.
- **Persistent XSS Vulnerability:** This vulnerability occurs when a web application accepts the attacker's malicious request, stores it in a data source, and later displays the information from the request to a wide range of users.
- **DOM-Based XSS Vulnerability:** This vulnerability doesn't involve server validation. The attack works on

a web browser, avoiding the server side [16]. The DOM 'environment' in the victim's browser is modified by original client-side script, and as a result of that, the payload is executed.

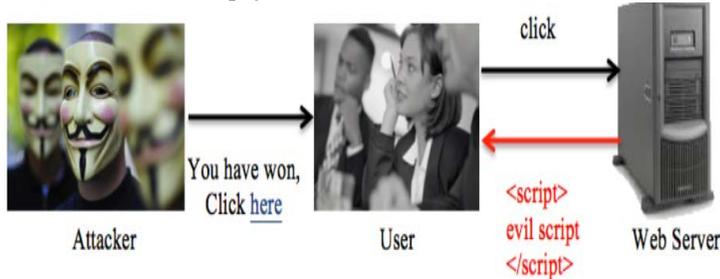


Figure: Non-Persistent XSS Vulnerability

Exploiting XSS Vulnerability

XSS vulnerabilities are exploited by using XSS attacks. XSS attacks are usually divided into three categories: Non-Persistent or Reflected XSS Attack; Persistent or Stored XSS Attack; and DOM-Based XSS Attack [16].

- **Non-Persistent or Reflected XSS Attack:** User registration information is saved in an online store database after 'creditCardNumber' parameter is validated on the server side. No input inspection for 'firstName' parameter is performed.

```
<form action="registrationServlet" method=post>
First Name <input type="text" name="firstName"
value="{newUser.firstName}">
Card number <input type="text" name="creditCardNumber">
<input type="button" value="Continue">
</form>
```

Payload:

```
firstName=John"><script>alert("firstName parameter is
vulnerable")</script>&creditCardNumber=1234
```

If the credit card number is incorrect, 'firstName' value will be reflected on the web page.

1.4 Security Misconfiguration Vulnerability

This type of vulnerability occurs when application, frameworks, application server, web server, database server, and platform configurations are not securely defined to prevent unintentional leakage of information. For example, a web application can use the GET method in an HTTP request for transferring password information. But while using the GET method, the browser encodes form data into a URL. Since form data is in the URL, it is displayed in the browser's address bar, and information leakage occurs.

GET

```
http://www.vulnerableApp.com/updateUserPassword?password
=falsepass HTTP/1.1
```

Host: vulnerableApp.com

```
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10.6;
rv:11.0) Gecko/20100101
```

Firefox/11.0

Accept:

```
text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
```

Accept-Language: en-us,en;q=0.5

Accept-Encoding: gzip, deflate

Proxy-Connection: keep-alive

Referer: <http://vulnerableApp.com/displayAccountPassword>
Cookie:

JSESSIONID=98224C7236B39895384AD3A760E405AB

While using the POST method, form data appears within the message body of the HTTP request, not the URL. Thus, password information is not revealed. To avoid security misconfiguration vulnerability in the above example, the password should be transferred via POST method.

IV. DEFENSE MECHANISMS AGAINST WEB VULNERABILITY AND SECURE CODING TECHNIQUES

Preventing vulnerabilities in web applications is extremely important due to the high number of attacks. The best way to prevent vulnerabilities in applications is to write secure code. According to Computer Emergency Response Team, or CERT, at the Software Engineering Institute at Carnegie-Mellon University, the following Top 10 Secure Coding Practices [17] are vital to security.

1. Proper implementation of Input Validation helps to avoid most of the web application vulnerabilities. But, on the other hand, handling each input in isolation to avoid unexpected command line arguments, user controlled files, and other suspicious input is a complex task, and as a result, the validation may be omitted.
2. Warnings and Error messages can suggest the places of possible security flaws for both developers and an attacker. Static and dynamic analysis tools can detect and eliminate the vulnerabilities.
3. Strong web application architecture helps to enforce security policies.
4. Simple design helps to avoid errors that can be made during implementation, configuration, and use.
5. To simplify the access mechanism, by default the access is denied. In other words, "Everything not explicitly permitted is forbidden."
6. To continue the ideas in points 4 and 5, the principle of least privilege is introduced, which suggests the execution of a process using the least set of privileges necessary to complete the job.
7. Before data is processed, it should be sanitized. The unvalidated data could be the cause of SQL, command, or other injection attacks.
8. In-depth defense mechanisms help to improve security by adding layers of multiple defensive strategies, so that if one layer of defense turns out to be inadequate, another layer of defense can prevent a security flaw from becoming an exploitable vulnerability, and/or limit the consequences of a successful exploit.
9. Quality Assurance is the key point in security of the software. There are different techniques to improve reliability of the application, like using source code analysis tools, penetration testing tools, and independent review of the system.
10. A secure coding standard should be adopted. Programmers should develop and/or apply a secure coding standard for the target development language and platform.

With Top 10 Secure Coding Practices for each vulnerability type, we provide the defense mechanism for top four vulnerabilities out of top ten OWASP vulnerabilities.

1.5 SQLI Defense

Server Side defense using Prepared Statement [18] is the most effective way to protect from SQL Injections, because it ensures that intent of query is not changed. For example, the insertPassword(User user) function adds a new record to UserPass table in "shopatujain" application database, when a new customer is registering his/her account.

```
public static int insertPassword(User user) {
    ConnectionPool pool = ConnectionPool.getInstance();
    Connection connection = pool.getConnection();
    PreparedStatement ps = null;
    ResultSet rs = null;
    String query = "INSERT INTO UserPass (EmailAddress,
    Password, Answer) VALUES (?, ?, ?)";
    try {
        ps = connection.prepareStatement(query);
        ps.setString(1, user.getEmailAddress());
        ps.setString(2, user.getPassword());
        ps.setString(3, user.getAnswer());
        return ps.executeUpdate();
    } catch (SQLException e) {
        e.printStackTrace();
    }
    return 0;
} finally {
    DBUtil.closeResultSet(rs);
    DBUtil.closePreparedStatement(ps);
    pool.freeConnection(connection);
}
```

In this example, PreparedStatement object is used with parameters. Before executing the query, all special characters will be escaped. All SQL functions, those that are not intended to be exploited while stress testing [19] the application, are developed using PreparedStatements.

1.6 Cross-Site Scripting (XSS) Defense

For prevention code injection attacks, including SQLI and XSS, all user data should be validated. There are several main rules that should be followed to increase security:

- Check the data type and set length limits on any form fields on your site.
- Encode or escape the data where it is used in your application to ensure that the browser treats the possibly dangerous content as text, and not as active content that could be executed.

From a security perspective, however, client-side validation is not effective, because it doesn't provide protection for server-side code. An attacker can easily bypass the clientside using proxies.

1.7 Security Misconfiguration Defense

Maintaining security settings of the application, frameworks, application server, web server, database server, and platform is a very complex problem. Web servers are frequent targets of attacks, so when trying to secure web servers, the following aspects should be taken into account [20]:

- Configuration

- Web content and server-side applications
- Operating System
- Documentation

Example:

HTTP server is subject to Slow type HTTP Attack [21]. There is number of steps to protect against this attack pattern [22].

The RequestReadTimeout directive value should be set to limit the time a client may take to send the request [23].

The implementation of defense mechanisms is an important part of the code analysis that is performed to increase the security of a web application. Some vulnerability can be exploited only if an attacker performs several steps successively or in specific order.

V. OBSERVATIONS

A customer cannot feel fully secured while using an application as long as there is a possibility of losing some personal information or other confidential data. Firstly, as many security flaws as possible should be discovered in order to secure a web application. To improve the success rate of discovering application flaws Web Application Vulnerability Scanners (WAVS) are used. WAVS are tools that most closely mimic web application attacks. These tools cannot guarantee that their use will eliminate the flaws completely, but they can make the application more secure. Web Application Security Scanner Functional Specification Version 1.0 [24] in 2008 defined a list of requirements that all WAVS must provide:

- Identify all types of vulnerabilities listed.
- Report an attack that demonstrates the vulnerability.
- Specify the attack by providing script location, inputs, and context.
- Identify the vulnerability with a name semantically equivalent.
- Be able to authenticate itself to the application and maintain logged-in state.
- Have an acceptably low False Positive rate.

In this paper three prominent free Web Application Security Scanners (Acunetix, Netsparker and Burp Suite) are used for vulnerabilities detection. The scanning results of Web Application Vulnerability Scanners are as follows:

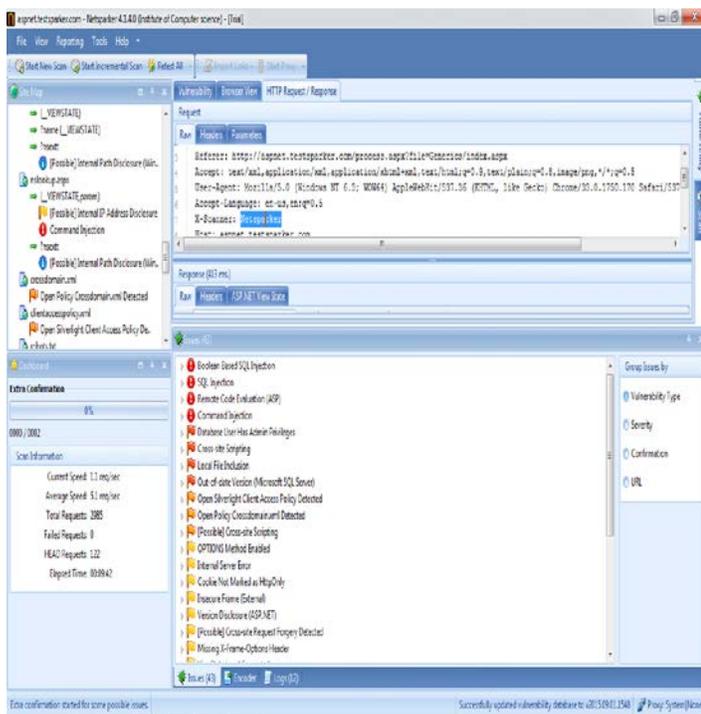
1.8 Acunetix

Acunetix Web Vulnerability Scanner (WVS) [7] is an automated web application security testing tool that audits web applications by checking for vulnerabilities like SQL Injections, Cross-Site Scripting and other exploitable hacking vulnerabilities. In general, Acunetix WVS scans any website or web application that is accessible via a web browser and uses the HTTP/HTTPS protocol.



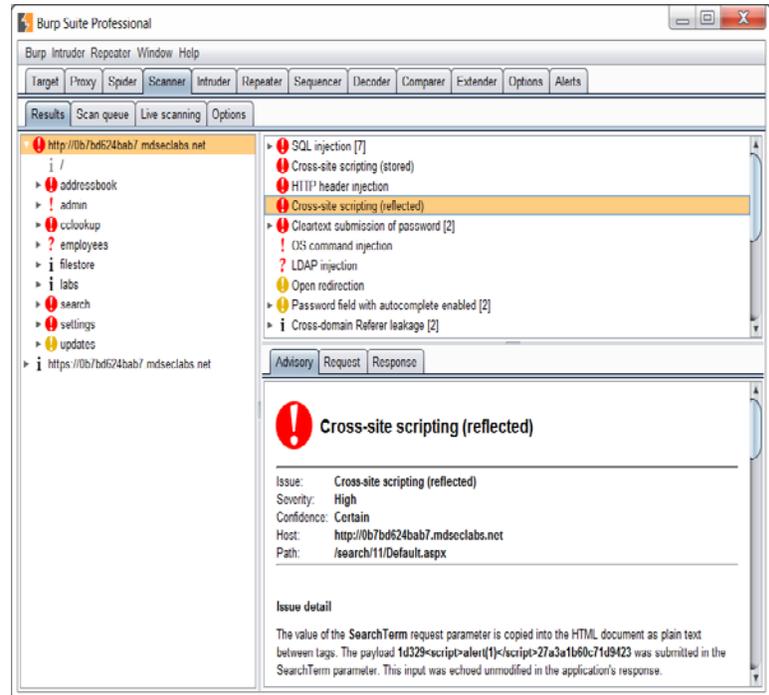
1.9 Netsparker

Netsparker does not require a brief knowledge to use the tool, it has a very good user interface, and it does a decent job detecting the most important vulnerabilities [8]. It has good reporting features that are easy to read and intuitively designed. Moreover it has ability to confirm detected vulnerabilities. This feature can be a real time saver as the tester does not need to validate those vulnerabilities that have been confirmed by Netsparker. The scanning results of Netsparker are shown below



1.10 Burp Suite

Burp is easy to use and intuitive, allowing new users to begin working right away. Burp is also highly configurable, and contains numerous powerful features to assist the most experienced testers with their work. The scanning results of Burp Suite are shown below



There are some free WAVS available in the market. We reviewed three of them: Acunetix Web Application Scanner (WAS), Netsparker Web Vulnerability Scanner and Burp Suite Web Vulnerability Scanner (WVS). All WAVS follow the common strategy: firstly they crawl the victim web site, then they create and insert payloads, and finally they analyze the response. We have chosen these scanners because they provide the feature that; they identify all types of vulnerabilities listed in OWASP Top Ten report

VI. EVALUATION OF WEB APPLICATION VULNERABILITY SCANNERS

The results of Web Vulnerability Scanners Acunetix, Netsparker and Burp Suite are shown in Table 1. The Table contains the following data:

- The first column represents the serial number.
- The second column represents the vulnerability number taken from Top Ten OWASP Vulnerabilities.
- The third column represents the vulnerabilities presented in the test suite.
- The fourth column shows the different types of a vulnerability presented in the third column.
- The fifth column contains the number of vulnerabilities detected by Acunetix WAVS.
- The sixth column contains the number of vulnerabilities detected by Netsparker WAVS.
- The last column represents the number of vulnerabilities detected by Burp Suite WAVS.

Table: Results of WAVS assessment

S No	OWASP report 2015 Number	OWASP Vulnerabilities	Vulnerability Type	Acunetix	Netsparker	Burp Suite
1	A1	SQL Injection		15	4	7
2	A2	Broken Authentication and Session Management	Password Guessing	5	0	2
			Brute Force	1	1	0
3	A3	Cross Site Scripting	Non-Persistent XSS	9	9	2
			Persistent XSS	1	3	1
			DOM XSS	3	1	0
4	A5	Security Misconfiguration	Password sent via GET Method	5	5	5
			Web Server DDoS	2	0	2
			Sensitive Data display	0	4	2
Total				40	27	18

The Table 1 reports the vulnerabilities that were detected by web application scanners. As seen from the Table 1 all the tool tools missed some weaknesses. The analysis of why the scanners missed certain vulnerabilities is as follows

1.11SQL Injection: Acunetix Scanner is able to discover all SQL Injection vulnerabilities. But Netsparker and Burp Suite scanners are failed to find some SQL Injection vulnerabilities, which are not executed immediately.

1.12Broken Authentication and Session Management:

Both Netsparker and Burp Suite scanners were not able to find the vulnerability.

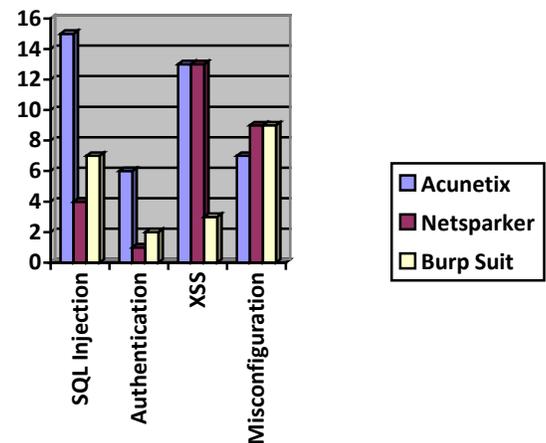
1.13Cross-Site Scripting: Acunetix and Netsparker Scanners discovered all NonPersistent XSS vulnerabilities. Burp Suite scanner result is very poor. Most of the Persistent XSS and DOM XSS vulnerabilities were missed by all scanners.

1.14Security Misconfiguration: All the scanners are able to find the vulnerability Password get via GET Method. Acunetix Scanner missed Sensitive Data Display vulnerability.

VII. CONCLUSIONS

This paper described OWASP Top 10 Security Risks implemented in the web application, which was used as a testset for evaluation of effectiveness of Acunetix web application vulnerability scanners, Netsparker web application vulnerability scanners and Burp Suite web application vulnerability scanners. We chose four vulnerabilities from Top 10 OWASP Security Risks for evaluation of three prominent Web Application Vulnerability Scanners. The evaluation of three prominent Web Application Vulnerability Scanners is done by analyzing the results that is obtained from the execution of web scanners against the vulnerable web application, then comparing the number of detected vulnerabilities.

The comparison of the three chosen scanners shown by the following graph:



The result show that both Acunetix and Netsparker scanners able to discover cross site scripting XSS but Burp Suit results was very poor. For SQL Injection Acunetix detect all the vulnerabilities. Scan results of Acunetix WAVS for Broken Authentication and Session Management vulnerabilities are better than other two scanners. But Security Misconfiguration vulnerabilities are not properly discovered by Acunetix, in this case the result of Netsparker and Burp Suit Scanners are better. The results show that the crawling has been significantly improved, although there are still limitations that affect the detection rate of such vulnerabilities as SQLI and XSS.

For several vulnerabilities presented in this application, we also explain defense measures, which secure the application significantly. The results of web application evaluation identify the most challenging vulnerabilities for scanner to detect, and compare the effectiveness of scanners. The assessment results can suggest areas that require further research to improve scanner's detection rate.

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CFD study for cross flow heat exchanger with integral finned tube

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Abstract- CFD investigations have been carried out in this paper to study the temperature difference for cross flow heat exchanger with smooth tube and low integral finned tube. The study includes geometry creation with dimensions (250×500×1200) mm width, height and length, respectively. has a single copper tube with eight passes.. The low integral finned tube with (19 mm) inner diameter, (21 mm) root diameter and (24 mm) outer diameter . The fin height is (1.5 mm). Air is assumed as a cooling fluid passing across the test tube with a range of velocities (1, 2, 3 and 4) m/sec. The inner side flow rates with a range of (2, 3, 4, 5 and 6) L/min. for water. The water temperatures at the inlet of test tube were (50, 60, 70, 80) °C. The results showe that the temperature difference and heat transfer coefficient for heat exchanger with finned tube is higher than with smooth tube.

Index Terms- : CFD, Cross flow, Heat exchanger, Integral Fin, Heat Transfer Coefficient.

I. INTRODUCTION

The simulation for any process in the industry were done by manufacturing a small prototype and subjected the prototype to the same boundary conditions that will may be face the original part. This process is expensive in cost and take a long period of time due to repeating the manufacturing process. Now a days, with the development of computer programing and Computational Fluid Dynamics (CFD), the numerical analysis takes his action instead of the prototype. CFD is a too advantageous device in analyzing the problems which contains heat transfer and fluid flow and it include three stages; these stages represent the main fundamentals for any numerical simulation process. The objective of the present work is to simulate the 3D geometry for cross flow smooth and finned tube heat exchanger with using hot water inside the tube and cooling air outside the tube by using computational fluid dynamic (ANSYS-FLUENT 15). The enhancement of heat transfer has been introduced in many fields of industrial and scientific applications. This paragraph gives an extra review about the enhancement of heat transfer especially with finned tube.

II. LITERATURE REVIEW

Mallikarjuna, et al [1] performed a numerical three dimensional simulation of turbulent flow for flat and round tube fin heat exchangers having two rows of staggered arrangement to study heat transfer and fluid flow using ANSYS Fluent software, for different Reynolds number of fin side in turbulent regime to detect the effect of various parameters (tube pitch fin pitch, and fin temperature on Friction factor f and Colburn j factor for both flat and round tubes). The performance of flat tubes is compared with that of round tubes with same geometrical parameters and flow area. For both flat and round tube domains with all the geometrical configurations simulated in the study Colburn j factor varies inversely with the inlet air velocity. More heat transfer with the higher fin spacing for both flat and round tubes following the above side trend.

Piyush and Kumbharb [2] performed CFD to predicts the heat transfer and flow of air over the dimpled fins due to forced convection. Dimpled fins are made and modeled using variation in parametric dimensional. Three parameters were considered [depth, diameter and pitch] of dimples. For analysis purpose, three different Reynolds number [6500, 8000 and 10000] is done. The increase of Heat transfer coefficient for the diameter is higher when compared with the depth and pitch, but the increase of heat transfer coefficient is very low for pitch variation, thus combination with the depth and maximum diameter, shows the best convective heat transfer coefficient. For dimpled configurations there is a substantial increase in the Nusselt number value with respect to plain fins. As the Reynolds number increase The friction factor decreases.

Khudheyer and Mahmoud [3] performed a three-dimensional CFD simulations to investigate heat transfer and fluid flow characteristics of a two row plain fin-and-tube heat exchanger using Open FOAM, for Reynolds numbers ranging from 330 to 7000 and the results were validated against experimental data, it is found that the heat transfer characteristics and pressure drop of a fin-and-tube heat exchanger have a reasonable accuracy with CFD calculations carried out in open source software, and that Open FOAM can be used to carry out practical work in the design process of heat exchanger.

III. COMPUTATIONAL DOMAIN

The computational domain of the present work is represented by the following:

- 1- The inlet and outlet for hot water and nanofluid for eight passes single copper tube (without and with low integral fin).
- 2- The inlet and out for cooling air which flows inside rectangular cross sectional duct.

3- The flow of cooling air is normal to the tube (cross flow heat exchanger).

The following assumptions are adopted to simplify numerical simulation:

1. Steady state and turbulent flow for water and air side.
2. No phase change for all the flowing fluids.
3. Radiation effects are negligible.
4. No heat generation.
5. Constant physical properties for the cooling air, hot water and nanofluid.
6. Three dimensional fluid flows.

A. GEOMETRY CREATION

The geometry created in the present work consists of single tube eight passes having one inlet and one outlet portion for hot water and nanofluid the air duct has inlet and outlet portion, software program SOLID WORK PREMIUM 2013 are used to draw the geometry in 3D form. The geometry is shown in figure 1.

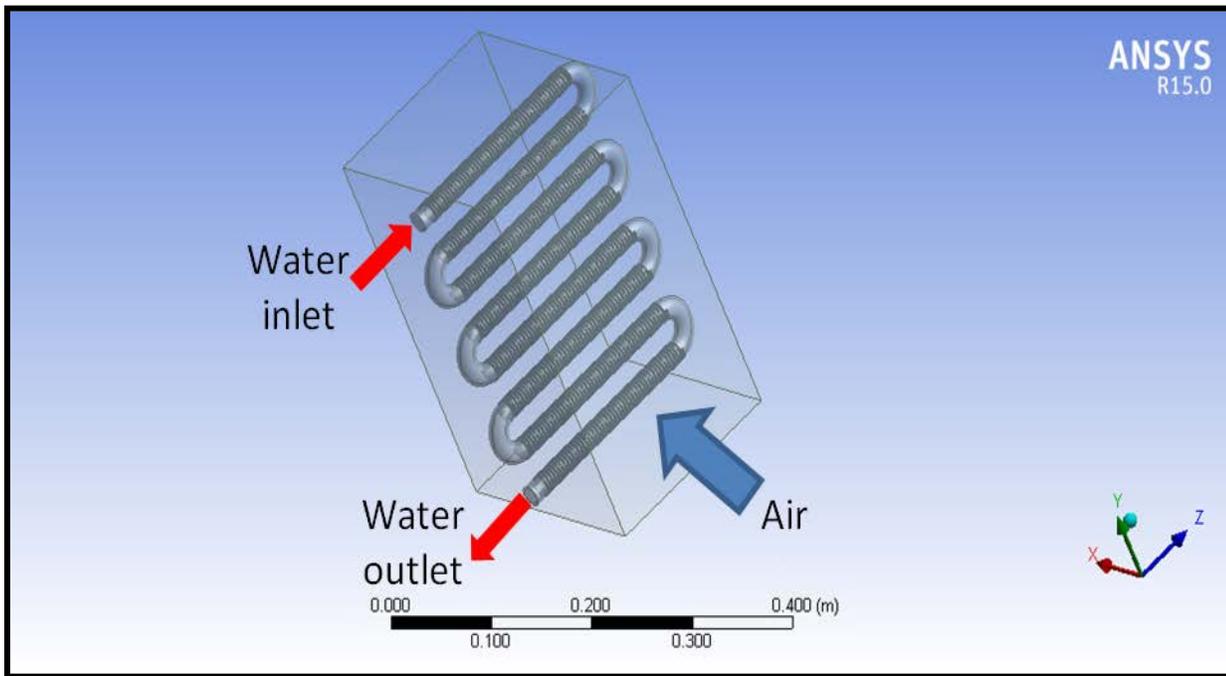


Fig 1. Geometry of the test section

B. Mesh Generation

Mesh generation is very important step of pre-processing stage because it fits the limits of computational domain. Many engineering applications need mesh generation that is appropriate for the solving of 3D Navier-Stokes equations. In the present work, tetrahedron element is used for 3D geometry mesh. Good mesh is recognized from its generated cells number. For a complex geometry, increase the cells number will increase the resolution and the accuracy, but also this increase will be opposed by increase in computer memory, need for high processor and take more time to complete the solution. At last there must be an optimization between the number of cells generated and the time consumed for the solution process. For the present work, the number of cells generated are shown in table 1 and mesh generation is shown in Figure 2.

Table 1 Number of cells generated during mesh.

Case	Number of nodes	Number of elements	Total number of cells
Smooth tube	242425	1170246	1412671
Integral finned tube	668413	3380078	4048491

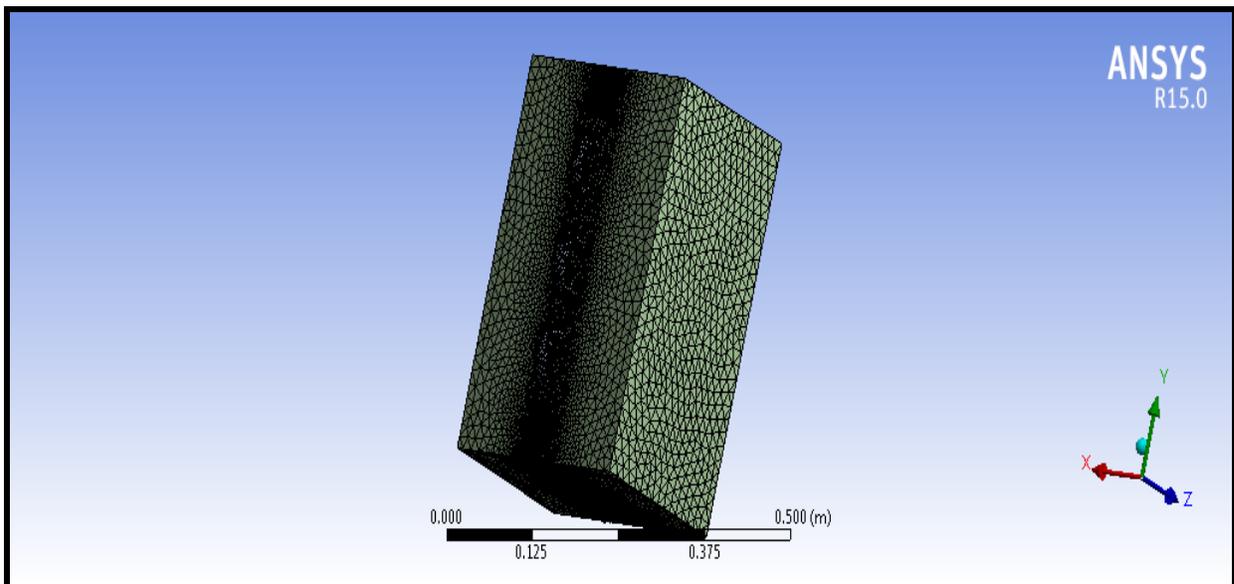


Fig 2. Mesh generation of the persent work geometry

C. GOVERNING EQUATIONS

The fundamental basis of most of CFD problems are the solutions of (mass, momentum and energy) equations, as well as the transport equation for turbulent viscosity and its scale. These are in steady state and have been stated below in simple form. For turbulent flow [4]:

a. Conservation of Mass:

The fundamental basis of most of CFD problems are the solutions of (mass, momentum and energy) equations, as well as the transport equation for turbulent viscosity and its scale. These are in steady state and have been stated below in simple form.

$$\frac{\partial \bar{u}}{\partial x} + \frac{\partial \bar{v}}{\partial y} + \frac{\partial \bar{w}}{\partial z} = 0 \quad (1)$$

b. Conservation of Momentum:

$$\left(\bar{u} \frac{\partial \bar{u}}{\partial x} + \bar{v} \frac{\partial \bar{u}}{\partial y} + \bar{w} \frac{\partial \bar{u}}{\partial z} \right) + \left(\frac{\partial}{\partial x} (\overline{u'^2}) + \frac{\partial}{\partial y} (\overline{u'v'}) + \frac{\partial}{\partial z} (\overline{u'w'}) \right) = -\frac{1}{\rho} \frac{\partial p}{\partial x} + \frac{\mu}{\rho} \left(\frac{\partial^2 \bar{u}}{\partial x^2} + \frac{\partial^2 \bar{u}}{\partial y^2} + \frac{\partial^2 \bar{u}}{\partial z^2} \right) \quad (2)$$

$$\left(\bar{u} \frac{\partial \bar{v}}{\partial x} + \bar{v} \frac{\partial \bar{v}}{\partial y} + \bar{w} \frac{\partial \bar{v}}{\partial z} \right) + \left(\frac{\partial}{\partial x} (\overline{u'v'}) + \frac{\partial}{\partial y} (\overline{v'^2}) + \frac{\partial}{\partial z} (\overline{v'w'}) \right) = -\frac{1}{\rho} \frac{\partial p}{\partial y} + \frac{\mu}{\rho} \left(\frac{\partial^2 \bar{v}}{\partial x^2} + \frac{\partial^2 \bar{v}}{\partial y^2} + \frac{\partial^2 \bar{v}}{\partial z^2} \right) \quad (3)$$

$$\left(\bar{u} \frac{\partial \bar{w}}{\partial x} + \bar{v} \frac{\partial \bar{w}}{\partial y} + \bar{w} \frac{\partial \bar{w}}{\partial z} \right) + \left(\frac{\partial}{\partial x} (\overline{u'w'}) + \frac{\partial}{\partial y} (\overline{v'w'}) + \frac{\partial}{\partial z} (\overline{w'^2}) \right) = -\frac{1}{\rho} \frac{\partial p}{\partial z} + \frac{\mu}{\rho} \left(\frac{\partial^2 \bar{w}}{\partial x^2} + \frac{\partial^2 \bar{w}}{\partial y^2} + \frac{\partial^2 \bar{w}}{\partial z^2} \right) \quad (4)$$

c. Conservation of Energy:

$$\left(\bar{u} \frac{\partial \bar{T}}{\partial x} + \bar{v} \frac{\partial \bar{T}}{\partial y} + \bar{w} \frac{\partial \bar{T}}{\partial z} \right) + \left(\frac{\partial}{\partial x} (\overline{u'T'}) + \frac{\partial}{\partial y} (\overline{v'T'}) + \frac{\partial}{\partial z} (\overline{w'T'}) \right) = \alpha \left(\frac{\partial^2 \bar{T}}{\partial x^2} + \frac{\partial^2 \bar{T}}{\partial y^2} + \frac{\partial^2 \bar{T}}{\partial z^2} \right) \quad (5)$$

d. Turbulence Kinetic Energy Equation [5]:

$$\rho \left(\bar{u} \frac{\partial k}{\partial x} + \bar{v} \frac{\partial k}{\partial y} + \bar{w} \frac{\partial k}{\partial z} \right) = \left[\left(\mu + \frac{\mu_t}{\sigma_k} \right) \left(\frac{\partial^2 k}{\partial x^2} + \frac{\partial^2 k}{\partial y^2} + \frac{\partial^2 k}{\partial z^2} \right) \right] + G_k - \rho \epsilon \quad (6)$$

e. Dissipation Rate Equation (ϵ) [6]:

$$\rho \left(\bar{u} \frac{\partial \epsilon}{\partial x} + \bar{v} \frac{\partial \epsilon}{\partial y} + \bar{w} \frac{\partial \epsilon}{\partial z} \right) = \left[\left(\mu + \frac{\mu_t}{\sigma_\epsilon} \right) \left(\frac{\partial^2 \epsilon}{\partial x^2} + \frac{\partial^2 \epsilon}{\partial y^2} + \frac{\partial^2 \epsilon}{\partial z^2} \right) \right] + C_{1\epsilon} \frac{\epsilon}{k} G_k - C_{2\epsilon} \rho \frac{\epsilon^2}{k} \quad (7)$$

f. Boussinesq hypothesis:

$$G_k = \mu_t \times S^2 \tag{8}$$

$$S \equiv \sqrt{2S_{ij}S_{ij}} \tag{9}$$

$$S_{ij} = \frac{1}{2} \left(\frac{\partial \bar{u}_i}{\partial x_j} + \frac{\partial \bar{u}_j}{\partial x_i} \right) \tag{10}$$

The turbulent eddy viscosity:

$$\mu_t = \rho C_\mu \frac{k^2}{\epsilon} \tag{11}$$

The values of model constants have been derived by RNG theory. ANSYS Fluent used these values by default. Table 2 shows the constant values.

Model symbol	$C_{1\epsilon}$	$C_{2\epsilon}$	C_μ	σ_k	σ_ϵ
Value	1.42	1.68	0.085	1	1.3

IV. THE BOUNDARY CONDITIONS

A. Inlet Boundary Conditions

The velocity of the inlet air is limited with a values of (1, 2, 3, and 4) m/s, while the volume flow rate of tube side liquid is limited with a values of (2, 3, 4, 5 and 6) L/min and the temperature of inlet air is the room temperature, while the temperature of tube side liquid is limited with a values of (50, 60, 70 and 80) °C.

B. Outlet Boundary Conditions

The outlet for air side and tube side fluid is specified as pressure outlet and it’s represented by the atmospheric pressure.

V. RESULTS AND DISCUSSIONS

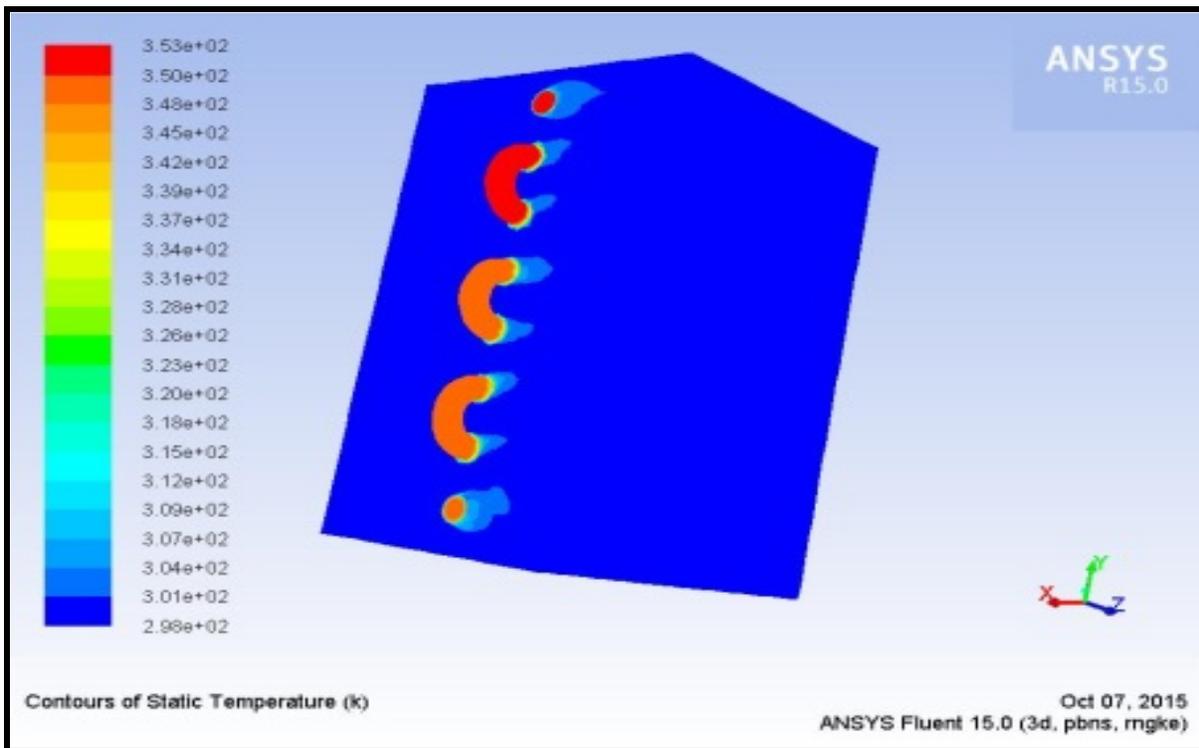
The numerical simulation is done by ANSYS FLUENT 15. software to show both the flow field and heat transfer of the present models. Many cases are studied. Three cases are discussed in the following sections. Same boundary conditions are used in the three cases, which are (air velocity of 1 m/s, water inlet temperature and flow rate of (80 °C) and (2 L/min) respectively).

A. Temperature Contours

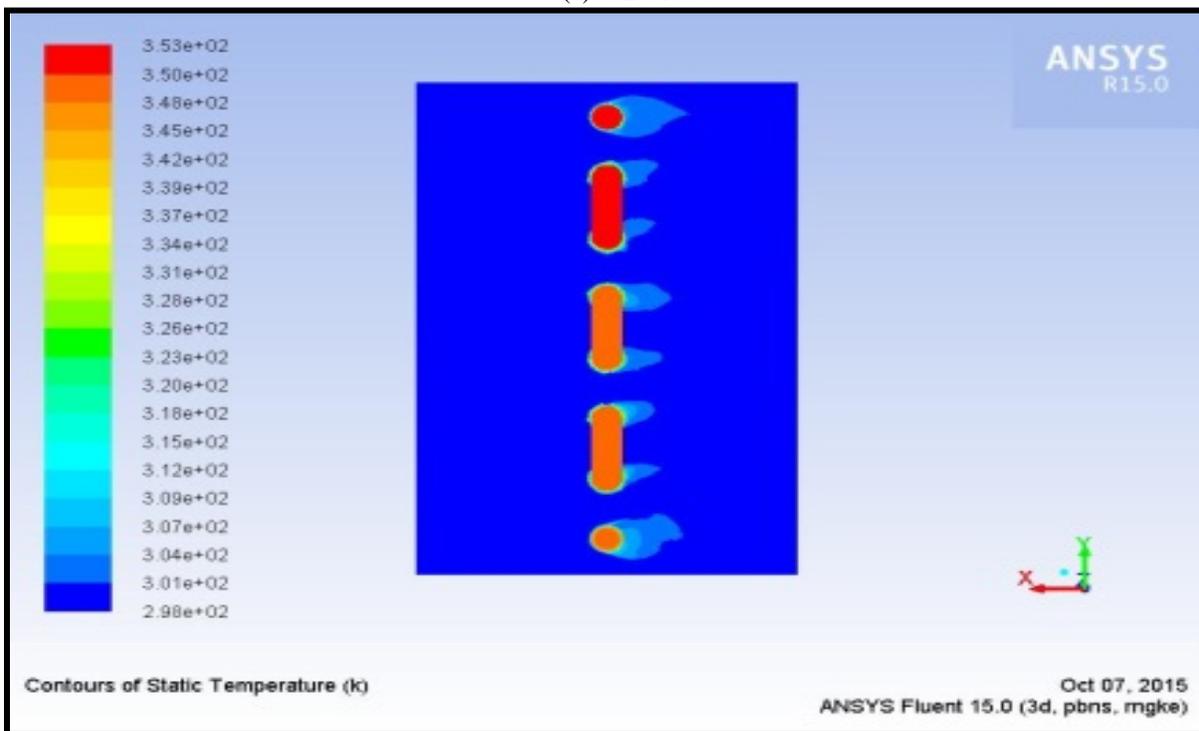
Figure 3. shows a 3D simulation of temperature distribution in the test section, figures 4. and 5. reveal temperature contours of smooth tube with water and integral finned tube with water. From these figures, it is noted that there is a gradient of temperature distribution along with test tube and the temperature difference are clearly appear in all cases. Also, it is clear from the figures that the temperature gradient of finned tube is higher than that of smooth tube. This means that fining have a substantial effect on increasing the temperature difference inside the test tube.

B. Velocity and Vectors Contours

Figure 6. “(a)” shows a longitudinal section of velocity contour, from figure, the velocity of water inside the tube is constant due to stability of water flow rate. Figures 6. “(b)” demonstrate a cross section of velocity contour, this figure represent the behavior of air through the test section, before the test tube the velocity of air are constant, the air velocity are increased during it across through the passes of test tube, eddies are formed behind the test tube and turbulence is increased.

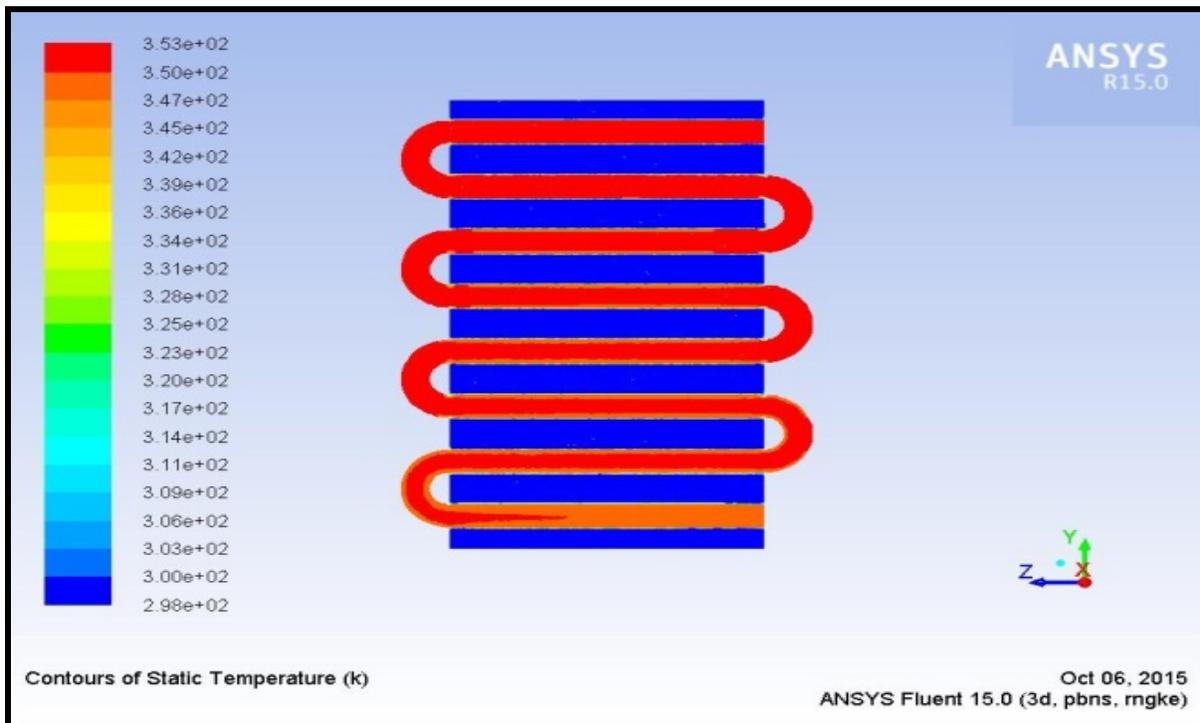


“(a)” 3D view.

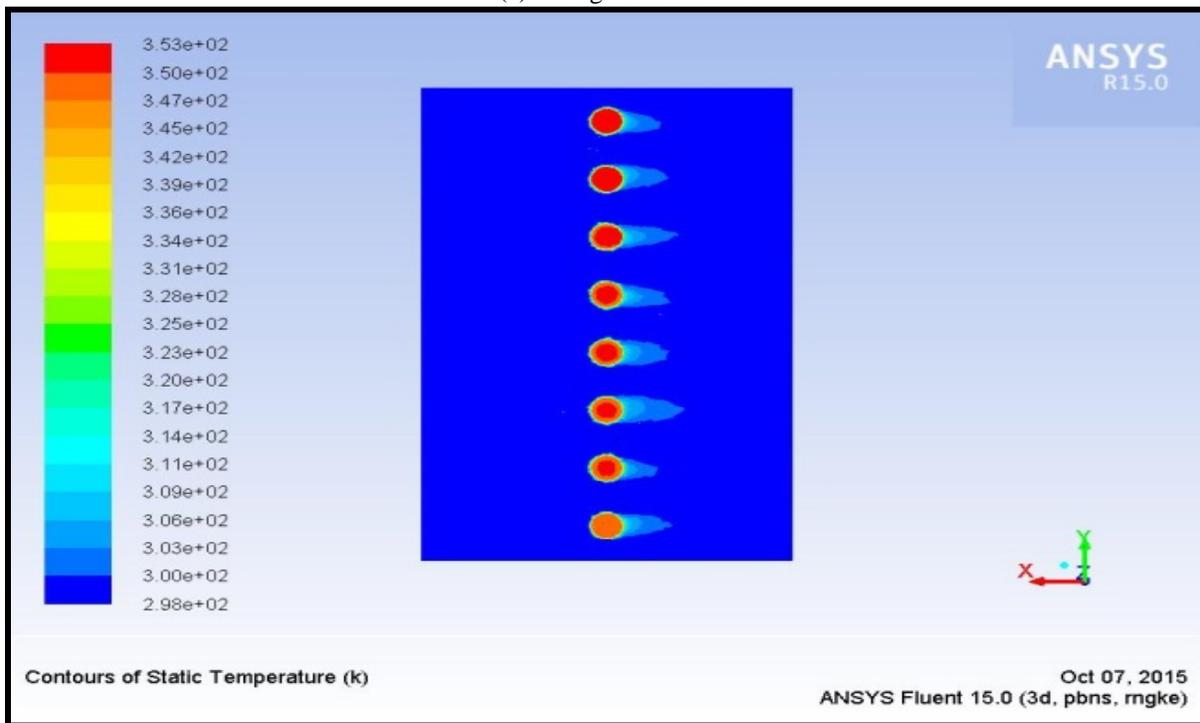


“(b)” Side view.

Figure 3. Simulation of temperature distribution in the test section.

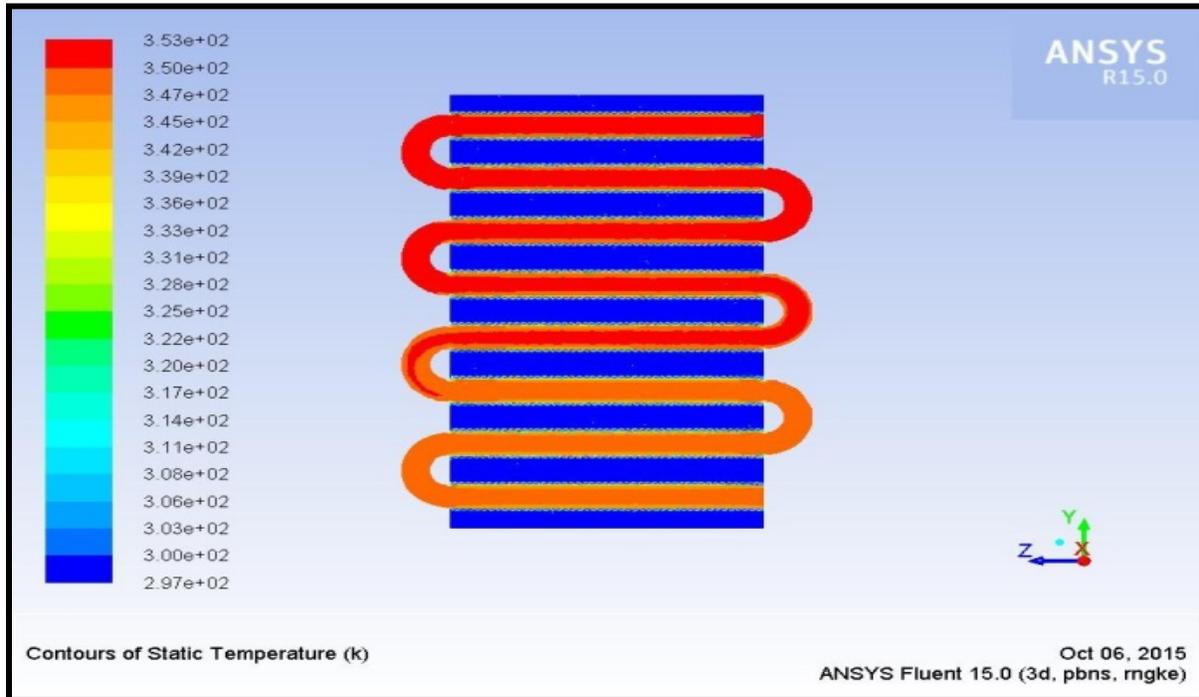


“(a)” Longitudinal section.

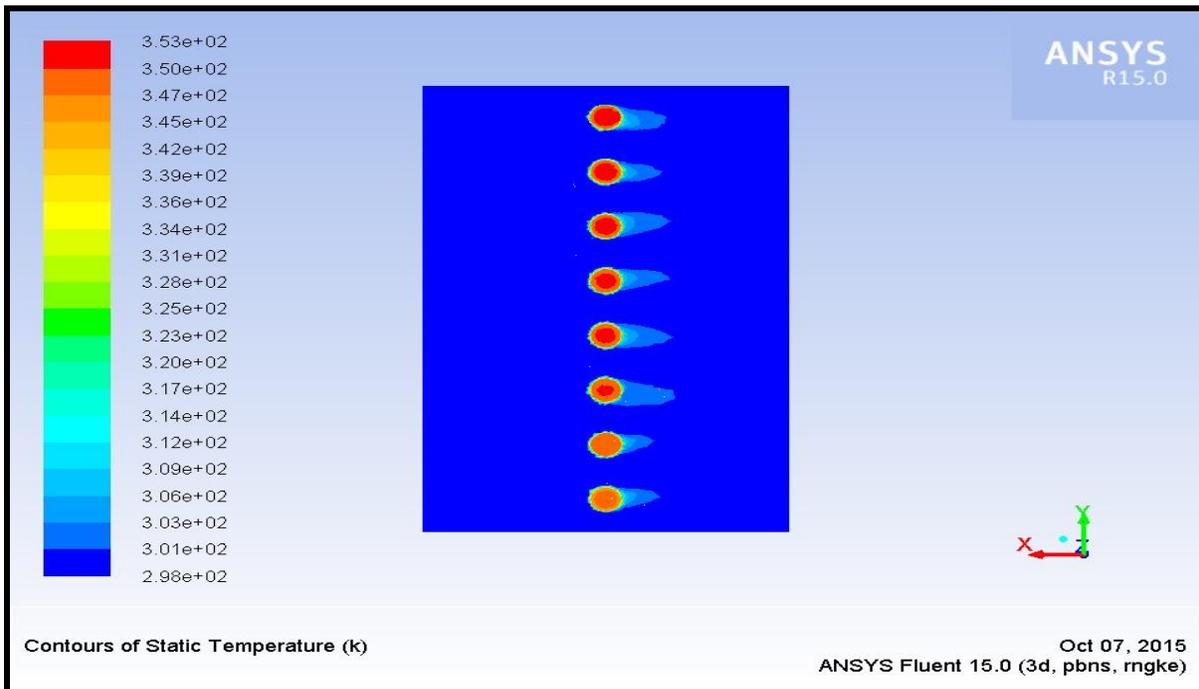


“(b)” Cross section.

Figure 4. Temperature contour of smooth tube heat exchanger with water at inlet temperature of (80 °C)



“(a)” Longitudinal section.



“(b)” Cross section.

Figure 5. Temperature contour of finned tube heat exchanger with water at inlet temperature of (80 °C)

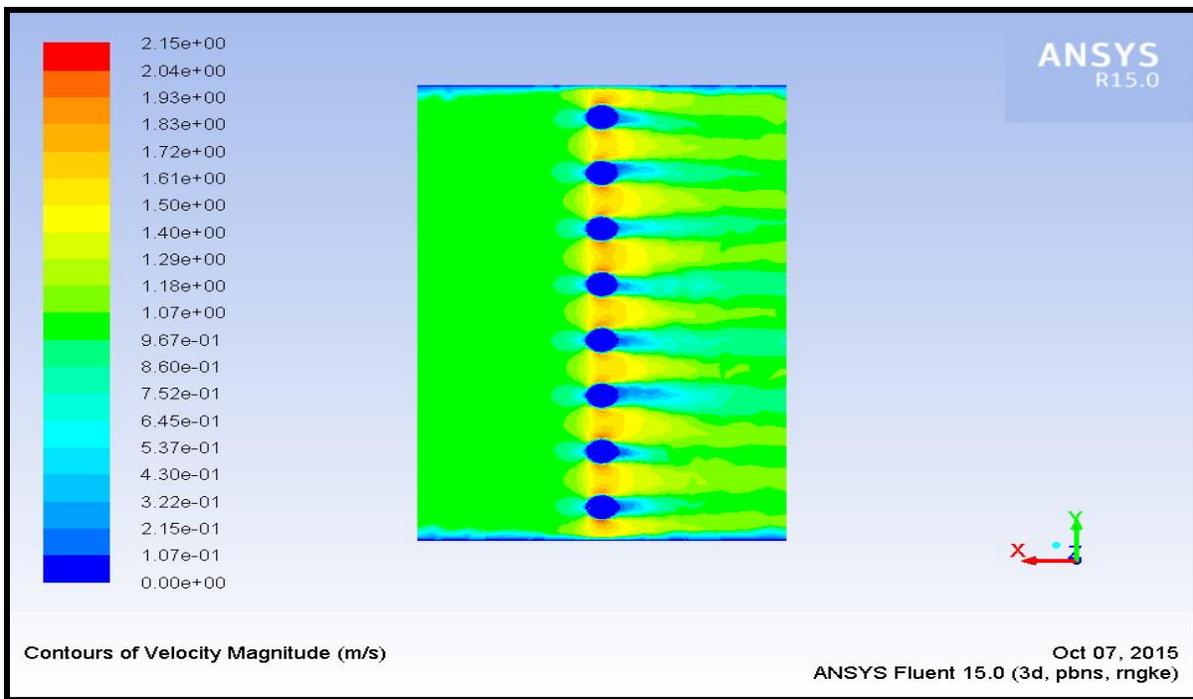
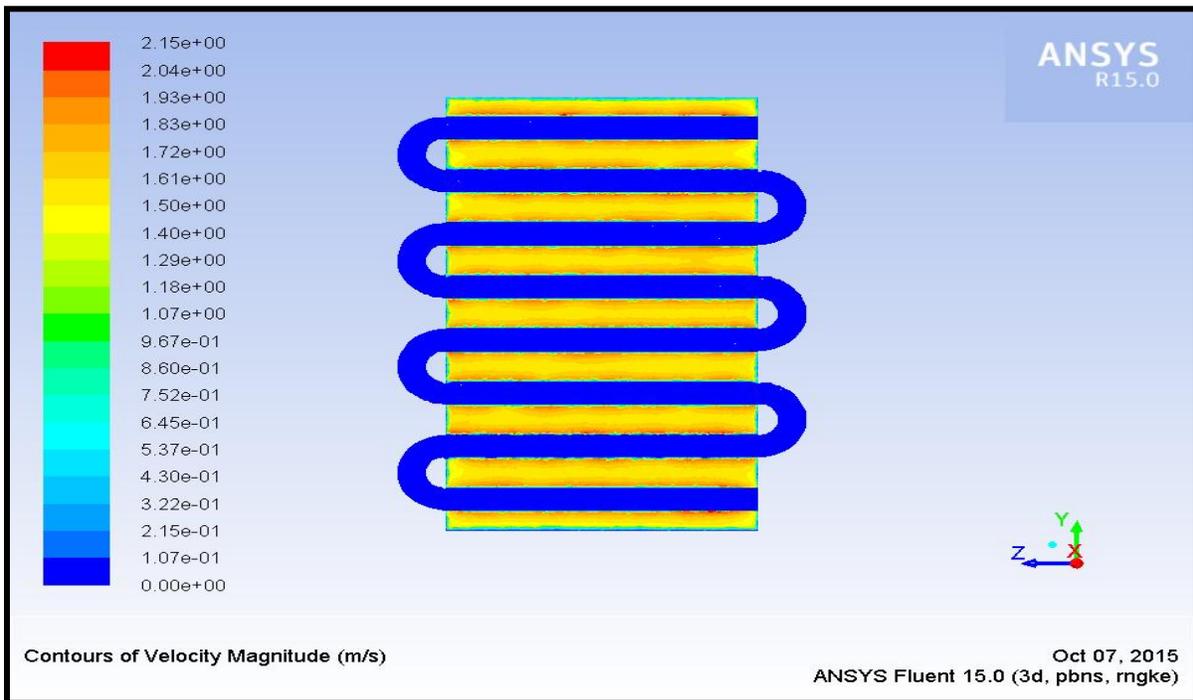


Figure 6. Velocity contour at air velocity of (1 m/s).

VI. VALIDATION

The experimental results for temperature difference are compared by numerical simulation produced by ANSYS FLUENT15 software as shown in figure 7. With maximum deviation of (+9.1%) between experimental and numerical results.

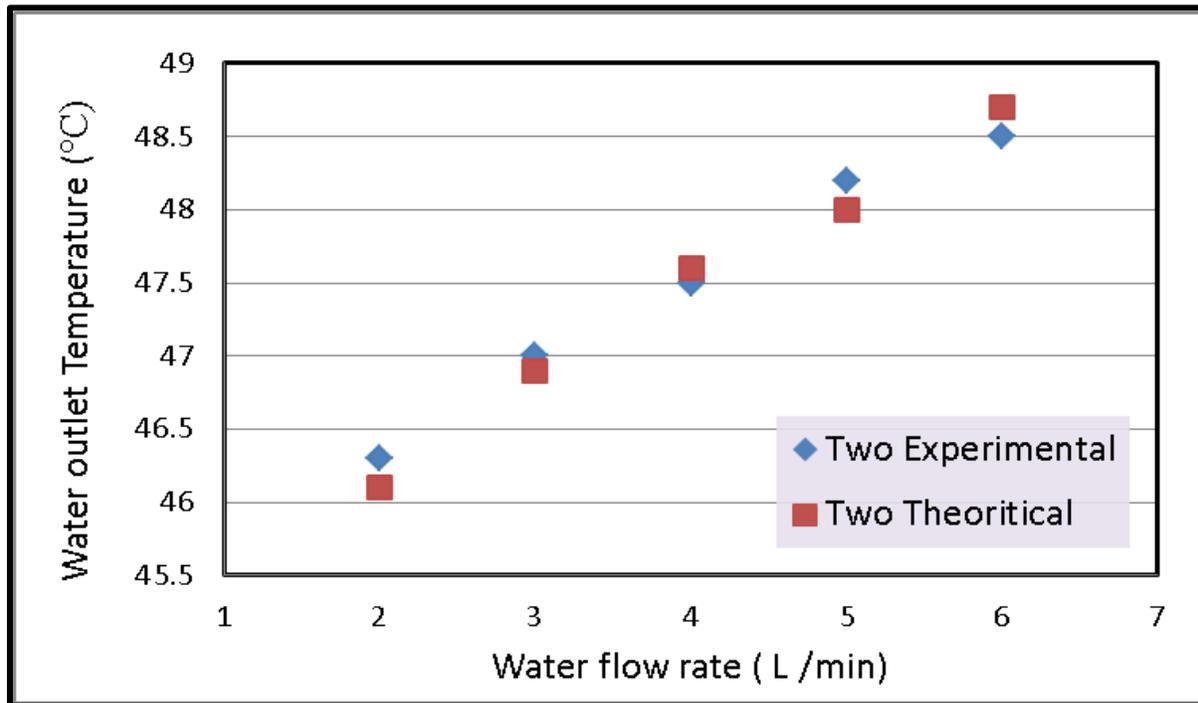


Figure 7. Comparison between experimental and CFD outlet temperature at inlet water temperature of (50 °C).

VII. CONCLUSION

The present study provide a CFD analysis for cross flow heat exchanger with smooth tube and low integral finned tube. The following conclusions can be detailed:

1. A gradient of temperature distribution along with test tube and the temperature difference are clearly appear in all cases.
2. The temperature difference increase with increasing the cooling air velocity and increase with decreasing the hot water velocity inside the tube.
3. The temperature gradient of finned tube is higher than that of smooth tube.
4. Good agreement is attain between the experimental and numerical results With maximum deviation of (+9.1%)
5. Ansys Fluent is good CFD program to to simulate the heat transfer cases.

VIII. ACKNOWLEDGMENTS

We would like to express our deep thanks and respect to all members of (College of Engineering / Mechanical Engineering Department at Wasit University) for their cooperation.

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Sixth Sense Technology

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Abstract- This paper deals with the new emerging technology The Sixth Sense. It's a wearable mobile interface that augments the physical world around us with the digitalised machine world. This technology bridges the gap between the digital world and real world just by allowing the interaction of humans with the machines through simple hand gestures. The category under which this technology falls is the Augmented Reality Technology. This paper eyes on the possible applications and outcomes of such technology and the advantages and drawbacks of the technology after sourcing or implementing it into real world for use. The most important are the technical challenges faced to get succeeded in future and enhancing it more for future and optimal use.

Index Terms- Augment reality, gesture recognition, wearable mobile device, mobile interface, Sixth Sense technology, Human computer interaction.

I. INTRODUCTION

At seeing today's scenario technology is developing at a very rapid speed. Humans are getting addicted to the technology and are getting habitual to it. This process in future will become very problematic for humans to survive. As this is changing humans according to the behaviour of the machine, soon manpower will get exhausted. Recently many technologies were launched in which one was introduced by Pranav Mistry at TEDx Talks. The area covered for research is the Artificial Intelligence in which it comes the Sixth Sense Technology. This integrates digital information into the physical world and its objects, making the entire world to be computer. It can turn any surface into a touch screen for computing, controlled by simple hand gestures. The device consists of several components connected together through Bluetooth or Wi-Fi with each other. The different components required are LED projector, cell phone, camera, mirror and some different coloured tapes to get recognised the gestures. The technology is mainly based on hand pattern recognition, image capturing, processing, and manipulation, etc. The software of the technology uses the captured video stream, which is captured by the camera, and also tracks the location of the tips of the coloured markers rolled on fingers to recognize the gestures.

II. SIXTH SENSE TECHNOLOGY

Sixth Sense Technology is that which allows people to interact physically with a digital world that has been augmented on their physical world, thus giving them the sense of having a sixth sense. It is a wearable device that projects visible digital data onto the physical world for users to interact with the digital

world.. The main idea behind this technology is to change the way people interact with devices and bridge the gap between the physical and digital world. The Sixth Sense device, presented by Mistry, consists of a short range projector, camera and mirror. These components are connected to a mobile device. The projector is meant to project images/videos on any wall or surface, the mirror helps to position these projections in front of the user who then interacts by hand gestures through coloured markers attached to each finger. These interactions are detected by the camera, and then passed on to the mobile phone for processing and performing required action for the user. Such simple arrangement and working has introduced a new way of interaction with devices. With such Sixth Sense device, a user can dial a phone number using the hand as key pad, check the timing on a palm watch that only appears when time needs to be checked, or take picture of an event by a simple hand gesture. The key to this lock here is that Sixth Sense recognizes the objects around , displays information automatically and let anyone access to it in every way one wants, in the simplest way possible.

The basic components used in technology are as follows:-

- A. Camera
- B. Projector
- C. Smart Phone
- D. Mirror
- E. Colour Markers

A) Camera

It acts as a digital eye which connects one to the world of digital information .Camera which works on the computer-vision based techniques which tracks user's hand gestures and captures images of the view at which the user looks and physical objects. Further, it transfers the images to smart phone.

B) Projector

A tiny LED projector, with a 3 hours battery backup, projects the visual information sent from the smart phone on any surface, wall or person used as interface.

C) Smart Phone

A Web-enabled smart phone in the user's pocket processes the video data, using vision algorithms to identify the hand gestures. Other software searches the Web and interprets the hand gestures.

D) Mirror

The mirror reflects image as projected by the projector, hung loosely on the neck of the user, on any surface.

E) Colour Markers

The user's fingers tips are marked with red, yellow, green and blue tapes. The movements and arrangements of these coloured markers are interpreted into patterns that act as interaction instructions for the projected application interfaces

III. FUNCTIONING

The hardware that makes Sixth Sense work contains a camera, a mirror and a projector and is connected to a Bluetooth of the smart phone that can slip comfortably into one's pocket. The camera recognizes individuals, images, gestures one makes with their hands. Information is sent to the Smartphone for processing. The downward-facing projector projects the image on to the mirror. Mirror reflects image on to the desired surface.

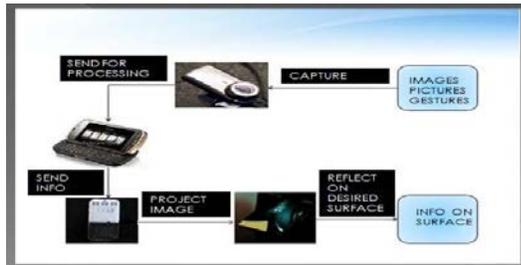


Fig. 1 Components of the Pendant

IV. APPLICATIONS OF THE SIXTH SENSE TECHNOLOGY

A) The map application lets the user study a map displayed on a nearby surface using hand gestures like zoom in zoom out etc.

B) The drawing application lets the user draw on any platform by tracking the fingertip movements of the user's index finger.

C) The camera helps user to take pictures of the scene he sees and later he can arrange them on any surface.

D) Enabling clock, inbox browsing, calendar, searching gallery, seeing contact list etc.

E) The device can tell arrival, departure or delay time of air plane on tickets.

V. CHALLENGES BEFORE SIXTH SENSE TECHNOLOGY

A) Hardware Limitations – The prototypes in the labs have not been assembled into a compact device, which can be used by user on daily basis, much due to hardware challenges.

B) Software Limitations - dependency on Microsoft code libraries; image processing challenges and accurate positioning and timing difficulties along with synchronization are the main obstacles before implementation.

C) Implementation Limitations – Conversion into a final product from ideas is still a challenge as no live demos are given, only recorded videos of the application are available.

D) Security and Privacy Issues: Hacking information from Facebook, taking pictures in public; a person could even obtain information about a total stranger in public due to the face recognition algorithm of the device are some problems to be concerned about.

E) Health and Safety Concerns: Brightness of projector on user's eyes; safety concerns with regards to wearing the device while driving are the major areas of concern.

F) Away from Reality – Over-reliance on the technology may grab the users away from the real world where no physical surface touch is available to feel.

G) Educational Aspects – Challenges exist in conducting virtual classes, the extent to which should be implemented and parents acceptance, which might take time.

VI. WINDOW FOR OPPURTUNITIES IN SIXTH SENSE TECHNOLOGY

Since its introduction, this technology has created ripples among the public, grabbing media attention and receiving great expectations from the people. Following are the areas for its brighter opportunities laying ahead -

A) A new technology with lots of potential:- With the ability to bridge the gap between the real and virtual world it is a step towards developing new methods of human-computer interaction.

B) Accessibility:- Sixth sense technology enables the user easy access and communication with the device using only the hand gestures.

C) Time Saving:- Tasks like taking pictures, can be done faster and on-the-spot without the need to take out any device outside the pocket and within a fraction of seconds the world is in your hands with the information one needs.

D) Financial Benefits:- The devices with sixth sense technology can be made light weight and small shape, that includes all features like Bluetooth, GPS, camera, Wi-Fi, microphone, speakers and touch pad, which will open doors for this invention in the market; from the production side, can be produced using cheap hardware components.

E) Many Features:- supports multi-touch and multi-user interaction; can be designed to recognise commands by speech or just a head tilt, and responds accordingly. The device can be designed to work on several platforms (like Google Glasses) like iPhone and Android and be used even in the dark due o projector or laser light.

F) Applicability:- Wide range of daily life applications from medical, manufacturing, visualization, pathplanning, entertainment and military to educational field where old traditional education system shifts to a fun and interactive one.

VII. CONCLUSIONS

Sixth Sense technology identifies the objects around us, displaying information automatically and letting us to access it in any way we need .The Sixth Sense device implements several applications that demonstrate the usefulness, flexibility and viability of the system. Allowing humans to interact with this information through natural hand gestures. The potential of becoming the lattermost "transparent" user interface for accessing information about everything around us. Currently the prototype of the device line around \$350 to build. It could change the way we interact with the real world and truly give everyone complete alertness and awareness of the environment around us. The Sixth Sense prototype implements several applications that expose the usefulness, viability and flexibility of the system. It will definitely revolutionize the world.

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Thermalstability and Photostability of new Azo dye

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Abstract- In this work Azo dye {(2,2'-(3,3'-dimethylbiphenyl-4,4'-diyl) bis (1-(2-hydrazinyl-3,5-dinitrophenyl)diazene)} have been prepared and characterized by, spectrophotometric method UV-Vis, FT-IR spectrum and ¹H-NMR spectrum. The absorption maxima was observed in the 464 nm, Thermogravimetric(TG) and differential scanning calorimetry (DSC) of this compound was measured, The photostability of azo dye in water occurred under UV irradiation processes. Dyeing process has on the dye prepared it gave good results. we have found that the colors of cotton fabrics after dyeing was orange

Index Terms- azo dye; Thermostability; Photostability

I. INTRODUCTION

Synthetic dyes are broadly used in paper printing, fabric dyeing , food , medicines, color photography, cosmetics and other manufacture⁽¹⁾.

Azo dyes are one of the very consequential and multilateral classify artifical organic compounds,with an immense variety of using^(2,3). Azo dyes which calcalate for 60 – 80% of the dyes consumed in fabric tretment^(4,5) are distinct by a typical double azo bond linkage (-N=N-), which is the most

frequent chromophore of azo dyes. Usually azo dyes have azo linkages between one to three, linking naphthyl rings or phenyl that are Usually substituted with some of functional groups for instance sulphonate, triazine amino, nitro, methyl, hydroxyl and chloro⁽⁶⁾.

Thermal analysis plays an major role in the study of the stability and structure of dyes. The application of some dyes for specific the thermal stabilities of them are also very important⁽⁷⁾.The resistance to uses and detect heat at elevated temperatures is one of the main properties required of dyes used in high temperature processes such as dyeing, printing and photocopying and in high technology areas for instance lasers and electro optical devices⁽⁸⁾.

The complex light-induced fading method of azo dyes corresponds to various factors and their chemical structures foroever play the most consequential role⁽⁹⁻¹³⁾.

Light fastness is an important factor in the determination of the useful life span of textiles. Light may produce two different fibrous materials; on the one hand the colour can fade, on the other hand changes in dyed photochemical degradation of the fibrous material can take place.⁽¹⁴⁾

Many factors effect the photostability of dyes , and these principally contain the chemical structure of the dye, The dye physical state on the fibre, the substrate chemical structure of, additives within the substrate, composition of atmospheric (water,oxygen and contaminants), temperature of the ambient and the spectral distribution of the incident light.⁽¹⁵⁾

We report here the synthesis, photostability , thermostabilities and application of new azo dye on cotton fabrics.

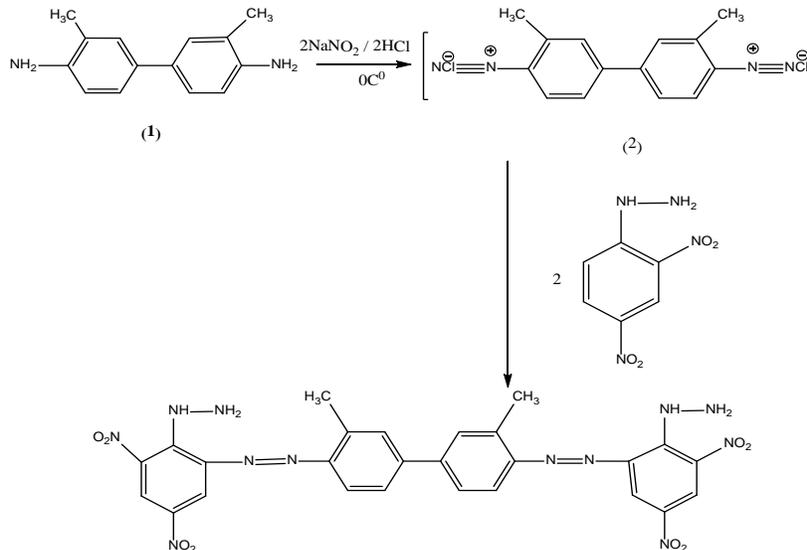
Chemical and Instruments

All chemicals used in this study were supplied from different international companies such as Merch, Fluke and BDH chemicals company, including; O-tolidine, 2-4dinitrophenyl hydrazin, ethanol, sodium hydroxide, and distilled water. The synthesized azo dye was subjected to infrared spectra were acquired KBr disc technique by using infrared SHEMADZU FT.IR-8400S and ¹HNMR .

Experimental procedures of Synthesis of azo dye

O-tolidine (2.12 g, 0.01mol) was dissolved in (3.5 ml) of concentrated HCl and (40 ml) D.W . The mixture was cooled at (-5C°) ice – water bath. Asolution of sodium nitrite (1.72 g, 0.02 mol) dissolved in (6 ml) of D.W , there was added adropwise to the mixture with stirring. In the other beaker 2-4 DNPH (2.96 g, 0.02 mol) dissolved in (1.32 g) of NaOH dissolved in (44ml) of D.W and place this beaker in ice-water bath

at (-5°C). The cold diazonium chloride was added to the coupling agent in small portions and stirred after each addition, Acompleting the addition , the reaction mixture was stirred less than (0C°) for (15) minutes. The black end result was precipitated and filtered recrystallized from ethanol yiled(2,2'-(3,3'-dimethylbiphenyl-4,4'-diyl)bis(1-(2-hydrazinyl-3,5-dinitrophenyl)diazene)



Schem (1) step of preparation of azo dye

Photostability experimental procedures

Samples of dye solution was irradiated with a UV source for 10,20, 30, 40, 50 ,60, 70, 80 ,90 and 100 min , in this experiments conducted in the photoreactor with a circulation water at 298±2 K, that were during process of the light irradiation . A 200 mL of dye solution was placed into the reaction container. At 10 min intervals, about 2 mL dye solution was collected and the UV-vis absorption ranging from 200 nm to 800 nm was measured using UV- Spectrophotometer . The decoloration proportion of azo dye was calculated by the following formula:

$$(\text{Decoloration } \%) = (A_0 - A) / A_0 \times 100\%$$

where A and A₀ are the residual and initial absprption of dye solution each in order.

Dyeing experimental procedures

In this research we have been dyeing cotton tissue by dye prepared, according to dyeing azo dye way (Azotic Dyes) which called dyeing snow and are in accordance with the following steps:

- 1- Prepare raw cotton tissue through the removal of starch , good boiling and bleaching.
- 2- Dissolve the dye: dye prepared dissolved in 10 ml of ethanol and 0.2 ml of sodium hydroxide and then complete the volume to 150 ml with distilled water at pH equal to 10.
- 3- Gmarat raw cotton in the soda for 30 minutes in a water bath containing 0.0004M sodium nitrite solution and 0.9 ml of HCl acid and 150 ml of distilled water in 15-20 ° C. Then raw dried degree normal temperature
- 4- put the cotton tissue in the bathroom of the display, which contains 0.1 g of dye and 1 ml of sodium hydroxide concentration of 0.32 M and continue treatment for 30 minutes in temperature 10- 15. Oevdil use of ice as it is obtained is usually the best results at low temperatures .
- 5- Washed raw in a soap bath and sodium carbonate to remove the dyeing materials outstanding Bavh for true color And thereby improve the stability force against the light, washing and friction, then removed the soap solution by rinsing process, a washing with cold water and dried

Result and discussion

The new prepared dye known to be one of thermal and photo stable materials⁽¹⁸⁾.

The chemical structure of the dye 2,2'-(3,3'-dimethylbiphenyl-4,4'-diyl)bis(1-(2-hydrazinyl-3,5-dinitrophenyl) diazene was determine by FT-IR, ¹H-NMR, and UV-Vis spectra. UV-Vis absorption spectra of dye solution was registered in methanol, the absorption maxima(λ max) of dye was found in 464 nm fig. 2 .

FT-IR fig. (3) which showed appearance bands at (1598-1543) cm^{-1} of stretching vibration of two (N=N) groups. Stretching vibration of (C-H) of alkyl group in o- tolidine appear at (2904) cm^{-1} , the appearance band at (3417-3277) cm^{-1} stretching vibration of two hydrazone -NH groups, the band at (1234) cm^{-1} stretching vibration of (N-N) groups.

The ¹H-NMR spectra signals at 2.8 ppm due to the existence of methyl groups in o- tolidine in the compound, signals (7.2-7.8) ppm due to aromatic protons of new compound , 8.5 ppm (hydrazone NH).These signals depict more characteristic prove for the formation of this compound fig(4).

Direct irradiated under ultraviolet (UV) light alone of dye solution shown in Fig. 5. The efficiency of degradation of dye solution was calculated to be 5.771% at 100 minuts by using 1×10^{-4} M concentration of dye solution .

These results show that much better stable for the dye under UV irradiation was occur when the azo solution was irradiated by UV light only. The values of the efficiency of degradation after irradiation for the difference times increases with time, especially after 100 min,indicating that the photostability of dye is usually accepted ⁽¹⁵⁾ that the photooxidation of azo dyes consist of attack by photochemically create singlet oxygen⁽¹⁶⁾.the photostability can be personal quality to the auxochromes which mean electron-withdrawing or electron-donating substituents that make more acute in color of the chromophore by altering the total energy of the electron system for each dye⁽¹⁷⁾.

Thermal stability that was measured and represented in Figure 6. It shows that the dye started decomposing at 290°C and its weight losing was 68.27% up to the temperature studied (600°C) , and this showed that the sample dye has thermal stability up to 290C°. And photooxidation process shown photostability for dye.

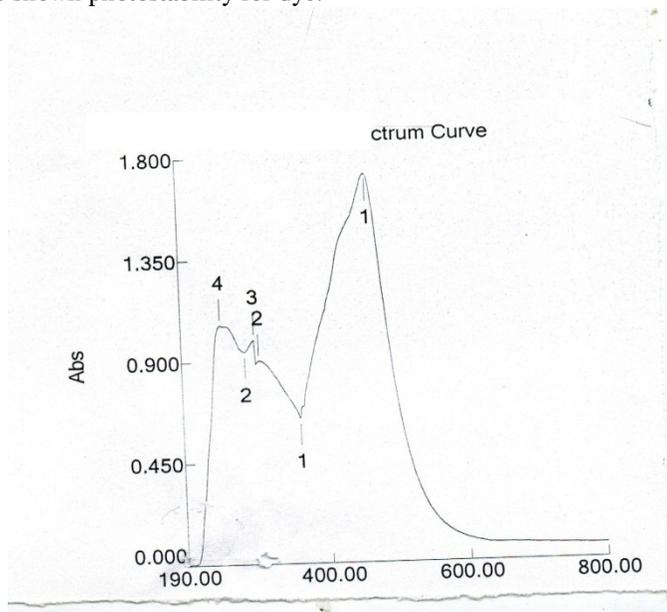


Fig. (2): UV-Vis absorption spectra of dye

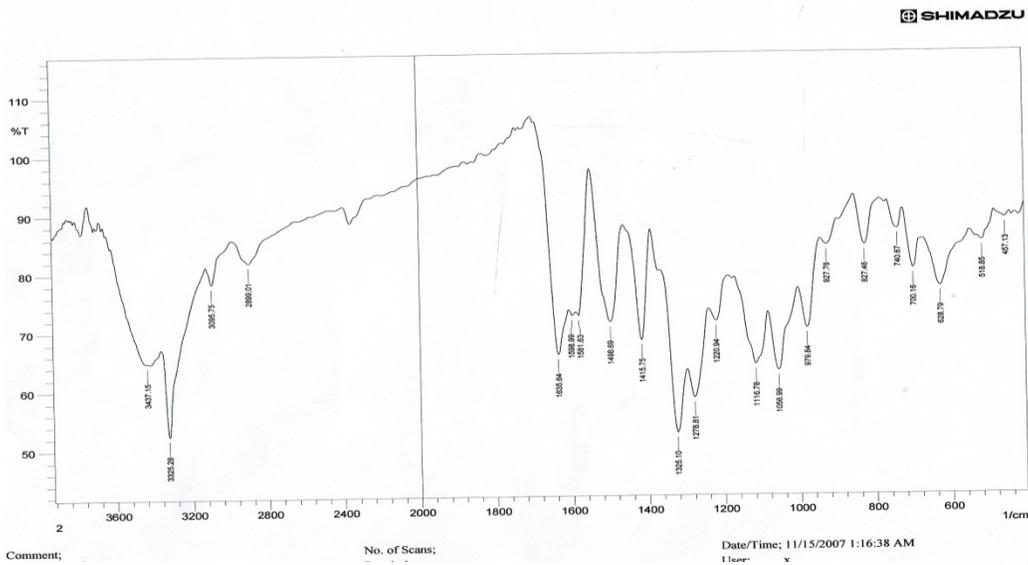


Fig. (3) : FT -IR spectra of dye

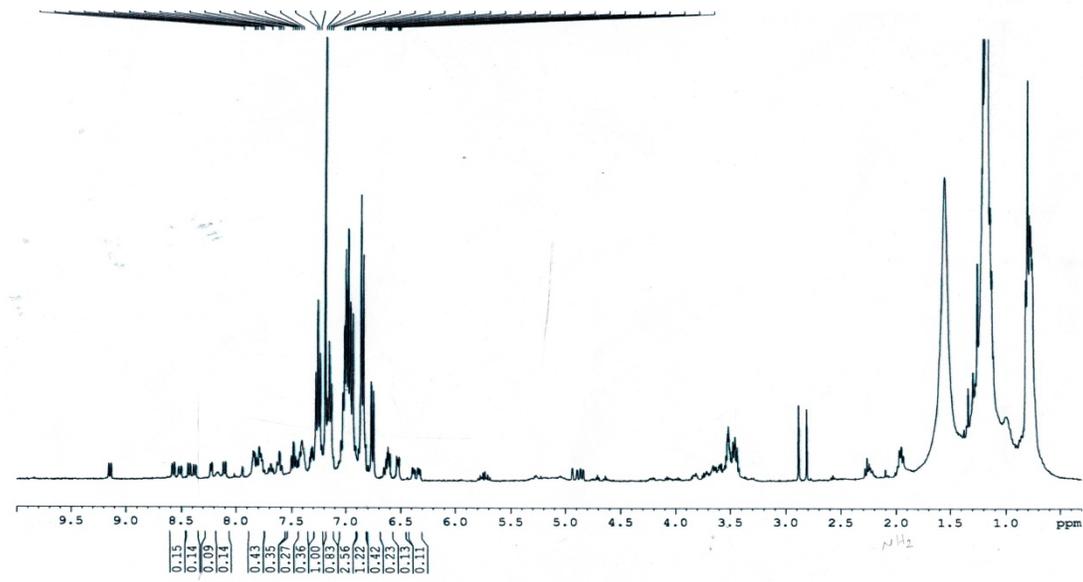


Fig. (4) : HNMR- spectra of dye

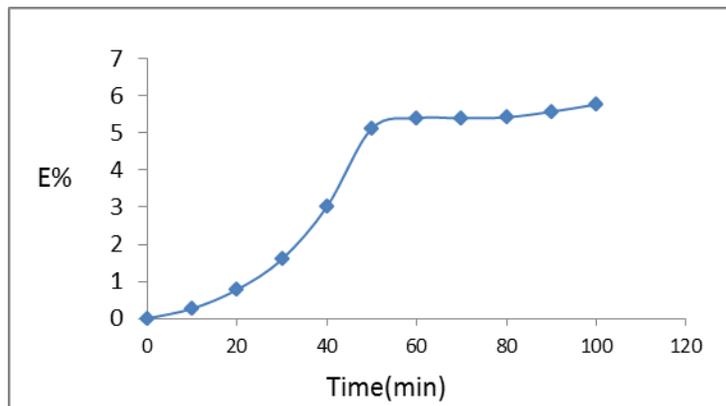


Figure 5. The efficiency of degradation of dye at differant

From Figure.6 it is shown that the weight losses observed between 50-150 C°, 150-290 C° and 290-600 C°. The temperature limits (50-150 C°) is assigned to the loss of hydrate water, and the other vary within values are refer to the decomposition stages of dye. From the TG curves in Figure 6, the weight change were 7.187%, 68.27% and 23.53% at a heating rate 10°C/min.

The DSC curve of dye gives two endothermic peaks at 75 C° which mention to dehydrate of water and at 230 C° this endothermic peak corresponding to melting of compound at 230 C°, the DSC curve shows exothermic peak at 600 C°. This information propose that the thermal stability of the dye.

consequently, the TG and DSC studies on dye showed that they can be used for many uses applications in types fields like as fabric fibres, that need thermal stability until to 150 C°.

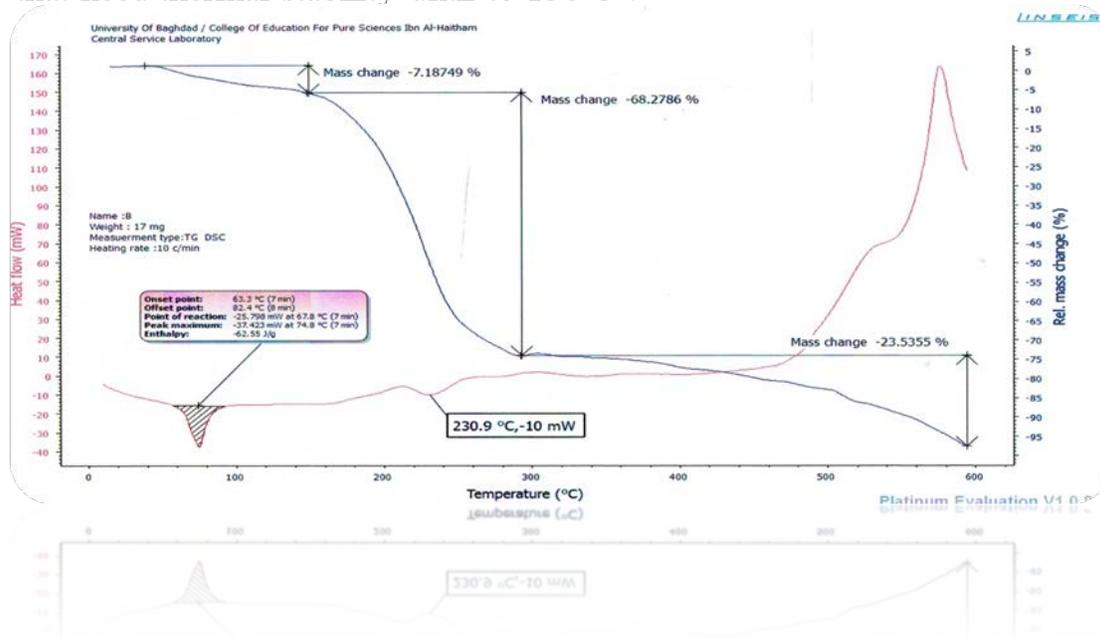


Fig.(6): TG and DSC curve of dye

Dyeing process has on the dye prepared dyeing process has in the acidic environment and has adopted a method of the snow dyeing, which is concerned with azo dyes only Because being prepared at low temperatures insatiab seersucker alkaline solution has been subjecting the samples dyed with dyes prepared a series of tests that usually take place after the pigments applied to cotton fabrics for the purpose of evaluation. The most important of these tests, the extent of resistance to sunlight and laundry detergents and color stability⁽²⁰⁾. As it gave good results. we have found that the colors of cotton fabrics after dyeing was orange.

II. CONCLUSIONS

The azo dye was synthesized by diazotisation- coupling and oxidation reactions in good yield shows greatly better photostability beneath UV irradiation and thermostability, it λ_{max} was observed at 464 nm .The decomposition temperatures of dye was found to be in the range 290–600 C°. The dye was better stable when the dye under UV irradiation, consequently, the thermal and photo stability studies on dye showed that

can be used for versatile applications in several fields which require photo and thermal stability . Dyeing process has on the dye prepared it gave good results. we have found that the colors of cotton fabrics after dyeing was orange

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Enhancement Factor Simulation of H₂S Absorption by Fe₂(SO₄)₃ Aqueous

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Abstract- The study aims to compute the enhancement factor (E) of the absorption of H₂S by aqueous Fe₂(SO₄)₃ solution with second order irreversible chemical reaction at isothermal condition. The study was conducted theoretically simulation program. The value of E was computed based on the derivation of the basic equation of film model absorption, and then the non linear film theory equations are solved numerically using orthogonal collocation method under MATLAB program.

Mass transfer film thickness is assumed to be equal. The value of E Independent various parameters such as dimensionless Hatta Number, concentration of solvent, and liquid flow rate was studied.

The value of Hatta Number was varied for fast reaction regime. However, under fast reaction regime, increasing these parameters will increase the value of Enhancement factor. This means that the absorption phenomena is more controlled by reaction and diffusion process rather than gas solubility.

Keywords: gas absorption, modeling, enhancement factor

I. INTRODUCTION

Hydrogen sulfide is being produced by many industrial activities such as petroleum refining, natural gas and petrochemical plants, viscose rayon manufacturing craft, pulp manufacturing, food processing, aerobic and anaerobic wastewater treatments and many other industries [1]. Sour gas contains hydrogen sulfide gas and ammonia. The existence of hydrogen sulfide in sour gas is very disturbing, besides it smells bad, on combustion it will evolve (SO₂) gas which pollutes environment, in global, it will cause acid rain. So that, it needs to be eliminated from sour gas.

For well-known reasons, the reactive absorption of a gas in liquid is normally preferred over physical absorption A.L. Kohl et al. [2]. In the reactive absorption of a gas in a liquid, the contribution of the chemical reaction to the enhancement of the mass transfer rate is traditionally quantified by a term called enhancement factor (E). This parameter needs to be quantified accurately for a good design of the gas-liquid contactor.

In gas absorption in which gas-liquid mass transfer is accompanied by a chemical reaction in the liquid phase the gas absorption rate may be enhanced significantly. Generally, the chemical reaction enhances the rate of absorption because it depletes the diffusing in the region of the interface producing a steeper concentration gradient, for describing this effect the enhancement factor concept is applied, in which the enhancement factor, E, is defined as : the ratio of the specific rate of gas absorption in a reactive liquid to the specific rate of absorption under identical conditions in a non-reactive liquid (physical mass transfer). Due to the importance of this enhancement factor for design purposes, several theoretical models have been developed to calculate this effect.

While a large number of mass transfer models is available in literature to describe the absorption process in gas-liquid systems with a well-defined liquid bulk K.R. Westerterp et al. [2], only three mass transfer models based on the film, penetration and surface renewal theories respectively are widely used to predict the contribution of the chemical reaction in enhancing the mass transfer rate (enhancement factor). Although for a wide range of operating conditions, the film model gives similar enhancement factors as those of the other two models, it is physically unrealistic and should therefore only be chosen because of its ease of use.

The penetration and surface renewal models involve unsteady-state diffusion with chemical reaction. As analytical solutions for the above mass transfer models are available for only certain asymptotic conditions, numerical solutions are generally required. Numerical solution of the mass transfer models is usually laborious and complex, necessitating the development of approximate solutions for calculating the enhancement factors based on one of the above mentioned mass transfer models. D.W.van Krevelen et al [2] developed an approximate solution for the enhancement factor based on the film theory. Yeramian et al. [2], Hikita and Asai [2] proposed approximate solutions based on Higbie's penetration theory. Onda et al. [2] and DeCoursey [2] have provided approximate solutions based on Danckwert's surface renewal theory. It should be noted that the above-cited references for the approximate solutions to various mass transfer theories are only indicative, as considerably more information is available in literature. Generally, the film model is regarded as the most simplified an, therefore, physically most unrealistic model.

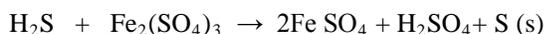
To solve a full numerical scheme using the above theories a number of mass balance are needed to describe the system. These are typically formulated as non-linear partial differential equations. Even with the current technological advances, solving a full numerical scheme is still computationally heavy. One way to reduce the complexity of a mass transfer model is to introduce the

enhancement factor, which is defined as the ratio of mass transfer from chemical absorption compared to physical absorption. It is therefore a relative factor which indicates the improvements of a reactive solvent compared to a physical non-reactive solvent. The enhancement factor is preferred in process simulations since it reduces the computational load. Several enhancement factor approximations were developed during the last century. One of the pioneering works is the simplified approach introduced by van Krevelen and Hofstijzer (1948). It describes the mass transfer rate of a reactive system in the pseudo-first order regime. It describes the mass transfer rate of a reactive system in the pseudo-first order regime. Later, an algebraic method for a second-order reversible reaction was presented by Onda et al. (1970). Since then, various approximate models were derived for well-defined reaction regimes and reaction kinetics [3]

A Hatta number \sqrt{M} and the instantaneous enhancement factor E_i are used in the calculations. The Hatta number is a relative parameter which compares the rate of reaction in a liquid film to the rate of diffusion. Thus a large Hatta value implies a much higher reaction rate compared to diffusion. Hence the reaction takes place mostly in the film. The instantaneous enhancement factor shows the intensification of a transfer phenomenon by an instantaneous and irreversible reaction. It corresponds to the asymptotic maximum limit of mass transfer enhancement. The approximate film model adjusts the instantaneous enhancement factor of the film to account for diffusivity differences of the species in the liquid film. It was concluded that the approximate film theory developed by Han and Rochelle (1982) compares well to the surface renewal model and it is also equivalent to the penetration theory. The traditional two-film model on the other hand differs to the surface renewal model especially at high Hatta numbers and large differences in diffusivity [3]

It is clear from the previous work on gas absorption with chemical reaction that the literature on isothermal gas absorption with irreversible chemical reaction is still inadequate. And the aim of present study is to analyze the absorption of gas accompanied by irreversible reaction in isothermal condition.

In this study, the chemical absorption of hydrogen sulfide into aqueous ferric sulfate has been studied on a sieve trays column has not done yet. In this process an aqueous $Fe_2(SO_4)_3$ solution is used as an absorbent. H_2S is absorbed and oxidized to elemental sulfur [4]. At the same time, Fe^{3+} is reduced to Fe^{2+} according to



II. MATERIALS AND METHODS

This study was carried out by developing mathematical model and simulation program to estimate enhancement factor for gas absorption accompanied by irreversible chemical reaction in isothermal condition based on film mass transfer model. (See Fig.1).

Several models have been proposed to describe these phenomena. Attention will be focussed only on the simple two-film model. In the two-film model (Fig. 1) a stagnant film is assumed at both sides of the interface and all resistance to mass transport is localized in these two films. This means that concentration gradients will only develop in these films [5]. It is further assumed that no resistance to transport occurs at the interface itself, so that the interface concentration of the gaseous component in the solution is related to the interfacial partial pressure by Henry's law:

$$p_{Ai} = H C_{Ai}$$

(1)

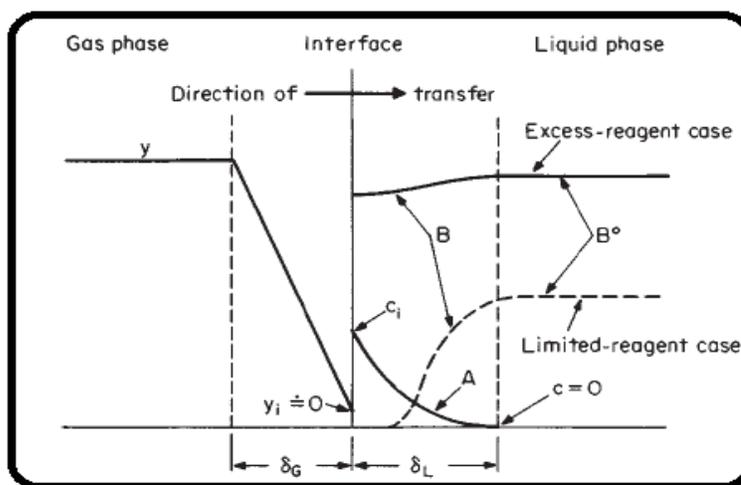
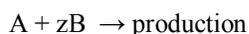


Figure. 1: Gas phase and liquid phase solute concentration profiles for second-order reaction

If a reaction



(2)

is carried out, the following continuity equations in the liquid film for both reactants hold :

$$D_A \frac{d^2 C_A}{dx^2} = r \qquad r = k C_A^n C_B^n \qquad (3)$$

$$D_B \frac{d^2 C_B}{dx^2} = zr$$

with boundary conditions

$$(4) \quad C_A = C_{Ai} \quad \text{and} \quad dC_B/dy = 0 \quad \text{at} \quad x = 0$$

$$C_A = 0 \quad \text{and} \quad C_B = C_{Bo} \quad \text{at} \quad x = \delta$$

For not too rapid reactions, the depletion will be moderate and the *B* profile will remain rather flat. With increasing rate, the depletion will become more severe and pronounced *B* profiles will develop. The limiting case of the instantaneous regime is reached when *B* becomes fully depleted at the interface[5]. The set of equations for a second order reaction with *z*=1 reads:

$$D_A \frac{d^2 C_A}{dx^2} = k C_A C_B \qquad (5)$$

$$D_B \frac{d^2 C_B}{dx^2} = k C_A C_B$$

and appropriate boundary conditions as given in relations (4). There is no analytical solution for Eqs (5), and a rigorous analytic expression for the enhancement factor cannot be given. However the enhancement factor can be obtained from numerical integration of the set of Eqs. (5). This is facilitated by reshaping these equations into dimensionless form. Introducing the dimensionless variables

$$A = \frac{C_A}{C_{Ai}} \qquad B = \frac{C_B}{C_{Bo}} \qquad X = \frac{x}{\delta} = \frac{k_1 x}{D_A}$$

$$dA = \frac{dC_A}{C_{Ai}} \qquad dB = \frac{dC_B}{C_{Bo}} \qquad dX = \frac{dx}{\delta} = \frac{k_1 dx}{D_A} \qquad (6)$$

$$M = \frac{k_2 C_{Bo} D_A}{k_L^2} \qquad E_i = 1 + \frac{D_B C_{Bo}}{D_A C_{Ai}}$$

the general Eqs. (5) are transformed into

$$\frac{d^2 A}{dX^2} - MAB = 0$$

$$\frac{d^2 B}{dX^2} - \frac{MAB}{E_i - 1} = 0 \qquad (7)$$

The set of equations is now integrated numerically for a series of values for the two parameters *E_i* and *M* and the enhancement factor evaluated as well. The isothermal enhancement factor can be predicted in equation (8), where the value of *E_i* can be estimated using orthogonal collocation method. [6]. The enhancement factor for the isothermal case is defined, similarly as

$$E = \frac{\bar{R}}{k_L C_{Ai}} = \frac{-D_A [dC_A/dx]_{x=0}}{k_L C_{Ai}} \qquad (8)$$

The enhancement factor which computed by approach adopted from Van Krevelen and Hoftijzer (1948) [6] and given by the equation:

$$E = \frac{\sqrt{M \frac{E_i - E}{E_i - 1}}}{\tan h \sqrt{M \frac{E_i - E}{E_i - 1}}} \qquad (9)$$

Numerical Solution (Interface Modeling)

The exit improvement to be introduced into the collocation method is to choose orthogonal polynomials for trial function. For simplicity in deriving the derivative matrices we can also write the series as [7]

$$y(x_j) = \sum_{j=1}^{N+2} d_i x_j^{i-1}$$

(10)

Taking the first and second derivatives of Eq. 10 we evaluate them at the collocation points. We take the collocation points as the N roots : these roots are between 0 and 1 ($x_1 = 0$ and $x_{N+2} = 1$). The location of the n internal collocation points (x_2 to x_{N+1}) are determined from the roots of the polynomial $P_n(x) = 0$, this points is described as following. [7]

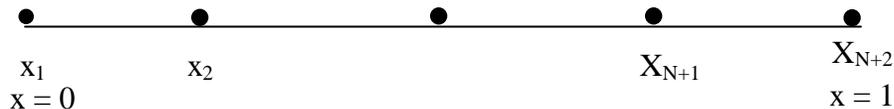


Figure. 2. Collocation Points Position.

The derivatives of Eq, 10 at the $N+2$ collocation points are

$$\frac{dy}{dx}(x_j) = \sum_{j=1}^{N+2} d_i(i-1)x_j^{i-2} \tag{11}$$

$$\frac{d^2y}{dx^2}(x_j) = \sum_{j=1}^{N+2} d_i(i-2)(i-2)x_j^{i-3} \tag{12}$$

The equations above could be written in matrix notation Q , C and D . Matrices Q , C and D are matrices of size $(N+2) \times (N+2)$. Eq. (10) may be presented in matrix notation as

$$y = Q.d \tag{13}$$

where d is the matrices of coefficient and

$$Q_{ji} = x_j^{i-1} \begin{matrix} i=1,2,\dots,N+2 \\ j=1,2,\dots,N+2 \end{matrix} \tag{14}$$

Solving Eq (10) for d we find

$$d = Q^{-1}.y$$

from the derivative of y in Eq (11) which in the matrix form become

$$\frac{dy}{dx} = Cd = CQ^{-1}y = Ay \tag{15}$$

where

$$C_{ji} = (i-1)x_j^{i-2} \tag{16}$$

For the derivative of y in Eq. (12) can be written in matrix form [7]

$$\frac{d^2y}{dx^2} = CQ^{-1}y = Ay \tag{17}$$

where

$$\frac{d^2y}{dx^2} = DQ^{-1}y = By \tag{18}$$

$$D_{ji} = (i-1)(i-2)x_j^{i-3} \tag{19}$$

With orthogonal collocation method, the collocation equation made an A_i , B_i , explicit to be solved by successive approximation method .[7]

$$\frac{d^2y}{dx^2} = \sum_{j=1}^{n+2} D_{ij}y_j; \frac{dy}{dx} = \sum_{j=1}^{n+2} C_{ij}y_j \tag{20}$$

For component A

$$A_i = \frac{\sum_{j=1}^{N+2} D_{ij}A_j - D_{ii}A_i}{(MA_i - D_{ii})} \tag{21}$$

For component B

$$B_i = \frac{\sum_{j=1}^{N+2} D_{ij}B_j - D_{ii}B_i}{\frac{MA_i - D_{ii}}{S}}$$

The system of non linear differential equations was solved using orthogonal collocation method and collocated equations described as non linear algebraic equations was solved using orthogonal collocation method.

Sherwood and Holloway (1940) in Danckwerts (1970) give the following expression for k_L and a [6]

$$k_L = 0.42 \left(\frac{g\mu}{\rho} \right)^{\frac{1}{3}} \left(\frac{D_{AB}\rho}{\mu_L} \right)^{\frac{1}{2}} \quad (22)$$

$$a = 0.38 \left(\frac{u}{u_t} \right)^{0.775} \left(\frac{u\rho}{nd\mu_L} \right)^{0.125} \left(\frac{g\rho}{d\sigma} \right)^{\frac{1}{3}} \quad (24)$$

Here u is the velocity of rise of the bubbles in the froth (taken to be 26.5cm/s under most conditions), n the number of holes per unit area of plate .

For sieve trays, Chan and Fair (1983) give the following expression for gas-phase mass-transfer coefficient $k_G a$ [9].

$$k_G a = \frac{316D_G^{1/2}(1030f + 867f^2)}{h_L^{1/2}} \quad (25)$$

Where : f = approach to flood, fractional

The interfacial Concentration of H_2S gas dissolved at interface estimated from solubility data following Henry's law and by considering gas side resistance that is,

$$C_{Ai} = \frac{k_G P_A + E.k_L C_A^0}{E.k_L + k_G H_e} \quad (26)$$

Ferric sulfate solution is used for H_2S absorption the reaction rate can be expressed as [8]

$$r = k C_{H_2S} C_{Fe^{3+}}$$

(27)

By assuming that the kinetic constant varies with temperature according to an Arrhenius function, the activation energy can be calculated. Therefore the reaction rate constant values were obtained as a function of temperature [8]

$$\log k = 9.3855 - \frac{2636.6}{T} \quad (28)$$

IV. RESULT AND DISCUSSION

In this study were assumed steady state and isothermal condition and this study of simulation comprises sieve trays column 70 cm in diameter filled with sieve trays 50 cm spacing to the height of 450 cm. Simulation the absorption of H_2S from sour gas.

This study presents a summary of the important features of the effect of chemical reaction on the absorption process expressed in the terms of enhancement factor. Figure.1 and Fig.2 shows enhancement factor (E) versus Hatta number \sqrt{M} plot with E_i as parameter for absorption of H_2S in $Fe_2(SO_4)_3$ solution of finite depth accompanied by an irreversible second order reaction in the sieve tray column. Simulation conditions : H_2S inlet mole fraction was $y_{Ain} = 0.28875$, $G = 751144.763 \text{ cm}^3/\text{s}$, $L = 10000 \text{ cm}^3/\text{s}$, $C_{(Fe_2(SO_4)_3)}$ was $0.002 \text{ mol}/\text{cm}^3$, temperatures 30°C .and pressure = 1 atm

E is the enhancement factor, the factor by which the of absorption is increased by the reaction. E_i is the enhancement factor corresponding to instantaneous reaction.

Figure.1 shows numerical simulation results for the enhancement factor E as a function of Hatta number \sqrt{M} according to the film theory, calculated according to Eq. 8 with E_i parameter. For a given value of E_i an increase in \sqrt{M} brings about an increase in E until a limiting value is approached where $E = E_i$. The value of $E_i = 50$ shows the highest E value compared to the value $E_i = 4$ and $E_i = 20$. Increasing the value of E_i will decrease the amount of gas A absorbed and value of E will increase proportionally. The similarity between this figure and the familiar van Krevelen Hoftijzer plot for isothermal absorption of H_2S is apparent; one can find a remarkable similarity between Fig .1 and the traditional E versus \sqrt{M} plots. For a given E_i , the enhancement factor tends to reach an asymptotic value which is determined by the instantaneous reaction regime. Increasing the value of E_i will increase the amount of H_2S absorbed and value of E will increase proportionally.

With the same value of parameter used in Figure.1, E is plotted as a function of \sqrt{M} with the value of $E_i = 6.6$ in Figure.2. In this figure shows the compares between the numerical simulation data of the film model and Krevelen and Hoftijzer equation (adapted as per Eq.9) for enhancement is given for the same asymptotic enhancement factor. The curve of E vs \sqrt{M} shows that for low values of \sqrt{M} the absorption takes place in the slow reaction regime, and therefore is E nearly equal to 1, while for the higher values of \sqrt{M} the transition to the fast regime takes places

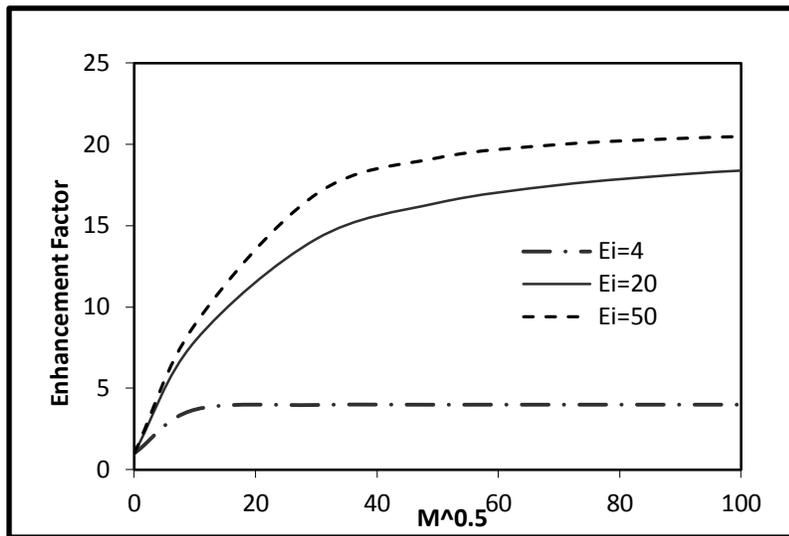


Figure. 1: Variation of the Enhancement Factor with Hatta Number for different values of E_i

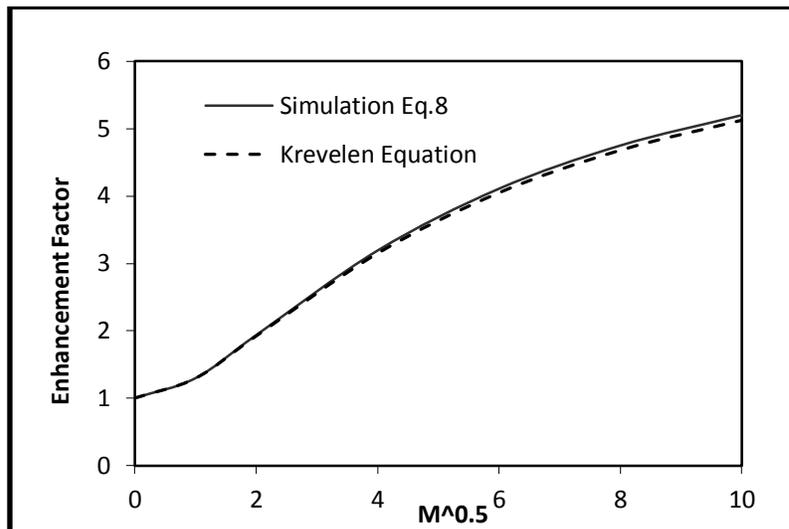


Figure.2: Relationship between simulation data and Krevelen and Hoftijer equation for Enhancement factors $E_i = 6.6$

Figure.3 shows with the same value of parameter used in Figure.1 with different concentrations of $\text{Fe}_2(\text{SO}_4)_3$ (1, 3, and $4\text{mol}/\text{cm}^3$). The variation of the enhancement factor at different $C_{\text{Fe}_2(\text{SO}_4)_3}$ is simulated in Figure.3 the result shows the effect of the concentrations of $\text{Fe}_2(\text{SO}_4)_3$ on the enhancement factor. The enhancement factor increases with increased concentration of $\text{Fe}_2(\text{SO}_4)_3$ because with increasing $C_{\text{Fe}_2(\text{SO}_4)_3}$ increasing chemical reaction rate, i.e. increasing Hatta number, enhancement of mass transfer occurs resulting in an increased concentration. They are better known when the solution behaves more like pure H_2O . A decrease in the $\text{Fe}_2(\text{SO}_4)_3$ concentration will decrease the amount of H_2S removed from the sour gas and this could affect the statistical results; the difference of removal from one run to another could be so small that there would not be much difference between results,

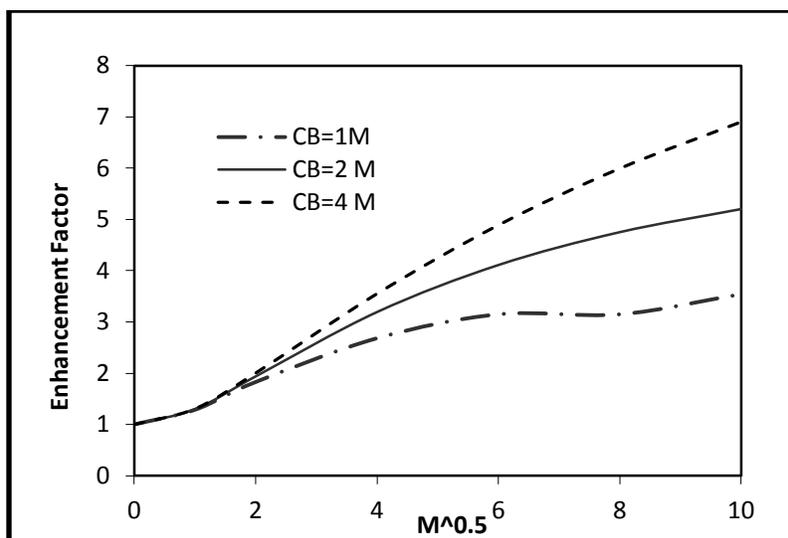


Fig.3: Effect of $C_{Fe_2(SO_4)_3}$ on Enhancement factors as function of \sqrt{M}

V. CONCLUSION

In this paper, a description of mathematical modeling and simulating for the isothermal gas absorption with chemical reaction in the sieve trays with the sample calculation of H_2S with $Fe_2(SO_4)_3$ solution was studied by means of numerical simulations. In this contribution, it was shown that approximate solutions for the enhancement factor, developed originally for mass transfer with chemical reaction. A fundamental description of isothermal mass transfer accompanied by irreversible chemical reaction has been presented, isothermal enhancement factor is dependent on the parameter E_i , and also on the concentration of solvent. The present work develops a film method for enhancement factor calculation. The model also is compared with the van Krevelen model. The numerical model used for the comparison is based on the two-film theory.

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Evaluation of Nurses Practices Concerning Sterile Techniques Critical Care Units in Al-Najaf AL-Ashraff City Hospitals

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Abstract- Background: Acquired hospital infection most of factors responsible for morbidity and mortality ,especially in critical care units , it is one of most dangerous units because they are crowded with patients who are much closer to each other as well as the most frequently penetrating procedures of the skin and mucous membrane beside that the length of patient hospitalization and treatment this increased susceptibility to infection. The study **aims:** to evaluate the nurse's practice for the sterile technique in critical care units concerning hand washing, uniform, gloves, gown, mask, instruments and equipment, Peripheral Venous Catheter, IV fluids and medication, medical waste management and sharp disposal and to find out relationship between the nurses practices and nurses demographic characteristics. **Methodology:** Descriptive study was conducted in the critical care units at Al-Najaf AL-ashraff City Hospitals from 20th October 2015 to 2nd 2016 to evaluated nurses practice concerning sterile technique in this units. Non probability a (purpose) sample was selected in which included (40) nurses who are work in critical care units at al sader and al hakeem hospital. The sample was collected by uses the instrument which consist of two parts. The first part was demographic data for study sample and the second part the observation checklist tool which consist of 9 domains and 55 items. The instrument validity by 21 experts each of them have more than 10 years' experience in specialty, the internal consist reliability determine by crohn Bach correlation which was $r=0.81$. The analyzed of data was conducted through application of descriptive statistics (frequencies, percentages, mean of scores Standard deviation) and inferential statistics (Chi-squared test and t- test analysis).

Results: showed that the nurses practices for sterile domains was 72.5% of nurses do not applied procedures of hands washing , 85% of nurses dressed uniform , 55% of nurses wearing gloves , 82.5% of them do not apply the practices related to wear sterile gown, 95% of them do not wear the mask , 75.5% of them sometimes sterilized medical instruments and devices, 80% of nurses do not use proper method to sterilize instruments used for peripheral venous catheter insertion, 95% do not applied proper sterilized technique to administration of intravenous fluids and medication ,0.75% of nurses do not separated waste and sharp disposal in safety ways. and the overall result of the study domains in application of the sterile technique was 60% sometimes were applied this practices. Also the results of study showed that There were significant relationship between level education and type of critical care units and their nurses practice for sterile technique (p equal or more than 0.05).
Recommendations: The study recommended to establish

special training course and Engaged all critical care nurses in this training course to improve knowledge and practice concerning infection control. And provided tools and medical supplies to the sterilization technique in the Critical Care units.

Index Terms- Evaluation, Nurses Practices, Sterile Techniques, Critical Care Units

I. INTRODUCTION

One of the most challenges is health care-associated infections (HAI), or infections acquired in health care settings this adverse event are most commonly occurs in health care delivery worldwide. Hundreds of millions of patients are affected by (HAI), worldwide each year, resulting in significant mortality and financial losses for health systems (Varshney, et. al., 2014). A breach in infection control practices facilitates transmission of infection from patients to health care workers, other patients and attendants. It is therefore important for all health care workers, patients, their family members, friends and close contacts to adhere to the infection control guidelines strictly. It is also imperative for health care administrators to ensure implementation of the infection control programme in health care facilities (Patel, et al., 2009). The nurse plays an important role in infection control and prevention. Educating patients may decrease their risk of becoming infected or may decrease the sequelae of infection. Using appropriate barrier precautions, observing prudent hand hygiene, and ensuring aseptic care of intravenous (IV) catheters and other invasive equipment also assists in reducing infections (Smeltzer, et al., 2010).

II. METHODOLOGY

Objectives of the study: The study aims to:

1. Evaluate the nurse's practice for the sterile technique in critical care units concerning hand washing, uniform, gloves, gown, mask, instruments and equipment, Peripheral Venous Catheter, IV fluids and medication, medical waste management and sharp disposal.
2. Find out the relationship between the nurses practices and socio -demographic characteristics which as the level of education, year of experiences, and training course.

Study Design: Quantitative design, was carried out in critical care units in Al-Najaf AL-Ashraff City hospitals for period of 20th October 2015 to 2nd May 2016.

Sample of the Study: Non probability sampling was performed . a purposive sample of (40) nurses who work in critical care units (respiratory care units RCU and cardio care units CCU) .

Study Instrument: the checklist was constructed for the purpose of study (observation tool) consisted from 55 items which include two parts.

Part I: Includes nurses demographic characteristics.

Part II: Observation checklist, which consist of 9 domains that includes: (Hand washing, Uniform, Gloves, gown, Mask, Instruments and Equipment, Peripheral Venous Catheter (PVC), Intra venous IV fluids and medication, and Medical waste management and Sharp disposal).

Validity and Reliability: The content validity of the instrument was established through a panel of (21) experts, the reliability of the items were based on the internal consistency of the checklist was assessed by calculating Cronbach s' Alpha which as= 0.81.

Statistical analysis: The statistical data analysis approach by using (SPSS-ver.20) is used in order to analyze and evaluate the data of the study. A **descriptive** statistical data analysis approach used to describe the study variables : Frequencies and Percentages. **Inferential** statistical data analysis approach: used by application of the Chi-square test, this test is used for determining the association between socio-demographic data and nurses practices concerning sterile technique. Testing the significant association. For this study the significant P-value ≤ 0.05 .

III. RESULTS

Table (1): Socio demographic characteristics of the study Sample

Demographic data	Classification	F NO.= 40	%
Age /years	20-29 years	20	50
	30-39years	11	27.5
	40-49years	5	12.5
	50 and over	4	10
Gender	Male	30	75
	Female	10	25
Levels of education	Nursing school graduate	1	2.5
	Nursing secondary school graduate	8	20
	Diploma in nursing	14	35
	Bachelor in nursing	17	42.5
Marital status	Single	12	30
	Married	28	70
Year of Experiences in nursing	1-5 years	14	35
	6-10years	12	30
	11-15 years	6	15
	16-20 years	3	7.5
	21 and more years	5	12.5
Years of experiences in critical care units	1-5 years	28	70
	6-10 years	5	12.5
	11-15 years	4	10
	16-20 years	3	7.5
Training course	Have not	40	100

Table (1) shows that 50% of the study sample at age group (20-29) years old, 75% of them are males, 42.5% college of nursing graduated, 70% of the present study ware married, 35% have 1-5 years of experiences, 70% have 1-5 years of experiences in critical care units, and 100% of nurses have not training course.

Table (2): Distribution of the study sample by their overall for Nurse applying to aseptic techniques

Domains	Classification	Frequency	Percent	M.S	Evaluation
Hand washing	Never	29	72.5	1.4	Never applied
	Some time	11	27.5		
	Always	0	0		
uniform	Never	1	2.5	2.72	Always applied
	Some time	5	12.5		
	Always	34	85		
Gloves	Never	2	5	2.35	Always applied
	Some time	16	40		
	Always	22	55		
gown	Never	33	82.5	1.35	Never applied
	Some time	7	17.5		
	Always	0	0		
Mask	Never	38	95	1.06	Never applied
	Some time	2	5		
	Always	0	0		
Instruments and Equipment	Never	1	2.5	2.14	Sometime applied
	Some time	30	75.5		
	Always	9	22		
Peripheral Venous Catheter (PVC)	Never	32	80	1.4	Never applied
	Some time	8	20		
	Always	0	0		
IV fluids and medication	Never	38	95	1.18	Never applied
	Some time	2	5		
	Always	0	0		
Medical waste management and Sharp disposal	Never	0	0	2.17	Sometime applied
	Some time	30	75		
	Always	10	25		
Total	Never	16	40	1.74	Sometime applied
	Some time	24	60		
	Always	0	0		

No. (40), cut off point (0.66), Not applied=(Never applied)(1-1.66) , sometimes applied = 1-2 time applied= (1.67-2.33) , always= three time applied =(2.34-3)

Table (2) shows that 72.5% of nurses have sometime applied practices concerning hand washing, while 85% of them always applied practices concerning uniform , whereas 55% of nurses always applied practices concerning gloves wearing , where 82.5% of them never applied practices concerning gown wearing, also the study results reveal that 95% of nurses have never applied masking , also 75.5% of them sometime applied practices concerning sterilization of equipment and instrument

,also the result founded that 80%of nurses, never applied practices concerning peripheral venous catheter sterilized, as well as 95% of nurses never applied sterile technique concerning intravenous fluids and medication sterilization, in addition to 75% of them sometime applied practices concerning medical management and sharp disposable, also Majority of the nurses 60% was sometime applied practice's concerning sterile technique in critical care units.

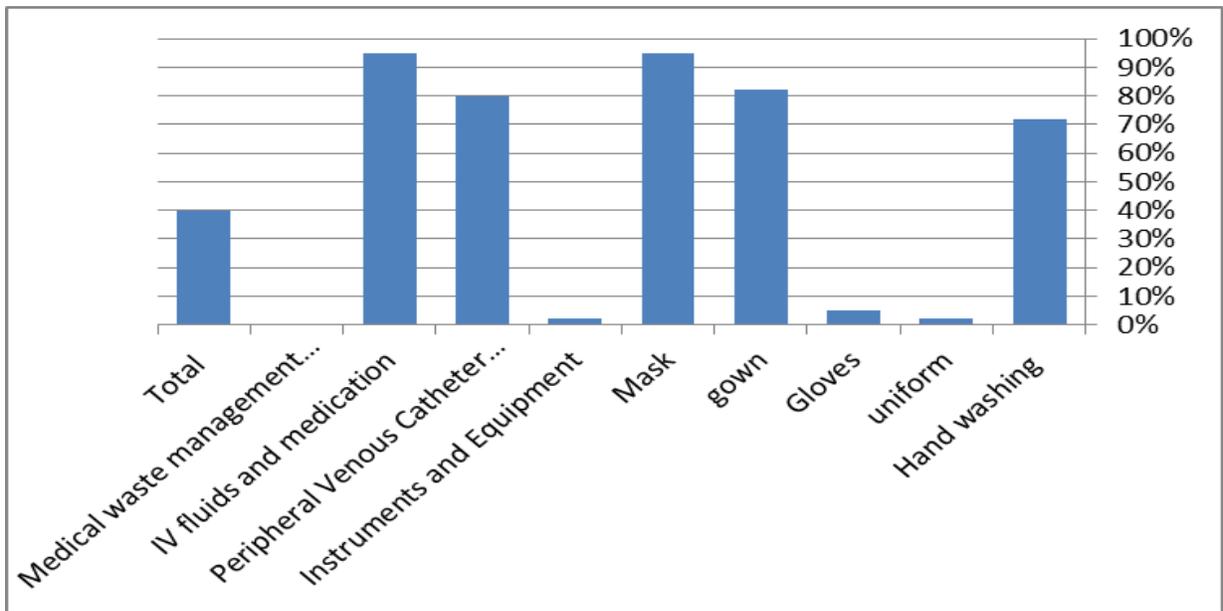


Figure (1): figure shows the nurses not applied for sterilization domains.

Table (3): Statistical Differences between applying of nurses to Aseptic Techniques and their gender

Demographic Data	Rating	N	Mean	Std. Deviation	Std. Error Mean	t-value	df.	p≥0.05
Gender	Male	30	2.5	0.50	0.09	0.537	38	0.595 NS.
	Female	10	2.4	0.51	0.16			

This table shows that there is no statistical difference between the gender of nurses and their applying to aseptic techniques at $P \geq 0.05$ level.

Table (2): Relationship between the nurses applying to Aseptic Techniques and their demographic Characteristics

Demographic data	Classification	Overall evaluation			Chi-square value	d.f	p≥0.05
		Never	Some time	Always			
Age /years	20-29	8	12	0	2.784	3	0.426 NS
	30-39	3	8	0			
	40-49	2	3	0			
	50+	3	1	0			
	Female	4	6	0			
Levels of education	Nursing school graduate	1	0	0	7.612	3	0.055 S.
	Nursing secondary school graduate	2	6	0			
	Diploma	9	5	0			
	Bachelor	4	13	0			
Marital status	Single	6	6	0	0.714	1	0.398
	Married	10	18	0			
Type of Units	CCU	7	18	0	4.000	1	0.046 S.
	RCU	9	6	0			

Years of Experiences	1-5	6	8	0	7.450	4	0.114 NS.
	6-10	5	7	0			
	11-15	0	6	0			
	16-20	1	2	0			
	21 and more	4	1	0			
Years of experiences in critical care units	1-5	9	19	0	2.609	3	0.456 NS.
	6-10	3	2	0			
	11-15	2	2	0			
	16-20	2	1	0			

This table presented that there were significant relationship between the nurses' applying for sterile techniques and level of education, and type of units at $p \geq 0.05$ value.

IV. DISCUSSION

Part I: Discussion of Demographic Characteristic of the Study Sample

The result of present study indicated that 50% of the study sample at age group 20-29 years old, and 75% of them are males, and 42.55 of the study sample graduated from nursing college, also, the study indicated that 70% of study sample was married, 35% of them have 1-5 years of experiences in nursing, while the 70% of study sample have 1-5 years of experiences in critical care units, and 100% of the nurses have not trained course. Present results agree with Jissir and Hassan, (2015) find in their study that the majority of nurses at 20-29 years. Bakey, (2008) evaluate the nurses' practice concerning infection control in Baghdad he finds that the high percent of nurses have 1-5 years of experiences in nursing, and the majority of study sample have 1-5 years of experiences in units, Eskander, et al., (2013) concluded in their study which conducted on 77 nurses to evaluated the nurses knowledge and practice about applying standard Precautions in intensive care units in Egyptian cancer hospital that the level of education for majority of nurses in their study were nursing college, Alice, et al., (2013), they assess the Knowledge and practice of infection control among health workers in a tertiary hospital in Edo state, Nigeria, they found that the majority of nurses are married, Bakey, (2008), also find in his study that most nurses not participation in training course related to infection control. While Ghadmgah, et al., (2011), concluded in their study on which conducted 135 nurses to evaluated the nurses knowledge, attitude and self-efficacy toward infection control in selected hospitals of Mashhad in Iran that the gender for majority of nurses in their study were males.

Part II: Discussion of Nurses Practice Concerning Sterile Technique

The present findings indicate that 72.5% of study sample not Applying the practices of hand washing. present results supported by Abbas, (2008), who evaluated the nurses' practices concerning isolation technique for adult leukemic patient in Baghdad hospitals which conducted on 50 nurses, he found that most of nurses have poor applying to hand hygiene. also the study results agree with Akyol, (2007) in which

concluded in their study on 129 nurses to evaluated the nurses practice concerning hand hygiene among nurses in Turkey, he founded that the majority of nurses have a poor level of practices concerning quality of hand washing. The researcher believed that the present result related to deficit of nurses knowledge about the risk of hand contaminated.

1. Nurses' Practices concerning Wear Uniform

The finding of present study revealed that 85% of nurses was wear the special uniform in critical care units CCU and RCU. These results agree with Khadoura, (2007), who presented that the high percentage of nurses was wearing the special uniform in intensive care units in Palestine.

2. Nurses' Practices concerning wearing Gloves

Regarding the nurses practices for gloving the present study shows that Sometime of nurses was address gloves 55%. this results disagree with Cason, et al., (2007), they evaluate the extent of nurses who working in intensive care units to implement best practices when managing adult patients undergoing mechanical ventilation in united states, They reported that 75% of nurses wearing gloves. The researcher believes that the present result related to not available of sterile gloves, but they can be used clean gloves during nursing intervention.

3. Nurses' Practices concerning Address of Gown

Result of present study indicated that 82.5% of a study sample not address the sterile gown. These results supported by Chan, et al., (2008) they evaluated the knowledge, attitudes and practice patterns on operating room staff towards standard they founded that the nurses have negative attitudes and practices toward standard precaution. These results may be to not availability of sterile gown in hospital.

4. Nurses' Practices for Wear Mask

The result of study revealed that high 95% of study sample not wear the mask. This result agree with Thair and Kadhim, (2012) they evaluated the nurses practices toward infection control in Baghdad hospitals they showed that the majority of nurses not wear the mask. the researcher believed that the

nurses in critical care units feeling discomfort as well as they have lack of knowledge related to important of wear mask.

5. Nurses' Practices concerning Medical Asepsis of 5. Instruments and Equipment in Units

Seventy five point five percent of the study sample were sometime the medical asepsis for instrument and equipment such as dressing sets, Monitors cables, blood pressure cuff monitors, ventilators, infusion pumps, syringe pumps, Laryngoscope, and Breathing tubes, Kandeel and Tantawy, (2012) stated in their study which done in Egypt to evaluated the nurses practice for prevention of ventilator associated pneumonia in ICU which revealed that high percent of nurses were used a sterile technique in preparing the instrument in critical care units.

6. Nurses' Practices Concerning uses Aseptic Techniques during insertion of Peripheral Venous Catheter

The nurses practices regarding the sterile technique for inserted peripheral venous catheter the present study shows 80% of nurses not uses sterile technique for it. This results disagree with, O'Grady, et al., (2011) they emphasized in their study about Guidelines for the Prevention of intravascular catheter-related Infections, that should be adherence to sterile technique during insertion peripheral venous catheter. The researcher believes that the nurses neglect is the main causes for not uses medical asepsis.

7. Nurses' applying for aseptic techniques during administration of IV fluids and medications

The result of present study revealed that 95% of nurses not applied sterile technique during IV fluids and administration of medication. These results disagree with Dolan, et al., (2010), they confirmed in their study that a safe injection, infusion, and medication vial practices in health care were need to adhere sterilization technique during administration of intravenous fluids and medication for patient. These poor practices by nurses leading to more complication for patient.

8. Nurses' practices about Medical Waste Management and Sharp Disposal apply

The study results indicated that 75% of nurses was Sometime applied the medical waste management and safe sharp disposal. The study agree with Ferreira, et al., (2010), they assess the Health care waste management practices and risk perceptions in Algarve region, they founded in their study that a health care worker was inadequate practice and knowledge related to the correct separation of wastes and sharp disposal. the researcher believed that hospital policy responsible about follow up the management of waste.

9. Nurses' Practices concerning applying to Aseptic Techniques in CCU and RCU

The study results indicated that 60% of study sample sometime applied a sterile technique in critical care units. Duerink, et al., (2013), concluded in their study on 1036 nurses to evaluate the nurses knowledge, attitude and behavior about infection control in the island of Java, they founded that 67% of nurses have positive response to the attitude questions about infection control guideline. Also, Ghadmgahi, et al., (2011), stated in their study which done in Iran to evaluated the nurses

practice, knowledge, attitude and self-efficacy about controlling nosocomial, which revealed that 67.9% of nurses had average knowledge about infection control. while Suchitra and Devi, (2007) assessed the knowledge, attitudes and practices on 150 different health care workers about nosocomial infections India, the study shows that 40% of nurses poor practices toward infection control and prevention protocol. also Sadoh, et al., (2006) evaluated the Practices of universal precautions among healthcare workers on 426 health workers, in Ogun state, Nigeria, they concluded that 50% of nurses never applied of universal precaution. the researcher believes, that the results of present study related to lack of nurses knowledge about important of aseptic technique for patient and health care worker safety this due to the shortage of training course and lack of follow by administrators, also may be related to the that the shortage of nurses staff in the RCU and CCU in a study hospitals.

Part III: Discussion of Nurse's applying to Sterile Technique with their socio-demographic characteristics

There were significant relationship between the nurses' applying for a sterile techniques and level of education, and type of units at $p \geq 0.05$ value.

The present finding agree with Duerink, et al., (2013) who assess the knowledge, attitude and behavior of Indonesian health care workers regarding infection control, they find that there were significant relationship between nurses attitude and type of units.

The results of present study agree with Alice and Danny, (2013), who evaluated the Knowledge and practice of infection control among health workers in a tertiary hospital in Nigeria, they founded that there were no statistically significant relationship with gender, duration of employment, or age.

The results of presents study disagree with Ghadmgah, et al., (2011) they evaluate the Knowledge, attitude and self-efficacy of nursing staffs in hospital about infections control they founded that there a significant relationship between knowledge and gender.

Present finding disagree with Kang, et al., (2009) they evaluated hospital nurses' knowledge and compliance on multidrug-resistant organism infection control guideline, in Korea, they founded that there were significant relationship between nursing practice concerning infection control and age and significant between the type of units and nurses practices.

The results agree with Suchitra and Devi (2007), they evaluated the knowledge, attitudes and practices among various categories of health care workers about nosocomial infections they founded that the educational level has a positive impact on retention of knowledge, attitudes and practices in all the categories of health staff.

V. CONCLUSION

The study concludes that the majority of nurses 60% was sometime applied practice's concerning sterile technique in critical care units. Also, there were no significant relationship between nurses practice and nurses demographic characteristic which as include: age, gender, marital status, work place, years of experience in nursing, years of experience in critical care

units and training course and there were significant relationship between level education and type of critical care units and their nurses practice for sterile technique

VI. RECOMMENDATIONS

Based on the study results and conclusion, the study recommended the following:

- 1- Engaged critical care nurses in special training course for improve knowledge and practice concerning infection control.
- 2- Establish infection control center to prepare training course r and Follow-up health care provider .
- 3- Activating the principle of reward and punishment for critical care nurses .
- 4- Printed poster fixation on critical care units walls to remembering all health staff about medical asepsis.
- 5- Engage nurse how are have bachelor degree in critical care units.
- 6- Provide equipment and facilities in critical care units .
- 7- Establishing educational programs, for critical care nurses about sterile technique in AL-Najaf AL-Shraff.

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Attitude and Level of Motivation in Rhythmic Activities of College Students in Selected Capiz State University Campuses

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Abstract- This descriptive-correlation study aimed at determining the attitude and level of motivation in rhythmic activities of the one-hundred seventeen randomly selected college students in selected campuses of Capiz State University (CapSU) when the students are classified according to sex and parental involvement. It further aimed at determining the significant differences of attitude and level of motivation in rhythmic activities when the students are classified according to sex and parental involvement and to determine the relationship between attitude and level of motivation in rhythmic activities. A researcher-designed questionnaire was used. Statistical tools used were means, standard deviation, t-test for independent sample and Pearson r . All inferential statistics were set at .05 alpha level. Generally, students seem to have similar attitude and level of motivation in rhythmic activities. There was no significant differences in the students' attitude in rhythmic activities when respondents were classified according to sex and parental involvement. The students' level of motivation in rhythmic activities did not differ significantly when they were classified according to sex and parental involvement. College students' attitude and the level of motivation in rhythmic activities are positively and significantly correlated.

Index Terms- Rhythmic activities attitude, level of motivation, college students

I. INTRODUCTION

It is doubtful that any teacher would question the value of rhythmic movement in a physical education program. The benefits of being able to move rhythmically and to keep a beat are numerous. First, children with rhythm have an increased kinesthetic awareness of their body in motion and stillness. As most physical activities have an inherent rhythm (e.g., tennis, swimming, running, or basketball), participation in lessons that focus on rhythm help sharpen kinesthetic awareness of the body in space as well as the length of time required to perform the individual components of a movement or skill (Hastie, Peter A.; Martin, Ellen H.; Gibson, Gary S, 2005). Rhythm is a regular beat of successive movements or sounds. It is an integral part of physical education and much of it makes use of music (Adebayo, I.A., and Junaid, H.G., 2015). Nwegbu (1985), ascertained that fundamental rhythm, which are considered under rhythmic activities are the same as those for movement exploration and body mechanics. They are locomotor movements of walking, running, hopping, leaping, skipping, galloping and sliding. The

non-locomotor movements include bending, turning, twisting, swinging, swaying, falling, pushing, pulling, lifting, throwing and catching. Other types of rhythmic activities are marching, singing games, folk dance, social dance and creative rhythm.

Indeed, rhythmic activities among college students should also be studied because continuous bodily exercise to maintain healthy lifestyle is not only applicable to children but also to all ages.

II. RESEARCH ELABORATIONS

This study was conducted at Capiz State University specifically at the campuses of Buriás, Poblacion, Dumarao, Tapaz, Sigma and Sapián. Respondents of the study were the one-hundred seventeen proportionately and randomly selected duly enrolled college students. Research instrument used was researcher-made questionnaire consisting of Part A (Personal data), Part B (twenty-item questionnaire about towards participation of students in rhythmic activities) and Part C (twenty-item questionnaire about motivation of students in rhythmic activities participation). Every item in the questionnaire was validated by three experts in the field of physical education, dance and guidance. It was pilot-tested to sixty college students enrolled in Physical Education. Using the Alpha Cronbach statistical method, it obtained a reliability of .9199. It was then personally administered by the researcher to respondents of every campus. Statistical tool used for the analysis of the study were mean to determine the respondents' attitude and level of motivation in rhythmic activities, standard deviation to determine the homogeneity and heterogeneity of the students in terms of attitude and level of motivation in rhythmic activities, t-test for independent samples to determine the significant differences in the respondents' attitude and level of motivation when the respondents are classified according to sex and parental involvement and Pearson r to relationships among the variables such as attitude and level of motivation in rhythmic activities.

III. RESULTS OR FINDINGS

The students' attitude toward rhythmic activities as an entire group ($M= 2.22$, $SD = .21$) and classified as to sex ($M= 2.26$, $SD = .22$ for male and $M= 2.19$, $SD= .19$ for female) was somewhat positive. When the students were classified as to parental involvement, those respondents whose parents were involved ($M=2.18$, $SD = .24$) and those students whose parents

were not involved ($M = 2.24$, $SD = .19$) also showed somewhat positive attitude towards rhythmic activities.

The students as an entire group manifested *average* level of motivation ($M = 2.03$, $SD = .22$). An average level of motivation was also shown by the male ($M = 2.02$, $SD = .22$) and female respondents ($M = 2.04$, $SD = .22$). Students whose parents were involved and those parents were not involved in their rhythmic activities participation showed an average level of motivation ($M = 2.00$, $SD = .24$ and $M = 2.04$, $SD = .21$ respectively).

There is no significant differences in the attitude towards rhythmic activities of the students when classified according to sex ($t(11) = 1.607$ $p > .05$) and according to parental involvement ($t(115) = 1.317$ $p > .05$). Likewise, there is no significant differences in the level of motivation towards rhythmic activities of the students when classified according to sex ($t(11) = -.413$ $p > .05$) and according to parental involvement ($t(115) = -1.102$ $p > .05$).

Attitude and level of motivation in rhythmic activities are positively and significantly correlated ($r = .259$ $p < .05$ and $r = .259$ $p < .05$ respectively).

IV. CONCLUSIONS

1. Generally, students seem to have similar attitude and level of motivation in rhythmic activities.
2. There was no significant differences in the students' attitude in rhythmic activities when respondents were classified according to sex and parental involvement.

3. The students' level of motivation in rhythmic activities did not differ significantly when they were classified according to sex and parental involvement.
4. College students' attitude and the level of motivation in rhythmic activities are positively and significantly correlated.

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Level of Student Satisfaction on the Frontline Services of Capsu Satellite Colleges

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Abstract- This descriptive-correlational study assessed the level of student satisfaction, in general, on the frontline services of CapSU Satellite Colleges in terms of tangibles, reliability, responsiveness, assurance, and empathy. The respondents were the 1,520 students randomly selected from the six Satellite Colleges of Capiz State University during the A. Y. 2015 – 2016. Using a researcher-made questionnaire to gather data, mean results revealed that the level of student satisfaction of CapSU Satellite Colleges was very satisfied.

Index Terms- Level, Student satisfaction, Frontline services

I. INTRODUCTION

Globalized competition has stressed the importance of quality and satisfaction in the battle for winning consumer (i.e. students) preferences and maintaining sustainable competitive advantages. Educational systems are becoming services for people especially; quality, satisfaction, and performance prove to be the key factors reciprocally interrelated in a cyclical relationship. The higher the service quality, the more satisfied the customers. Thus, to attract new customers, educational institutions and universities are placing greater emphasis on meeting the expectations and needs of their customers the “students” (Thomas, 2011).

Service quality is a critical factor for developing and sustaining relationships with customers (Park et al., 2006). Since it has significant impact on customer satisfaction and customer loyalty to service firms, this construct is a major determinant of the firm’s success or failure in a competitive environment (Lin et al., 2009). Service quality is the discrepancy between consumer perceptions of services offered by a particular firm and their expectations about the firm offering such services (Chou et al., 2011).

The importance of such a service is highlighted by the presence of many stakeholders and their interests, either educational or social. A strategy of continuous improvement with regard to quality is important. The demand is at a higher level not only in relation to the quality of teaching but also to social expectations.

RESEARCH ELABORATIONS

The research design used was descriptive - correlational method. The participants of the study were 1,520 students randomly selected from the 3,877 population from Second Year to Sixth Year enrolled in the six(6) Satellite Colleges (Dayao, Dumarao, Mambusao, Pilar Sigma and Tapaz) of Capiz State University for Academic Year 2015 – 2016. After determining the sample size of the study, stratified random sampling was used to determine the sample size per satellite college, department and year level. The researcher employed a self-made questionnaire based on the SERVQUAL instrument developed by Parasuraman et al. (1988), the Civil Service Commission’s Report Card Survey, Capiz State University’s Citizen’s Charter, books, journals, unpublished thesis and dissertations. Part I dealt with the socio-demographic profile of students such as age, sex, year level, department affiliation, satellite college and estimated monthly family income. Part II gathered the data in assessing the level of student satisfaction on CapSU frontline offices such as the Office of the Registrar, Library, Accounting and Collecting Office, Guidance Office, and Medical/Dental Clinic. There were five (5) indicators on the level of student satisfaction, namely; tangibles, reliability, responsiveness, assurance, and empathy. There were ten (10) items for each indicator. The items were formulated based on the content of the SERVQUAL instrument, books, journals, unpublished theses and dissertations.

The questionnaire was subjected to content validation by a panel of knowledgeable persons in management, language, questionnaire preparation, and analysis and interpretation of data. The suggestions and comments of the members of the panel were consolidated to come up with the final questionnaire. After the validation of the questionnaire, it was pretested to 30 students; 10 students each from the Technology Department, the College of Business and Management and from the College of Teacher Education of Capiz State University, Main Campus, Roxas City. Convenience sampling was used to select the pretest student – respondents. The computed reliability coefficient of the questionnaire was 0.995.

Level of student satisfaction’s responses in the questionnaire were scored, classified and given verbal interpretations as follows:

Score	Scoring Interval	Verbal Interpretation	Meaning
5	4.20 – 5.00	Very Satisfied	Manifests high contentment of the actual performance of the service.
4	3.40 – 4.19	Satisfied	Manifests contentment of the actual performance of the service.

3	2.60 – 3.39	Moderately Satisfied	Manifests average contentment of the actual performance of the service.
2	1.80 – 2.59	Less Satisfied	Manifests less contentment of the actual performance of the service.
1	1.00 – 1.79	Least Satisfied	Manifests a very little contentment of the actual performance of the service.

The researcher then asked approval from the different satellite college directors of the six satellite colleges of Capiz State University to administer the questionnaire. The HRMO designate or the SSC President of each satellite college was requested to help the researcher administer the questionnaires to the selected students. Once accomplished, these were retrieved and submitted to the researcher for consolidation, processing and analysis.

The data gathered was encoded through Microsoft Excel and was processed using the Statistical Package for Social Science Software (SPSS). Frequency count and percentage used

to determine the socio-demographic profile of the students in terms of age, sex, year level, department affiliation, satellite college, and estimated monthly family income. The level of student satisfaction of CapSU Satellite Colleges in terms of tangibles, reliability, responsiveness, assurance, and empathy were analyzed and interpreted also using the mean.

II. RESULTS OR FINDINGS

Table 1. Socio-demographic Profile of the Students

	Frequency	Percent (%)
Age (in years)		
15 – 19	1030	67.76
20 – 24	451	29.67
25 and above	39	2.57
Total	1520	100
Sex		
Male	533	35.07
Female	987	64.93
Total	1520	100
Year Level		
Second Year	649	42.70
Third Year	489	32.17
Fourth Year	374	24.61
Fifth Year	4	0.26
Sixth Year	4	0.26
Total	1520	100
Department Affiliation		
Agriculture and Veterinary Medicine	263	17.30
Bachelor of Arts	18	1.18
Business Administration	35	2.30
Computer/Information Technology	221	14.54
Criminology	281	18.49
Fishery	44	2.90
Food Technology and Entrepreneurship	18	1.18
Office Administration	58	3.82
Social Work	69	4.54
Teacher Education	268	17.63
Technology	79	5.20
Tourism and Hospitality Management	166	10.92
Total	1520	100
Satellite College		
Dayao	370	24.34
Dumarao	268	17.63
Mambusao	180	11.84

Sigma	239	15.73
Pilar	277	18.22
Tapaz	186	12.24
Total	1520	100
Estimated Monthly Family Income		
P5,000 and below	886	58.29
P5,001 – P10,000	410	26.97
P10,001 – P15,000	150	9.87
P15,001 and above	74	4.87
Total	1520	100

Majority of the students were aging 15 – 19 years old (67.76%); dominated mostly by female (64.93%), second year (42.70%), criminology students (18.49%); engaged largely by Dayao Satellite College.

Table 2. Level of Student Satisfaction on the Services of CapSU Satellite Colleges in Terms of Tangibles, Reliability, Responsiveness, Assurance and Empathy

Indicators	Mean	Verbal Interpretation
Tangibles	4.29	Very Satisfied
Reliability	4.29	Very Satisfied
Responsiveness	4.27	Very Satisfied
Assurance	4.28	Very Satisfied
Empathy	4.28	Very Satisfied
Grand Mean	4.28	Very Satisfied

The grand mean on the level of student satisfaction on the services of CapSU Satellite Colleges in terms of tangibles, reliability, responsiveness, assurance and empathy is 4.28 with a verbal interpretation of very satisfied. The means of the five indicators on the level of student satisfaction based on the services of CapSU Satellite Colleges, which ranged from 4.27 to 4.29, had verbal interpretations of very satisfied.

III. CONCLUSIONS

- Majority of the students who participated in the study were at the age 15 - 19 years old; dominated mostly by female, second year, criminology students; engaged largely by Dayao satellite college, and with a monthly family income of Php5,000 and below.
- The level of student satisfaction on the frontline services of CapSU Satellite Colleges was “very satisfied”. Therefore, this is a manifestation that the students had high level of contentment of the actual performance of the service rendered by CapSU Satellite Colleges. Apparently, the students were very satisfied because the services are beyond their expectations.

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Leadership Practices of Secondary School Principals in the Province of Capiz

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Abstract- This quantitative-qualitative study intended to determine the leadership practices of the Secondary School Principals in the Province of Capiz, Philippines for the school year 2013-14 and to determine the significant differences of the leadership practices among Secondary School Principals in the Province of Capiz.

For the quantitative design, the survey method was utilized; for the qualitative design, the Focus Group Discussion (FGD) was conducted. A total of 80 public and private secondary school principals in the Province of Capiz for School Year 2013-2014 were utilized as respondents of the study. The descriptive statistics used were the frequency count, percentage, and standard deviation whereas the inferential statistics used was the analysis of variance. The alpha level of significance was set at .05. The findings of the study revealed that the most dominant leadership practices of Secondary School principals is that which “challenge the process” and there are significant differences between the leadership practices of the secondary school principals.

Index Terms- Leadership Practices, Secondary School Principals

I. INTRODUCTION

Leadership is definitely not a ‘one-size-fits-all’ sort of word. It is one of those words that is ceaselessly debated and typically elicits a spectrum of individual opinions, from describing personality attributes, ‘position’ characteristics, or even behaviors. Whatever the arena – sports, politics, religion, business, or an educational institution – a leader impacts and influences organizational effectiveness.

The continuous and major challenges of the educational reforms require effective leadership competence in dealing with the current issues, as well as leading the organizations towards excellent performance. The requirements are comprised of numerous individual characteristics, particularly appropriate knowledge competency, communication skills, interpersonal relations, and leadership wisdom (Ahmad, Rahim & Seman, 2013).

Successful leaders have vision and are able to connect the disparate pieces and develop a cohesive view of their schools which is an alignment of goals that can lead their organizations to success (Manasse, 1986). In spite of the demands placed on effective principals in a rigorous accountability system, the leadership practices of the interviewed principals (Sanzo, et.al. 2010) enabled them to promote and sustain a successful academic environment. The analysis of the transcripts revealed four overarching themes which surfaced from the conversations

with the ten middle school principals: sharing leadership, facilitating professional development, leading with an instructional orientation, and acting openly and honestly.

In public and private institutions in the Philippines, school administrators have clear vision, mission, goals and development plans, clear performance parameters, clear policies, system and procedures. Chief Executive Officers have centralized and decentralized leadership and decision-making, strong management Information System, active Board of Trustees involvement on total school life and work, rationalized ranking system and pay plan, comprehensive management and development, comprehensive resource/property development and management and development, comprehensive plan, sound financial planning, monitoring and control, relative effectiveness and efficiency of organizational structures, no financial transparency, involvement of key staff/leaders in decision-making process, etc.

At present, as observed by the researcher, the issue that confronts school principals today is the extent of their institutional capability such as leadership practices to become more effective in their attainment of the vision, mission and goals of the institutions that they serve.

It is on this premise that the researcher has decided to embark on this study on the leadership practices of the public and private secondary school principals in the province of Capiz that influence their organizational effectiveness.

II. RESEARCH ELABORATIONS

The participants of the study were 80 public and private secondary school principals for the school year 2012-2013. Census or complete enumeration was used as a technique to determine the number of participants. Their demographic profile of is shown in Table 1.

Table 1 demonstrates the demographic data of the participants in terms of age, sex, marital status, highest degree earned, type of school affiliated with, years of experience as school principal, and basic monthly salary. Of the 80 secondary school principals included in the study, as to age, 6(7.5%) ranged in age 30 to 39 years old, more than a majority, 55(68.8%) ranged in age 40 to 49, and the remaining 19 (23.8%) ranged in age more than 49 years old; As to sex, 51 (63.8%) are females and 29 (36.3%) are males; As to marital status, 12 (15%) are single, while 68 (85%) are married; Majority or 70 (87.5%) of the respondents, are master’s degree holders, 4 (5%) have finished the bachelor’s degree, and 6 (7.5%) have acquired doctorate degrees; As to the type of school affiliated with, 62 (77.5%) come from the private schools whereas 18 (22.5%) come from the public schools; As to years of experience as

school principal, 14 (17.5%) of the respondents have served a minimum of less than 5 years, 22 (27.5%) have served between 5 to 10 years, and 44 (55.0%) have served to a maximum of more than 10 years; in terms of basic monthly salary, 62 (77.5%) of the

participants receive a salary of more than P30,000.00, and 62 (77.5%) have a salary which ranged from P25,000.00 to P30,000.00,

Table 1. Demographic Profile of the Participants

Variables	F	%
Age		
30 - 39 yrs	6	7.5
40 - 49 yrs	55	68.8
> 49 yrs	19	23.8
Sex		
Male	29	36.3
Female	51	63.8
Marital Status		
Single	12	15.0
Married	68	85.0
Highest Degree Earned		
Bachelor's Degree	4	5.0
Master's degree	70	87.5
Doctorate degree	6	7.5
Type of School Affiliated With		
Public	62	77.5
Private	18	22.5
Yrs of Experience as School Principal		
< 5 yrs	14	17.5
5 - 10 yrs	22	27.5
> 10 yrs	44	55.0
Basic Monthly Salary		
PhP25,000- 30,000	18	22.5
> PhP30,000	62	77.5
Total	80	100.0

The researcher used a questionnaire composed of Part One about the demographic profile of the participants of the study such as their (a) age, (b) sex (c) marital status, (d) highest degree earned, (e) type of school affiliated with (f) years of experience as school principal and (g) basic monthly salary and Part Two, the *Leadership Practices Inventory* (LPI) which was utilized to acquire information on their leadership practices using standardized instrument of Kouzes and Pousner (2000) It was used to obtain information on the use of the five leadership practices (Modeling the Way (Items 1-5), Inspiring a Shared Vision (Items 6-10), Challenging the Process (Items 11-15), Enabling Others to Act (Items 16-20), and Encouraging the Heart (Items 21-25). However, the instrument was modified to suit the

purpose of the study. The LPI contained 25 items (5 items for each scale).

Responses to each of the 5 items were rated using a 5-point Likert scale with anchors labeled: 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree. The scores obtained in the respective were tabulated in a separate score sheet, summed up and the mean was computed. The respondents' leadership practices were interpreted using the scale below:

Scale	Description
4.20 – 5.00	Most Dominant
3.40 – 4.19	More Dominant
2.60 – 3.39	Moderately
1.80 – 2.59	Slightly Dominant
1.00 – 1.79	Least Dominant

The instrument was jury-validated, pilot-tested to 30 school administrators who were not actual participants of the study and had reliability index of .915.

The FGD was conducted on December 14, 2014, at 8:00-11:00 A.M. at the MVW Hotel & Restaurant, with 7 teacher-participants and 6 student-participants. The FGD Guide for the teacher-participants was made up of ten (10) open ended questions asking the participants to respond to how their principals lead their school, engage their participation as stakeholders as well as the organizational effectiveness of their leaders. The areas covered the vision, culture, management, collaboration, ethics and political, social, economic and legal aspects of the school. Participants also were asked to describe the state of their current school, the changes implemented by their principals, their most important responsibilities and the greatest obstacles faced by them.

For the student-participants, the FGD guide was made up of eleven (11) open ended questions asking the participants to respond to how their principals govern their schools. They were also encouraged to share their opinions and/or comments about the leadership competencies of their principals.

Permission to conduct research was requested from the Department of Education and the school authorities i.e. the school supervisors and principals. Permission to participate in the study was also sought from each respondent. Participants were informed about the research in which interviews were used. They were assured that their privacy and is going to be protected. They were also assured that the information was going to be used solely for the research purposes. It was also revealed to the respondents that information used would be treated as highly confidential.

After the researcher sought the approval of the different School heads, he personally requested the respondents of the study to fill-up the questionnaires. When all the questionnaires were retrieved, these were encoded, tallied, tabulated and analyzed using the Statistical Package for Social Science (SPSS) software.

Data gathered from the study were analyzed using mean, frequency count and percentage to determine the respondents' demographic profile in terms of age, sex, marital status, highest degree earned, school affiliated with, years of experience as school principal, and basic monthly salary. Standard Deviation was used in order to determine the homogeneity as well as the heterogeneity of the respondents' leadership practices. Analysis of Variance was carried out to determine the significance of the differences among three or more compared groups. All inferential tests were set at .05 alpha level of significance.

III. RESULTS OR FINDINGS

Table 2 Leadership Practices of Secondary School Principals

Leadership Practices	Mean	SD	Rank	Description
Overall (N = 80)	4.46	0.33		Most Dominant
Challenge the Process	4.56	0.41	1	Most Dominant
Encourage the Heart	4.52	0.42	2	Most Dominant
Enables Others to Act	4.45	0.41	3	Most Dominant
Inspire a Shared Vision	4.42	0.39	4	Most Dominant
Modelling the Way	4.35	0.46	5	Most Dominant

Scale	Description
4.20 – 5.00	Most Dominant
3.40 – 4.19	More Dominant
2.60 – 3.39	Moderately Dominant
1.80 – 2.59	Slightly Dominant
1.00 – 1.79	Least Dominant

Principals who “Challenge the Process” ranked 1st ($M = 4.56, SD = 0.41$), those who “Encourage the Heart” ranked 2nd ($M = 4.52, SD = 0.42$), those who “Enable Others to Act” ranked 3rd ($M = 4.45, SD = 0.41$), those who “Inspire a Shared Vision” ranked 4th ($M = 4.42, SD = 0.39$); and those who are “Modelling the Way” ranked 5th. ($M = 4.35, SD = 0.46$). This indicates that

secondary school principals are finding a process that needs to be improved the most.

In the focus group discussion (FGD) conducted with the teachers, all seven (7) discussants expressed that the school principal:

“is not the single most important factor in the success of their school.”

Discussant 5 remarked:

“once the school is improving or reaping success in every endeavor, the principal has a very significant contribution in that success. But the teachers and students also share their part to the achievement of the goals of the school as a whole.”

Discussant 7 also reiterated:

“I think aside from the very influential role of the principal in the organization, I would also say that even if the organization has a very beautiful plan, a very objective plan but if the subordinates do not want to support this, then the program will not succeed.”

In the same manner, discussant 3 commented:

“the school principal plays a vital role in the achievement or in the success of a certain organization, because they are the ones planning and implementing for the betterment of the school. However, no man is an island. No man could stand alone and we cannot attain progress without others so the principal is not the only factor in the attainment of success but also the subordinates.”

Moreover, Pupil-discussant 4 shared:

“our principal gathers the opinions of the teachers, so I can say that she doesn’t think only what is best for her but what is best for everybody.”

Table 3 .Differences Among the Leadership Practices of Secondary School Principals

Source of Variance	SS	df	MS	F	Sig.
Between Groups	2.35	4	.59	3.36	0.010*
Within Groups	69.03	395	.17		
Total	71.37	399			

*Significant @ 5% level of significance

Table 3 reflects the ANOVA differences among the leadership practices of the principals. The results indicate that there are significant differences in the leadership practices of the participants, $F(4,395) = 3.36$ with $p = .010$. This shows that the kind of leadership practices applied by secondary school principals matters in the achievement of their goals in school.

Different situations require different leadership styles/practices. In this view, leaders change the way in which they lead depending on where they are. In other words, the most successful leaders are those who adapt their style to the unique demands of any given situation. This result was confirmed by teacher- discussant number 3 who mentioned:

“there are principals who have different strategies, and their own style and of course there are some that focus on the schedule of classes and monitoring the teachers whether or not they are handling their classes. Some are good, they deal with us professionally. Other principals focus on renovations or for the improvement of school facilities, but we also had principals who do not continue what the previous principals have started, so there is no continuity.”

Discussant number 2 also remarked:

“I guess, it just so happens that some principals have different principles or priorities. Our principal focuses on the infrastructures and physical development instead of giving more attention on improving our academic achievements and I think we are moving backward instead of moving forward.”

Moreover, Discussant number 3 emphasized that her principal:

“is concerned with her people. I know this because, she was my teacher and my adviser during my high school years, she is very concerned with her people especially when she saw the teachers struggling in their way of teaching, because most of the

teachers in our school are new. Our school principal is really looking into our potentials and developing them, because I was one of those who benefited out of it.”

Confirming the teachers’ views of their principals, student-discussant number 2 narrated:

“our principal is responsive to our needs. For example, when our teacher suggested that a faculty room be provided for the teachers, he provided a vacant lot in our school. He also accepts comments and opinions of the teachers, parents and students.”

Discussant number 3 also claimed:

“our school principal is a good model to us, and he is someone who is worthy to be emulated, especially by those who wanted to become a principal, because he has the ability to encourage teachers, students and parents. He also establishes good rapport with the stakeholders.”

Furthermore, discussant number 5 reported:

“our principal really ‘walks the talk’. If she tells us that we need to construct something in school, she really takes an initiative to start and implement the project, even if it meant spending her own money.”

CONCLUSIONS

1.The most dominant leadership practices of Secondary School principals is that which “challenge the process”.

2. There are significant differences between the leadership practices of the secondary school principals.

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Therapeutic effect of bee venom formulation in the treatment of FMD viral infection: Preclinical and clinical evaluation

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Abstract- Foot-and-Mouth disease (FMD) is one of the world's most important infectious animal diseases especially cloven-hooved livestock caused by picornavirus and responsible for huge global losses of livestock production and trade, as well as frequent and highly disruptive large-scale epidemics. Bee (*Apis mellifera*) venom therapy is an alternative form of healing to treat various diseases. Bee venom contains at least active components which have some pharmaceutical properties; the most significant components of bee venom which have antiviral properties like melittin, phospholipase A2 (PLA2) and Protease inhibitor. Melittin is main active component and the powerful stimulator of phospholipase A2 that destroys phospholipids and dissolves the cell membrane of the agent. Protease inhibitor inhibits the activity of different proteases like trypsin, chymotrypsin, plasmin, thrombin, thus decreasing inflammation. In this work, Egyptian bee venom (*Apis mellifera lamarckii* venom) was obtained from VACSERA used as a treatment against FMDV-O in Egypt. There are improvements in hematological, biochemical and histopathological tests, the clinical signs are decreased in the treatment period and the virus load is more significance decreases. So this study proved that the bee venom used as natural medicine has been developed to fulfill recent medical requirements without noticed side effects. Bees have been appreciated for their medicinal purposes as a treatment for many diseases and restoring the vitality of the body.

Index Terms- Foot-and-Mouth Disease, FMDV-O, Bee venom, *Apis mellifera lamarckii*, hematological, biochemical and histopathological.

I. INTRODUCTION

Foot-and-Mouth Disease (FMD) is a disease listed in the World Organization for Animal Health (OIE) Terrestrial Animal Health Code. FMD is a highly contagious viral disease of cloven-hooved animals with significant economic impact, in cattle and swine as well as sheep, camels and goats as well as more than 70 species of wild animals. All species of deer and antelope as well as elephant, and giraffe are susceptible to FMD. It is caused by picornavirus of the genus *Aphthovirus* Foot-and-mouth disease, there are seven immunologically distinct types of FMD viruses, A, O, C, SAT1, SAT2, SAT3 (South African Territories), and Asia1 (Grubman and Baxt, 2004), It causes damage to the epithelial cells around the mouth and feet, and the

mucous membrane lining the mouth and gut system. FMD virus enters the body through inhalation. FMD morbidity is high, but mortality is usually low in adult animals. In young animal's mortality can be high because the disease damages heart muscle cells. FMD also causes painful sores and is characterized by fever and blister-like sores on the tongue and lips, in the mouth, on the teats and between the hooves. The disease causes severe production losses and while the majority of affected animals recover, the disease often leaves them weakened and debilitated (Aftosa, F. (2014).

Bee venom is therapy which utilizes the application of bee venom to treat many different diseases. Bee venom contains at least 18 pharmacologically active components including various enzymes, peptides and amines. It is a complex mixture of proteins, peptides and enzymes low molecular components. Using these components which have antiviral and antibacterial properties such as phospholipase A2 (PLA2), melittin, apamin, mast cell degranulating peptide, histamine, and dopamine (Ali, 2012). It has long been used for the treatments of chronic inflammation (rheumatoid arthritis), skin disease and for pain relief in traditional medicine for thousands of years. The aim of the present study was to determine the possible alterations in haematological and biochemical and histopathological parameters in large and small animals with FMD and under the effect of bee venom.

II. MATERIALS & METHODS

Materials: Venom: *Apis mellifera lamarckii* (Egyptian) venom. Provided from Honey Bee Keeping Department Agriculture Research Center – Egypt. **Virus:** Foot and Mouth Disease Virus (FMDV-O) Provided from Animal Health Institute –Egypt. **Animals:** Fifteen guinea Pigs (Duncken hurtly) and Twelve goats provided from Helwan Farm, VACERA – Egypt. **Blood samples:** From each animal (at time of bleeding) about 2 ml bloods were taken in vacutainers, containing EDTA. These samples were used for determining the hematological picture (erythron, leukon, and thrombon), and prothrombin time respectively. **Serum samples:** About 20 ml blood was taken simultaneously as before in vacutainers but without addition of any anticoagulant. The obtained serum was kept in a deep-freezer (at - 20°C) until used.it was used for determination of different blood chemistry, and immunological parameters.

Methods: -

Infection of tested animals by FMD virus: The test group were injected subcutaneously in the foot pad by FMDV (1×10^5 dose TCID₅₀) in guinea pig and ($1 \times 10^{6.5}$ dose TCID₅₀) in goats, both were kept under supervision for seven days till observed the clinical signs of FMD on animals which manifested by high temperature and vesicles formation in the foot pad and between the toes.

Injection of bee venom solution as treatment in guinea pigs and goats: Guinea pigs were divided to two groups (test and control) each consist of 15 animals. The control group will be kept far from the tested animals without any infection, Application of treatment will be done just appear the vesicles by injection of bee venom 0.2 ml/animal daily intradermal by recommended dose according to the animal weight for five days. Goats were divided to two groups (test and control) each consist of 6 animals. The control group will be kept far from the tested animals without any infection. Application of treatment will be done just appear the vesicles by injection of bee venom 4 ml/animal daily intradermal by recommended dose according to the animal weight for seven days.

Collection of whole blood samples: -

Blood samples were collected from each tested animal into EDTA vacutainers. The samples were gently mixed immediately and put on ice bag till time of examination, and were used for **Hematological examination** (RBCs Count, Hematocrit value (PCV), Hemoglobin content, blood indices (MCV, MCH, MCHC, WBCs count, and platelets).

Preparation of serum samples: -

Part of the blood samples was taken simultaneously into empty clean vacutainers without anticoagulant. Each blood sample was left to coagulant at room temperature till the clot retracted. The serum was removed by automated pipette and clarified by centrifugation at 3000 r.p.m. for 15 min. And clean non hemolysed serum samples were kept at -20 °C till time of analysis to be done directly after separation. And were used for Biochemical investigations (ALT, lactate dehydrogenase (LDH), and creatinine level)

Histopathological examination: Specimens like liver, kidney, and heart from guinea Pigs and goats in all experimental

groups were collected and fixed in neutral buffered formalin 10%, washed in tap water overnight and exposed to ascending concentration of ethanol (70%, 80, 90 and 100%), cleared in xylene and embedded in paraffin. Sections of the tissues (4-5 μ thick) were prepared and stained with hematoxylin and Eosin (**Bancroft et al, 1996**).

Statistical analysis: The obtained results were processed statistically according to **Snedecor and Cochran (1980)**, where minimum, maximum, mean value, standard deviation, standard error, and range were represented. Comparison between groups for significance was done by using T-test.

III. RESULTS & DISCUSSION

Results: -

Preclinical evaluation of bee venom treatment against FMDV-O in guinea pigs: - Clinical signs observation: The severity of the lesion and the heels condition of the animals were noticed and monitored during the treatment period. At the seventh day of infection, we begin noticed that gradual increasing in temperature of the animals manifested by redness of the eye as seen in (Photo-2). Appearance of clear inflammation of the foot pad manifested by redness and swelling in the foot pad as shown in (photo-3), and also between the toes as seen in (photo-1). At the end of treatment period, the animals were better than previous as seen in photo (3-C), the redness on the foot pad nearly disappear and febrile condition is completely cleared as seen in photo (3-C). There are another clinical signs of FMD in guinea pigs like increasing in temperature (fever) as appeared in table (1) and reduction in the body weight as shown in table (2). Also the virus titer was determined during the treatment period and found that the titer of virus at 7th day of treatment of bee venom was decreased to be disappeared and the final titer of virus was zero as seen in table (3). Different changes are seen in hematological and biochemical analysis during the treatment period revealed improvement of the animals gradually in compare with the infected cases at the beginning of the study as seen in (table 4,5) and (figures from 1 to 2).

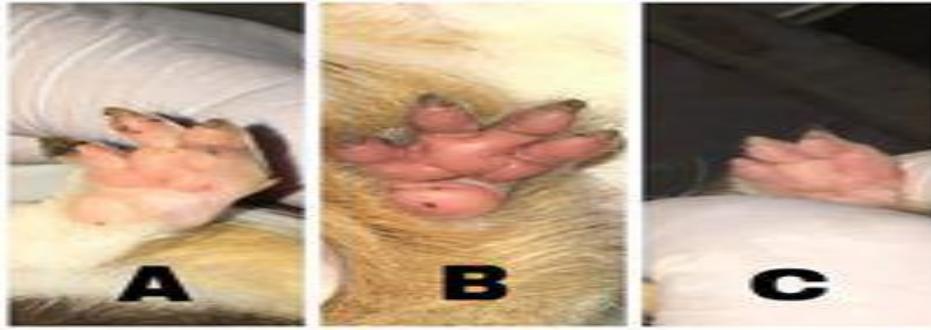


Photo (1):

- A) - Shows the normal toes of guinea pig
- B) - Shows the infected toes of guinea pig with swelling between the toes.
- C) - Shows the treated toes of guinea pig

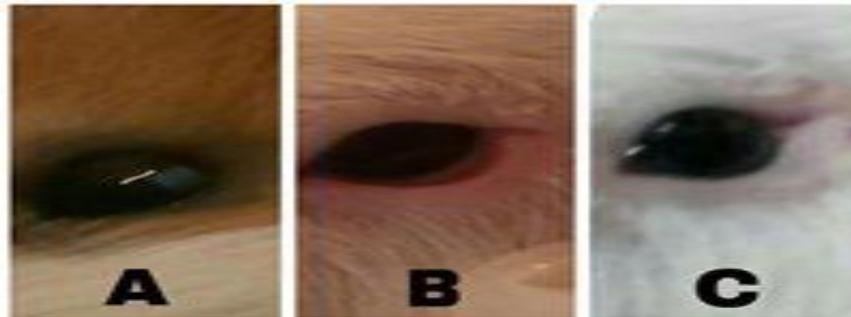


Photo (2):

- A) - Shows the normal eye of guinea pig
- B) - Shows the infected eye of guinea pig with redness around it
- C) - Shows the treated eye of guinea pig



Photo (3):

- A) - Shows the normal heel of guinea pig
- B) - Shows the infected heel of guinea pig with Severe redness and inflammation
- C) - Shows the treated heel of guinea pig

Table (1): The temperature of Guinea pigs during infection of FMDV-O and treatment of bee venom.

Normal temperature of animals	Temperature at the 7th day after infection (1 st day of treatment)	Temperature of treated animals at 3 th day	Temperature of treated animals at 7 th day
35.9 ± 2.3 °C	38.8* ± 0.8 °C	37.5 ± 0.7°C	36 ± 0.6°C

Table (2): The body weight of Guinea pigs during infection of FMDV-O and treatment of bee venom.

Normal body weight of animals	Body weight of infected animals at 7 th day	Body weight of treated animals at 7 th day of treatment period
500 ± 50 gm.	460* ± 45 gm.	490 ± 49 gm.

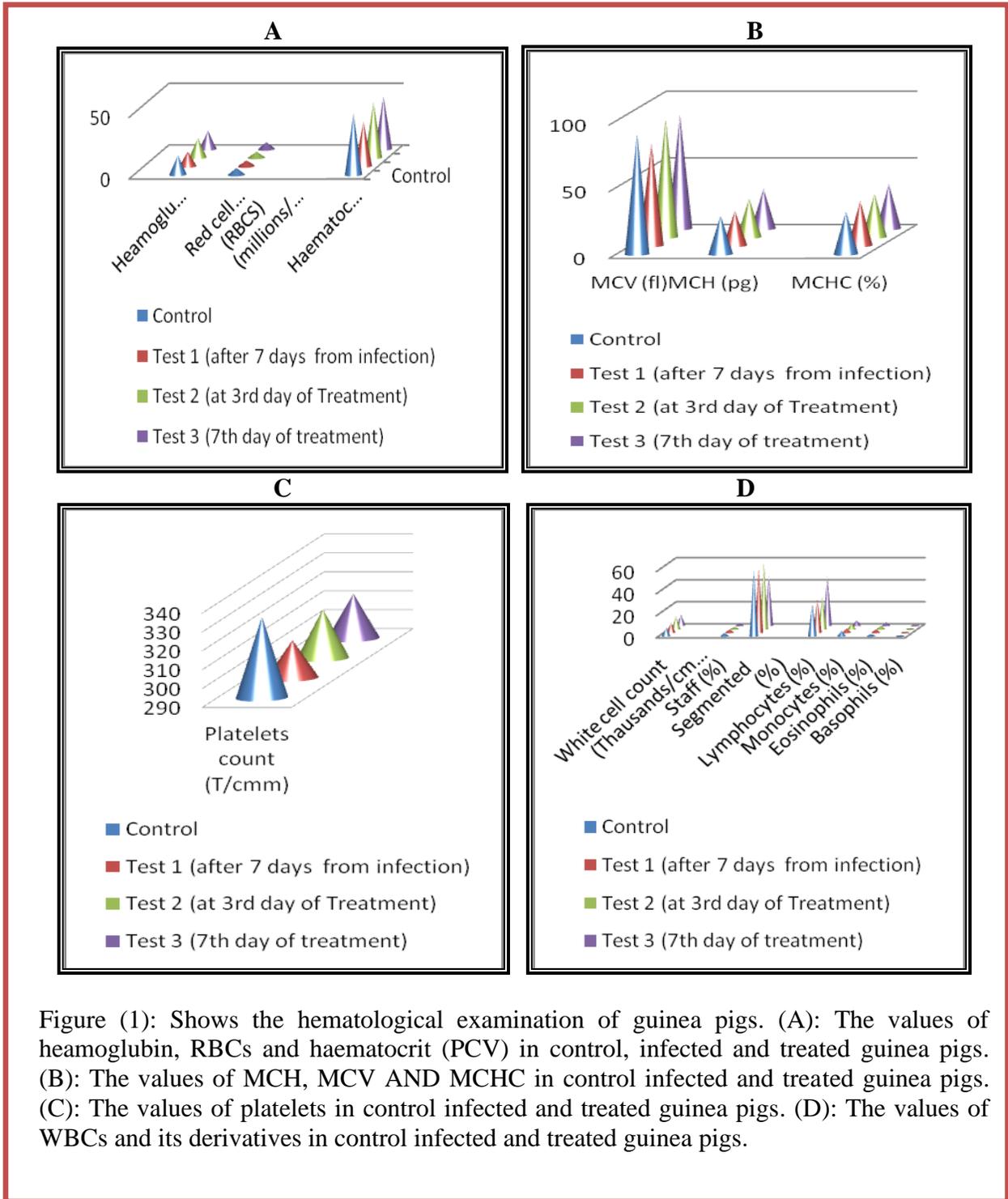
Table (3): The titer of FMDV-O in infected and treated guinea pigs:

FMDV-O titer (infected)		FMDV-O titer (treated)			
1 st day of Infection titer	At the 7th day after infection (1st day of treatment)	At 3 rd day	At 7 th day		
			After 24 hrs	After 48 hrs	After 72 hrs
1×10 ⁵	1×10 ⁶	1×10 ^{2.7**}	1×10 ^{1.7***}	1×10 ^{1.2***}	0***

Hematological examination of guinea pigs: -

Table (4): Hematological values of guinea pigs: -

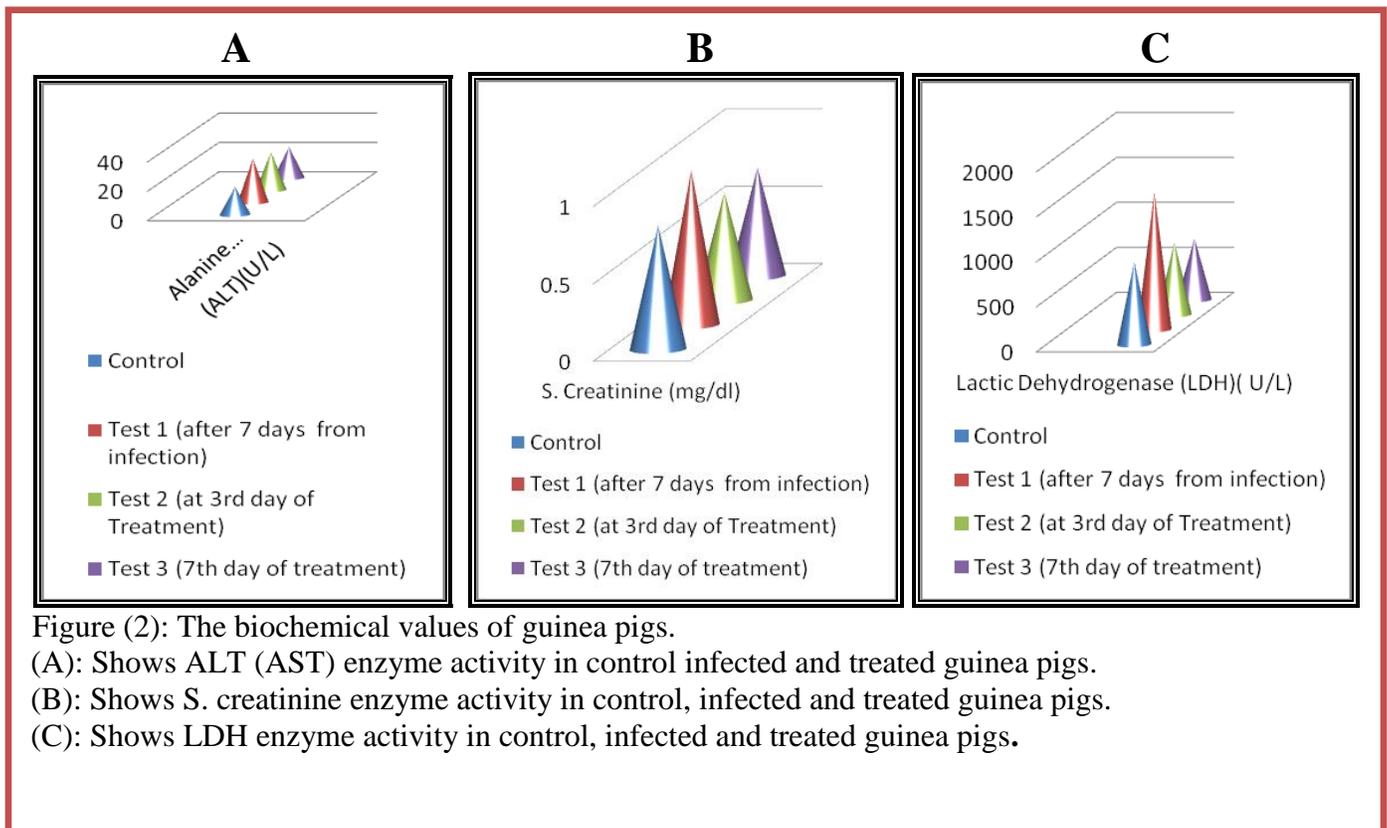
Parameters	Control	Test 1 (after 7 days from infection)	Test 2 (at 3rd day of Treatment)	Test 3 (7th day of treatment)
Heamoglobin (g/dl)	16.0 ±1.6	12.2 *±1.22	15.8 ±1.58	15.1 ± 1.51
Red cell count (RBCS) (millions/cmm)	5.5± 0.55	4.7±0.47	4.8±0.48	5.66± 0.566
Haematocrit (PCV) (%)	50.0 ±5	36.3*±3.63	45.0±4.3	43.0 ±4.3
MCV (fl)	90.9 ±9.09	77.2* ±7.72	89.6±8.96	85.5 ± 85.5
MCH (pg)	29.1 ±2.91	26.0*±2.6	29.2±2.9	30.0 ±3.3
MCHC (%)	32.0 ±3.2	33.8 ±3.38	32.6 ±3.26	33.7± 3.37
Platelets count (T/cmm)	333 ±33.3	310±33	316 ±31.6	313.8 ±31.38
White cell count (WBCS) (Thousands/cmm)	8.0 ±0.8	8.8 ±0.88	11.8 *±1.18	10.0**± 0.1
Staff (%)	3 ±0.3	3 ±0.3	2 ±0.2	2 ±0.2
Segmented (Neutrophils) (%)	60 ± 6	60 ±6	60 ±6	45* ±4.5
Lymphocytes (%)	30 ±3	30 ±3	30 ±3	45* ±4.5
Monocytes (%)	5 ±0.5	4 ±0.4	5 ±0.5	5 ±0.5
Eosinophils (%)	2 ±0.2	3 ±0.3	3 ±0.3	3 ±0.3
Basophils (%)	0 ±0	0 ±0	0 ±0	0 ±0



Biochemical examination of guinea pigs: -

Table (5): Enzyme activities in serum of guinea pigs: -

Parameters	Control	Test 1 (after 7 days from infection)	Test 2 (at 3rd day of Treatment)	Test 3 (7th day of treatment)
Alanine Transaminase (ALT)(U/L)	19 ±1.9	30** ±3	26* ±2.6	21 ±2.1
S. Creatinine (mg/dl)	0.8± 0.08	1.0 ±0.1	0.7±0.07	0.7±0.07
Lactic Dehydrogenase (LDH)(U/L)	922 ±92.2	1531**± 153.1	810* ±81	683** ±68.3



Histopathological examination of guinea pigs: -

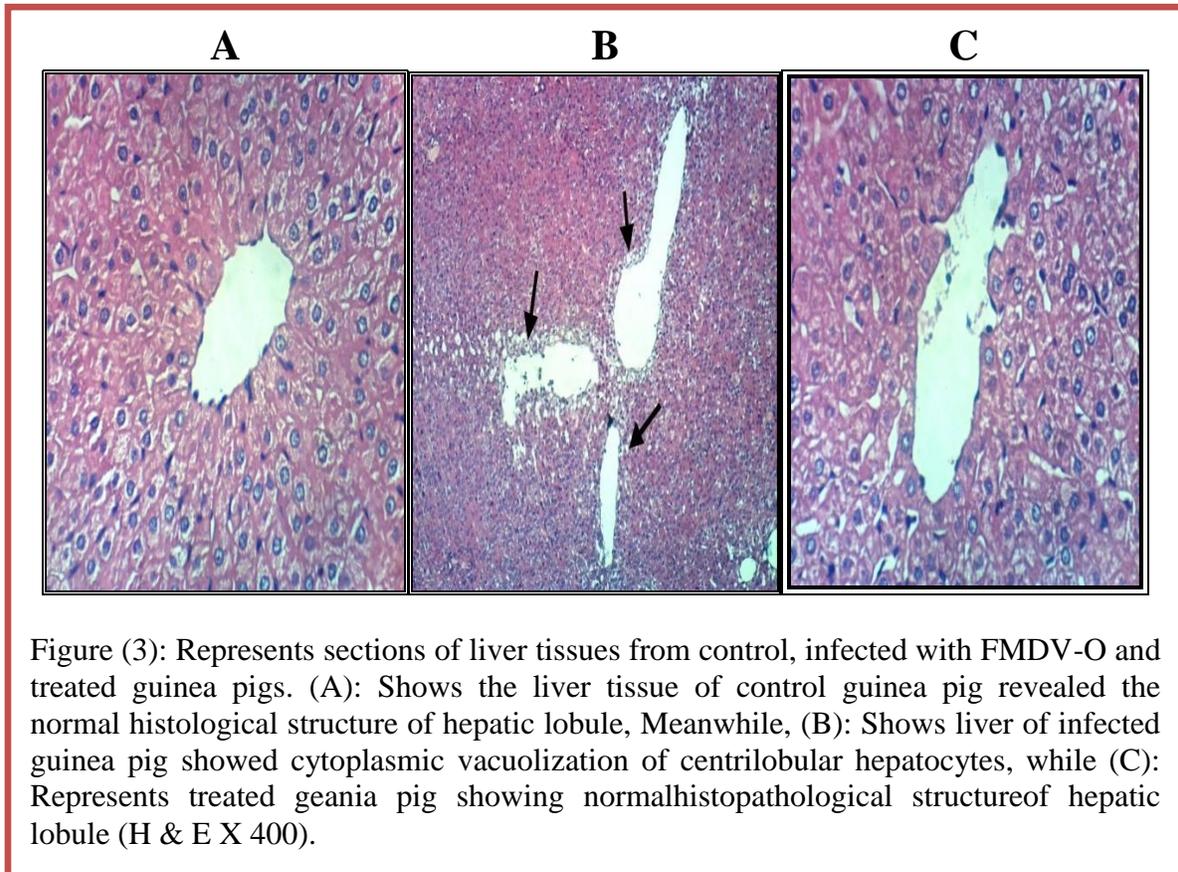


Figure (3): Represents sections of liver tissues from control, infected with FMDV-O and treated guinea pigs. (A): Shows the liver tissue of control guinea pig revealed the normal histological structure of hepatic lobule, Meanwhile, (B): Shows liver of infected guinea pig showed cytoplasmic vacuolization of centrilobular hepatocytes, while (C): Represents treated geania pig showing normalhistopathological structureof hepatic lobule (H & E X 400).

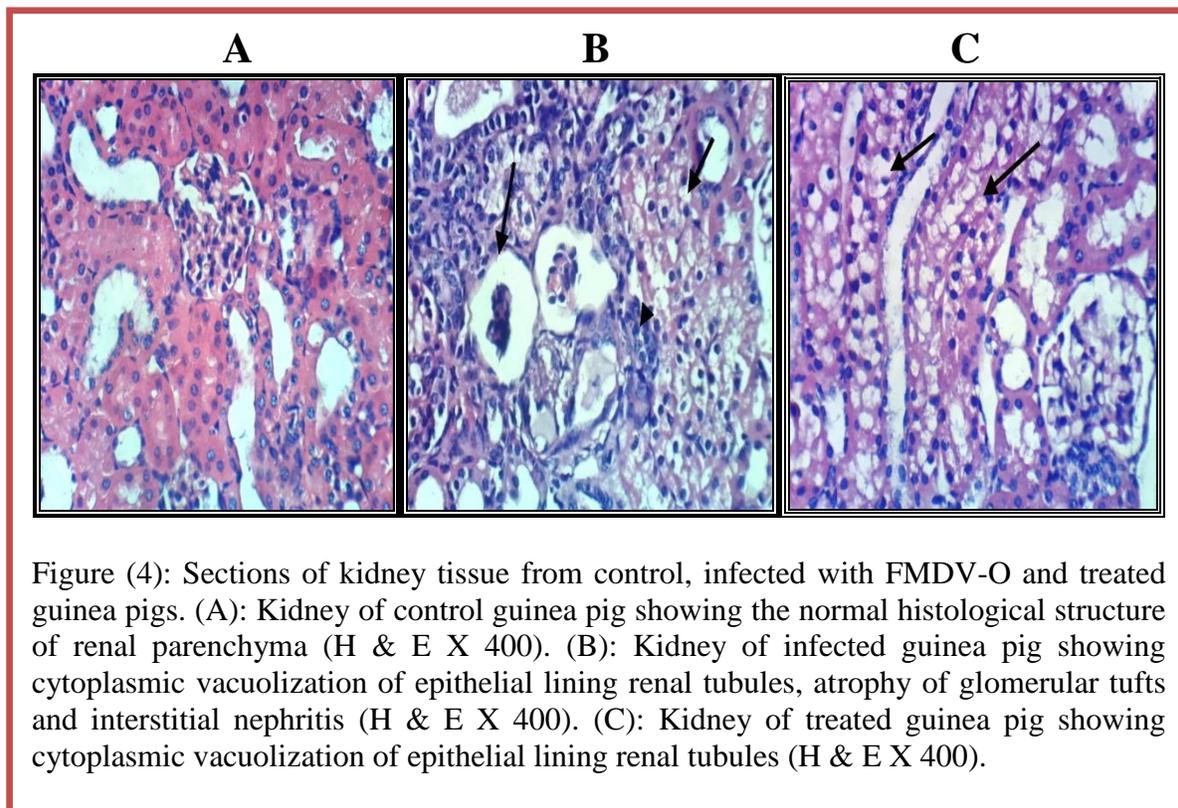
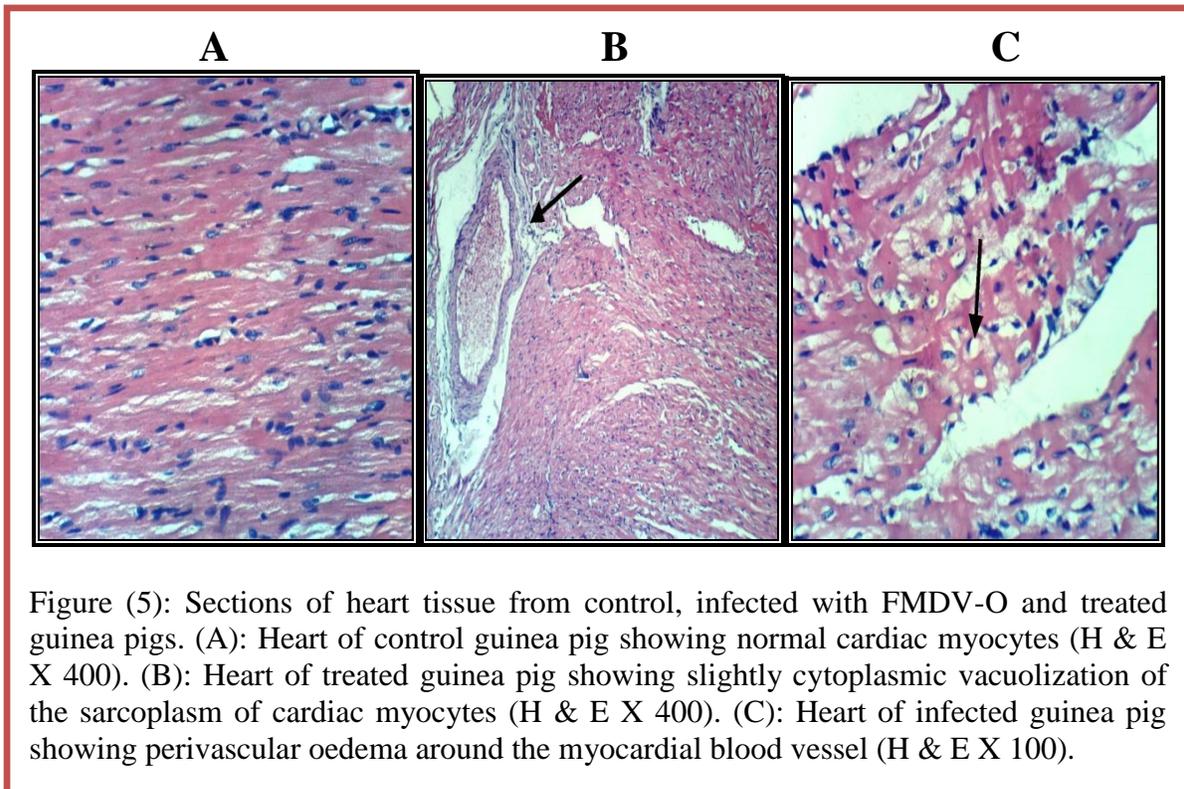


Figure (4): Sections of kidney tissue from control, infected with FMDV-O and treated guinea pigs. (A): Kidney of control guinea pig showing the normal histological structure of renal parenchyma (H & E X 400). (B): Kidney of infected guinea pig showing cytoplasmic vacuolization of epithelial lining renal tubules, atrophy of glomerular tufts and interstitial nephritis (H & E X 400). (C): Kidney of treated guinea pig showing cytoplasmic vacuolization of epithelial lining renal tubules (H & E X 400).



Clinical evaluation of bee venom treatment against FMDV–O in goats: -

Clinical signs observation: The severity of the lesion, temperature and the heels condition of the animals were noticed and monitored during the treatment period. (Photo-4) represent lesions on gum of goat, the lesions on gum nearly disappear and febrile condition is completely cleared at the end of treatment period. There are another clinical signs of FMD in goats like increasing in temperature (fever) as appeared in table (6) and reduction in the body weight as shown in table (7). Also virus titer was determined before and during the treatment period and showed that the titer of virus at 7th day of treatment of bee venom was decreased till disappeared finally as seen in table (8). Different changes are seen in hematological and biochemical analysis during the treatment period revealed improvement of the animals gradually in compare with the infected cases at the beginning of the study as seen in (table 9,10) and figures from 6 to 7.

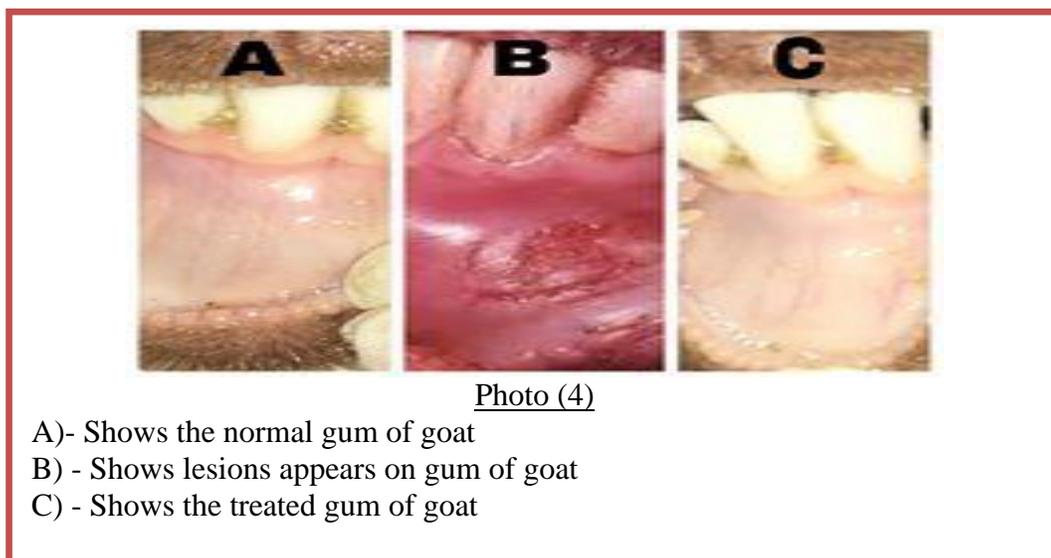


Photo (4)

- A)- Shows the normal gum of goat
- B) - Shows lesions appears on gum of goat
- C) - Shows the treated gum of goat

Table (6): The temperature of goats during infection of FMDV-O and treatment of bee venom.

Normal temperature of animals	Temperature at the 7th day after infection (1 st day of treatment)	Temperature of treated animals at 3 th day	Temperature of treated animals at 7 th day
38.4-40 °C Range (39.4°C)	39.9 ±3.99 °C	38.2 ±3.82 °C	38.4 ± 3.84°C

Table (7): The body weight of goats during infection of FMDV-O and treatment of bee venom.

Normal body weight of animals	Body weight of infected animals at 7 th day	Body weight of treated animals at 7 th day of treatment period
30 ±3.0 Kg	25±2.5 Kg	29±2.9 Kg

Table (8): The titer of FMDV-O in infected and treated goats:

FMDV-O titer (infected)		FMDV-O titer (treated)			
1 st day of Infection titer	At the 7th day after infection (1st day of treatment)	At the 3 rd day	At the 7 th day		
			After 24 hrs.	After 48 hrs.	After 72 hrs.
1×10 ^{6.5}	1×10 ^{6.5}	1×10 ^{5*}	1×10 ^{4.1*}	1×10 ^{2.4**}	0***

Hematological examination of goats: -

Table (9): Hematological values of goats: -

Parameters	Control	Test 1 (7 th day of Infection Period)	Test 2 (3rd day of Treatment)	Test 3 (7th day of treatment)
Heamoglobin (g/dl)	11.5 ±1.15	11.4 ±1.14	9.2* ±0.92	11.3 ±1.13
Red cell count (RBCS) (millions/cmm)	5.0 ±0.1	4.4±0.4	4.56± 0.056	4.4 ±0.44
Haematocrit (PCV) (%)	33.0 ±0.3	33.9±3.39	32.2±3.22	37.6 *±3.76
MCV (fl)	30.0±3	77.0** ±7.7	79.3±3.93	76.4± 7.64
MCH (pg)	25.3±11.53	25.9±2.5	24.3±2.43	25.7 ±2.57
MCHC (%)	38.0 ±38.3	33.6 ±3.36	41.2 ±41.82	33.7±3.37
Platelets count (T/cmm)	400 ±4	979**±97.9	512* ±51.2	400.0 ±40
White cell count (WBCS) (T/cmm)	22.0 ±2.2	14.0*±1.4	13.0**±1.3	14.5* ±1.45
Staff (%)	2±0.2	2 ±0.2	1 ±0.1	2 ±0.2
Segmented (Neutrophils) (%)	45 ±4.5	55* ±5.5	50 ±5	45 ±4.5
Lymphocytes (%)	45 ±4.5	65** ±6.5	70** ±7	50 ±5
Monocytes (%)	5±0.5	5±0.5	6± 0.6	3 ±0.3
Eosinophils (%)	3 ±0.3	3 ±0.3	2 ±0.2	1 ±0.1
Basophils (%)	0 ±0	1 ±0	0 ±0	0 ±0

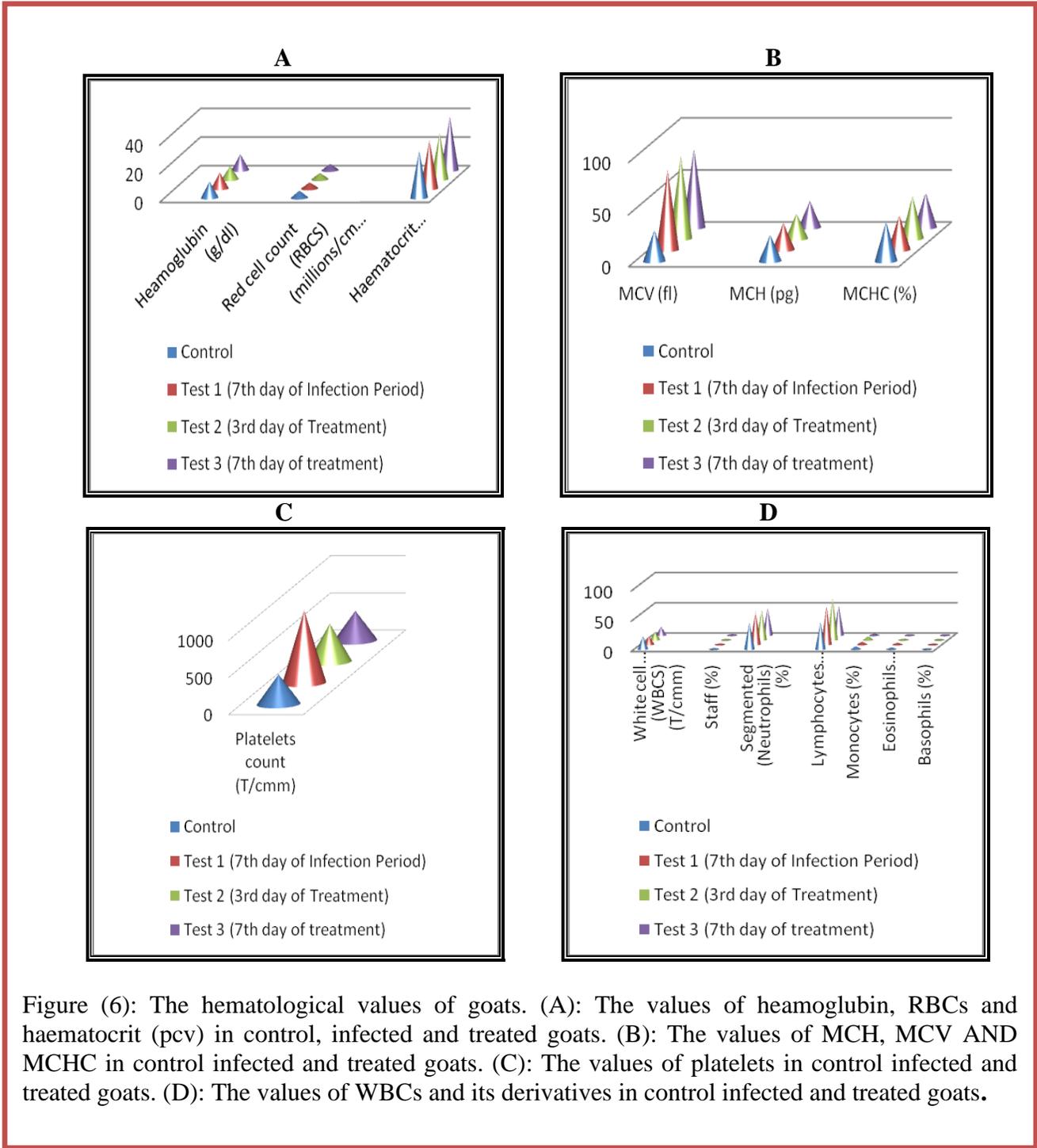
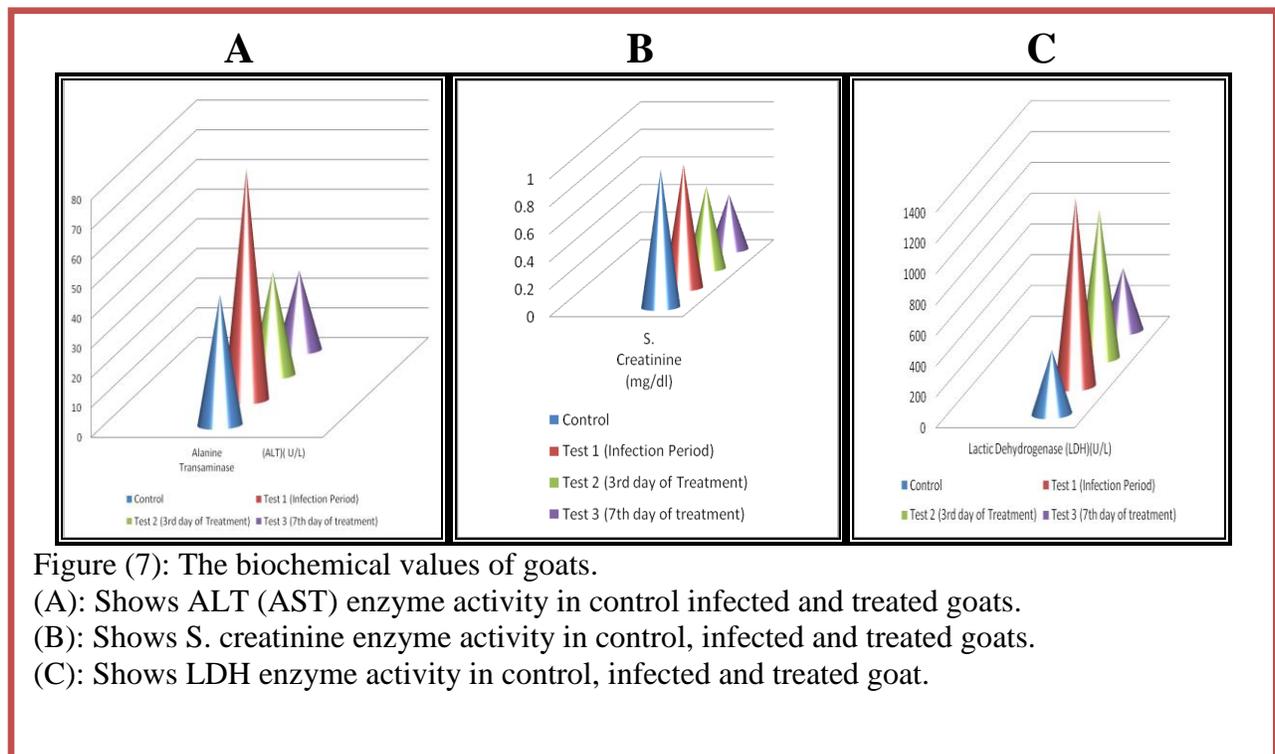


Figure (6): The hematological values of goats. (A): The values of heamoglobin, RBCs and haematocrit (pcv) in control, infected and treated goats. (B): The values of MCH, MCV AND MCHC in control infected and treated goats. (C): The values of platelets in control infected and treated goats. (D): The values of WBCs and its derivatives in control infected and treated goats.

Biochemical examination of goats: -

Table (10): Enzyme activities in serum of goats: -

Parameters	Control	Test 1 (Infection Period)	Test 2 (3 rd day of Treatment)	Test 3 (7 th day of treatment)
Alanine Transaminase (ALT)(U/L)	44 ± 4.4	78 *±7.8	35* ±3.5	27 **±2.7
S. Creatinine (mg/dl)	1.0 ±0.1	0.9 ±0.09	0.6 ±0.06	0.4± 0.04
Lactic Dehydrogenase (LDH)(U/L)	415 ±4.15	1224 ***±122.4	965** ±96.5	405 ±40.5



Histopathological examination of goats: -

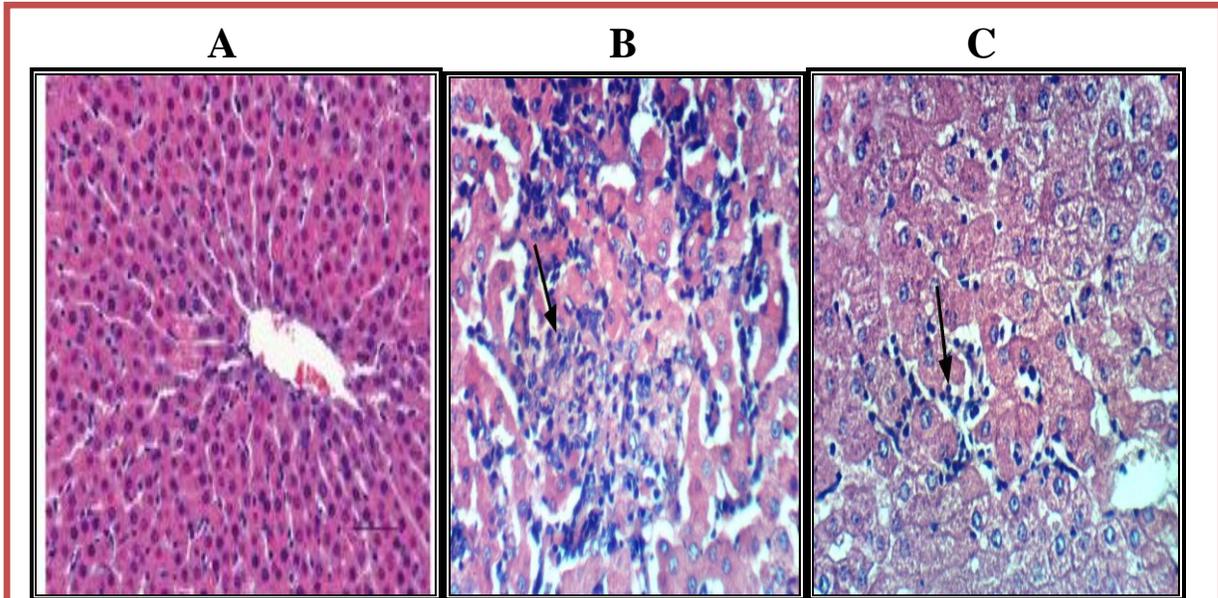


Figure (8): Sections of Liver tissue from control, infected with FMDV-O and treated goats. (A): Liver tissue of control goats revealed the normal histological structure of hepatic lobule (H & E X 400). (B): Liver infected with FMDV-O showing focal hepatic necrosis associated with mononuclear inflammatory cells infiltration (H & E X 400). (C): Treated liver showing sinusoidal leukocytosis (mainly lymphocytes) (H & E X 400).

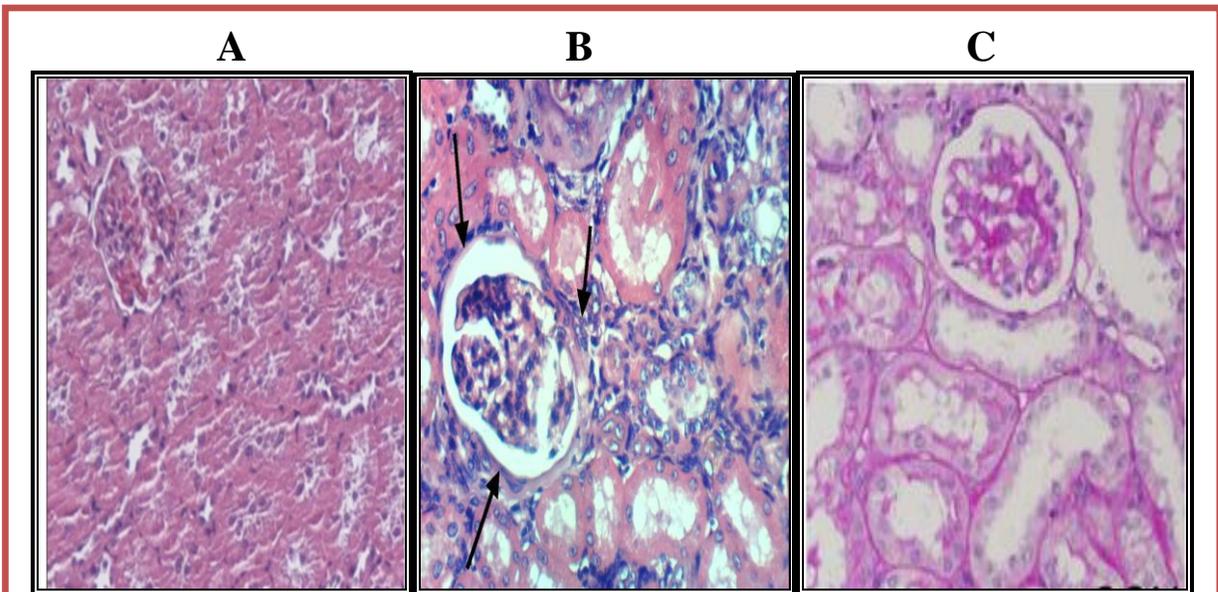


Figure (9): Sections of Kidney tissue from control, infected with FMDV-O and treated goats. (A): Kidney of control goats showing normal cardiac myocytes (H & E X 400). (B): Photomicrograph of kidney infected with FMDV-O showing interstitial nephritis and thickening of the parietal layer of Bowman's capsule (H & E X 400). (C): Treated kidney showing cytoplasmic vacuolization of epithelial lining renal tubules (H & E X 400).

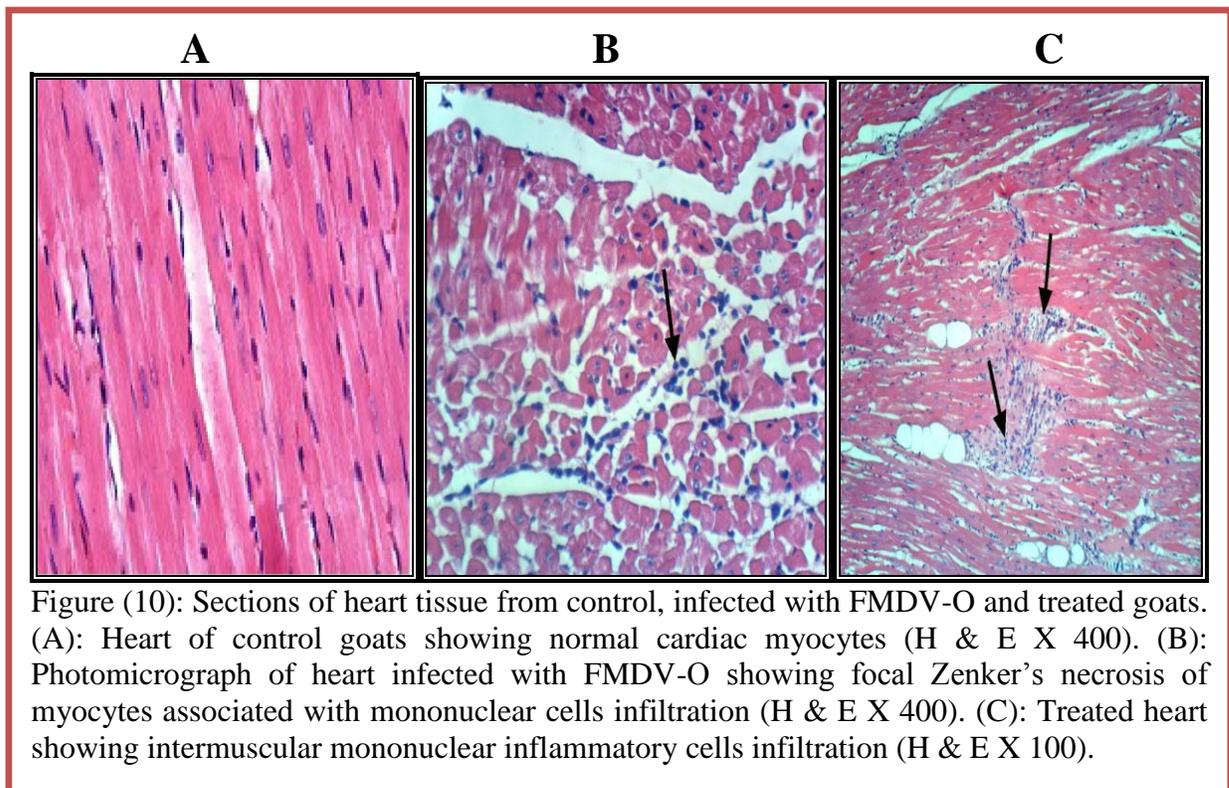


Figure (10): Sections of heart tissue from control, infected with FMDV-O and treated goats. (A): Heart of control goats showing normal cardiac myocytes (H & E X 400). (B): Photomicrograph of heart infected with FMDV-O showing focal Zenker's necrosis of myocytes associated with mononuclear cells infiltration (H & E X 400). (C): Treated heart showing intermuscular mononuclear inflammatory cells infiltration (H & E X 100).

Discussion: -

Regarding to the previous results, Infection of Guinea pigs by FMDV-O resulted in redness and swelling in the foot-pad and eye and between the toes and febrile /condition, these previous results due to the effect of virulent virus on guinea pig as agreed by **Chen and Liu (2013)**, **Lohse, et al (2012)**, **Wang et al, 2011**, **Núñez et al, 2007**, and **Knudsen et al, 1979**. Infection of goats by FMDV-O resulted in appearance of lesions in gum and febrile condition of the animals manifested by shivering in all tested animals, these previous results due to the effect of virulent virus on goats and guinea pigs as agreed by **Gakuya et al (2011)**, and **Wernery & Kinne (2012)**, while rectal temperatures was determined and we found significant decrease in temperature after treatment by bee venom injection as shown in (table 1,6), this result was agreed with (**Kittelberger, et al, 2015**). Regarding the hematological results, total number of RBCs in the infected group was significantly lower than that in the treated group ($P < 0.05$), while MCV values were significantly higher in the treated group. There were no significant differences in the other haematological parameters between the groups. The significant reduction in RBCs and elevation in MCV may be attributed to endocrinopathy as reported previously by (**Gokce et al., 2004**). Regarding the biochemical results as shown in (5,10), there were significant increase in ALT, Creatinine and LDH in infected group comparing with the control group as reported previously by (**Gokce et al., 2004**), these biochemical and haematological alterations may indicate the development of anaemia and pancreatic dysfunction in animal suffering from FMD. This study also indicated that Aphtovirus induces the production of nitric oxide, in vivo. These findings provided information on our understanding of the clinical pathology and pathogenesis of FMD.

Treatment of diseased guinea pigs and goats by bee venom injection daily for 7 days resulted in disappearance of the previous clinical signs at the end of treatment period.

Regarding the RBCs count, hemoglobin content, and PCV value of infected and test guinea pigs and goats as shown in (tables 4, 9 and figures 1 and 6), there was non-significant increase in RBCs count, and hemoglobin content after 7 days of bee venom injection with concomitant gradual significant increase in Hematocrit percent within normal range along the period of the study. Similar results obtained by (**Husseien, et al, 2001**). While MCV, MCH and MCHC values showed no significant increase along the testing period between the infected and tested group. This result was in agreement with that previously reported by (**Ishay et al, 1975**). The overall results of the erythron indicated that injection of bee venom in guinea pigs for 7 days resulted in improving blood status which explained by improving integrity of RBCs leading to increase in erythron and stimulatory effect on the heart that may result in increasing blood flow as reported by (**Vick et al, 1974**), (**Eliezer kaplinsky et al, 1976**) and **Husseien et al (2001)**. Concerning leukons, there was significant increase in total leukocytes with concomitant increase in lymphocytes count although this increase was within the normal range after 7 days of bee venom injection compared with the control group. This may be due to enhancement of lymphocytosis under the effect of bee venom components as PLA2 which discussed by (**Prinz et al, 1987**), or due to lymphocytes proliferation by stimulation of immune system as result of bee venom injection, this was assessed by (**Lonnitzer and Rabson, 1986**). Monocytes showed non-significant decreased after 7 days of bee venom injection although this was within the normal range. This decrease can clarify that increase in lymphocytes was due to its proliferation and not due to allergy

otherwise monocytes was also increased in response to allergy (**Moneret -Vautrin et al, 1987**). Neutrophils showed non-significant decrease while eosinophils and basophils count cause non-significant changes along the test period, these results were in agreement with (**Somerfield et al, 1984**) and may be due to the injection of nontoxic dose as mentioned by (**Kosnik and Wraber, 2000**).

The platelets count as shown in (table 4, 9 and figures 1,6), there was non-significant increase after 7 days of bee venom injection, while the observed increase in the values were within the normal level. This platelets activity was due to bee venom hypersensitivity (**Tsicopolous et al, 1989**) but the use of bee venom in special schedule for injection may cause desensitization which give rise to adjustment of platelets level to be in the normal range. Also may be due to inhibition in platelets aggregation under the stimulatory effect for production of prostaglandin as mentioned by (**Ribardo et al, 2001**).

Regarding the biochemical activities, AST activity showed moderate significant decrease ($P \geq 0.01$) in its levels in treated group along the test period as shown in (table 5,10 and figure 2, 8). These give us more confidence that bee venom has improvement action on the liver. The serum creatinine level (table 5, 10 and figure 2, 8) of treated group resulted in significant decreases after 7 days with no-significant decrease along the test period compared with infected group. This means that bee venom has benefit effect on the kidney. As shown in (table 5, 10 and figure 2, 8), there was moderate significant decrease in the LDH levels in compared with infected group along the test period. These previous biochemical changes attributed to the benefit effect of bee venom on the blood which increase the tissue tolerance to lack of oxygen (hypoxia) with increase in arterial blood flow and vascular permeability so the exchange between blood and tissue is increased (**Foster, 1969, Vick et al, 1974, and Chkenderow and Kobourova, 1981**). This explained that bee venom didn't induce cellular toxicity determined by decrease in release of lactic dehydrogenase (LDH).

Regarding the pathological examination of guinea pigs and goats, as shown in (figure 3,4,5,8,9,10), Microscopically, In Figure (3-B) shows liver of infected guinea pig showed cytoplasmic vacuolization of centrilobular hepatocytes, while figure (3-C) represents treated guinea pig showing normal histopathological structure of hepatic lobule. In Figure (4-B) shows sections of kidney tissues of infected guinea pig revealed cytoplasmic vacuolization of epithelial lining renal tubules. Meanwhile, In figure (4-C) shows treated guinea pig revealed slightly vacuolization. In figure (5-B) shows heart of infected guinea pig showing perivascular oedema around the myocardial blood vessel. Meanwhile, In figure (5-C) represents heart of treated guinea pig showing slightly cytoplasmic vacuolization of the sarcoplasm of cardiac myocytes. In figure (8-B) shows liver infected with FMDV-O showing focal hepatic necrosis associated with mononuclear inflammatory cells infiltration. In figure (8-C) shows treated liver showing sinusoidal leukocytosis. (9-B) represents Photomicrograph of kidney infected with FMDV-O showing interstitial nephritis and thickening of the parietal layer of Bowman's capsule and in figure (9-C) shows treated kidney showing cytoplasmic vacuolization of epithelial lining renal tubules. In figure (10-B)

shows heart infected with FMDV-O showing focal Zenker's necrosis of myocytes associated with mononuclear cells infiltration. (10-C) shows treated heart of goat showing intermuscular mononuclear inflammatory cells infiltration. Finally, there was improvement in histopathological case according to the previous results comparing between treated and infected organs.

By determination of the virus load before and after the treatment period we found that there is significant decrease in virus load along the period of treatment in compare with the beginning virus load. These results revealed that there is antiviral activity of *Apis mellifera lamarckii* venom may be due to the high level of melittin and These results were agree with **De-Clercq et al, (2000)** proved that bee venom melittin inactivates HIV and also aborts cell-to-cell fusion and transmission of HIV, due to its high-affinity interaction with gp120 and **Masuda et al, (2005)** explained that the antiviral effect of the bee venom phospholipase A2 depends essentially on its ability to hydrolyze phospholipids in host cell membranes Also proved that Bee venom melittin inactivates HIV and also aborts cell-to-cell fusion and transmission of HIV, due to its high-affinity interaction. As shown in **Moreno and Giralt (2015)**, The antiviral activities described for melittin and its analogs are caused by specific intracellular events, with the selective reduction of the biosynthesis of some viral proteins, as reported for the melittin analog Hecate on herpes virus-1 and for melittin itself on HIV-1-infected lymphoma cells. In the 90s, active melittin was presented to provide an improved composition complementary to azidothymidine (AZT) to inhibit the reverse transcriptase and growth of HIV-infected cells. Another study of **Bose and Acharya (2015)** shown that although melittin destroys the infectivity of HIV particles, the utility of this toxin is limited by its nonspecific cytotoxic effects: melittin kills cells by disrupting membrane structure and function. **Lawrence and Skalka (1980)** stated that the melittin compound can make the viral envelope permeable, that make it loss of its infectivity and **Mitsuishi et al, (2006)** indicated that the direct addition of bee venom phospholipase A2 to 293A cells suppressed adenovirus plaque formation in both number and size. **Pharney (1996)** described the beneficial effect of bee venom active components on the human body as follow: Apamin and melittin were more potent than penicillin against certain bacteria, while mast cell degranulating peptide and adolapin were non-steroidal anti-inflammatory. **Matsuzaki (1997)** said that honeybee venom contains at least 18 active substances. Melittin, is the most prevalent and it is one most potent anti-inflammatory agents known (100 times more potent than hydrocortisol). Adolapin is another strong anti-inflammatory substance and inhibit cyclooxygenase. Apamine inhibits complement C3 activity and blocks calcium-dependent potassium channels, thus enhancing nerve transmission. Other substances such as compound X, hyaluronidase, phospholipase A2, histamine and mast cell degeneration protein are involved in the inflammatory response of the venom in during a softening of tissue and facilitation of fluid flow.

These results due to **antiviral effect of bee venom** as reported by **De-Clercq et al, (2000)**, **Masuda et al, (2005)**, **Moreno & Giralt (2015)**, **Bose and Acharya (2015)**, **Lawrence and Skalka (1980)**, **Mitsuishi et al, (2006)**, **Ramadan et al,**

(2009), (Fenard *et al*, 1999), (Yong *et al*, 1990) and (Yunginger *et al*, 1978) whose mentioned that this antiviral activity due to melittin and or phospholipase A2 enzyme activity also may be due to protease inhibitor which involved in bee venom (Bogdanov, 2015). Also bee venom has **anti-inflammatory** effect which manifested by decrease foot bad inflammation during the treatment period by induction of COX2 expression and stimulation of prostaglandin generation which have biological activities resulting in revealed viremia and inflammation as reported by Ribardo *et al*, (2002), Park *et al* (2004), kim (1992) and lee *et al*, (2005).

Also in Vick *et al*, (1972) observed that bee venom or one of its components (melittin) when injected S/C in Rhesus monkeys stimulated the production of cortisol from the adrenal gland through its action on the pituitary gland without any gross or microscopic tissue changes. These observations may explain bee venom benefits in variety of disease conditions that also respond to adrenal steroid therapy. In Lee *et al*, (2004) study reported that acupuncture therapy with bee venom suppressed the development of arthritis and caused inhibition of the immune responses in type-II collagen-induced arthritis. The incidence of arthritis, the mean arthritis index, and the number of arthritic limbs were significantly lower in the bee venom treatment compared to the control group. Among the serum pro-inflammatory cytokines, examination of the histopathology of the joints of murine CIA showed decreased inflammation signs and less lymphocyte infiltration after bee venom acupuncture therapy. Hyoung *et al*, (2005) stated that bee venom has been used traditionally for the control of pain and inflammation in various chronic inflammatory diseases. They also suggested that bee venom inhibits the proliferation of rheumatoid synovial fibroblast cells through induction of apoptosis by caspase-3 activation. Kwon *et al*, 2003 reported that subcutaneous bee venom injection produced a marked suppression of leucocyte migration and tumor necrosis factor (TNF)-alpha concentration. The anti-inflammatory effect bee venom administration was mediated in part by the release of catecholamines from the adrenal medulla. Also the previous results may be attributed to effect of bee venom as **immunomodulator** which it stimulates immune system to protect the body against infection by its stimulation of prostaglandin generation which have biological activities resulting in revealed of viremia due to stimulation of IL-10, TNF alpha, and CD8 which result in regulation in IgE which responsible for histamine release (Rekka *et al*, 1990). McHugh *et al*, (1995) examined changes in cytokine secretion in patients before and during both rush and conventional venom immunotherapy (VIT) in bee venom allergen patients and showed that immunotherapy shifted cytokine responses to allergen from a TH-2 to a TH-1 dominant pattern, suggesting direct effects on T cells. So it is possible to use whole venom in treatment of various medical disorders/diseases. Kammerer *et al*, (1997) said that venom immunotherapy (VIT) lead to transient increase in T-cell proliferation followed by T-cell hypo responsiveness and modulation of cytokine secretion from T (H0)-type to a T(H1) type pattern. Akdis *et al*, (1998) found that bee venom phospholipase A2 (PLA) induced high IL-4, IL-5 and IL-13 production in peripheral blood mononuclear cell cultures. These features may enable new applications for safer immunotherapy.

IV. RECOMMENDATION

From the previous project we recommend to use bee venom as injection as alternative medicine in veterinary practice as it is safe and effective medication against virus infection specially RNA viruses as seen in the previous results on FMDV-O. We succeeded to treat laboratory and large animals by bee venom. Using of bee venom by intradermal injection is useful to maintain the health condition through its immune-stimulant effect.

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Statistical Study of Rainfall Pattern in Gombe Metropolis, and its Implication on the Attainment of Sustainable Development Goals (SDGs)

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Abstract- This paper examines the statistical rainfall pattern in Gombe metropolis and its implications on the attainment of sustainable development goals (SDGs). Adopting statistical tools commonly used to describe climate such as mean, standard deviation, coefficient of variation, standardized coefficient of skewness and kurtosis, linear trends and Standardized Anomaly Index were used to examine the recent trends and pattern. The trend of rainfall in the study area in the last three decades shows that inter-annual fluctuation responsible for dryness and recent wetness in the study area. The results of the standardized anomaly index, 3- year running moving average and the linear trend revealed that rainfall total is increasing in the study area; the increase in the annual total is predominantly as a result of the increase of August and October, which are critical months for agricultural production in the area. The research recommend that there is need for total commitment and integrated approach towards attainment of SDGs and monitoring rainfall trend as it plays a significant role in the interface of economy, means of livelihood, poverty index and attainment of food security for the benefit of the present and future generation.

Index Terms- Gombe Metropolis, Implication on the attainment, Rainfall Pattern, Statistical Study, Sustainable Development Goals

I. INTRODUCTION

Globally, it has been observed that changes are occurring in the amount, intensity, frequencies and type of rainfall. In Africa, rainfall exhibits high spatial and temporal variability. Mean annual rainfall ranges from as low as 10 mm in the innermost core of the Sahara region to more than 2000 mm in parts of the equatorial region. The rainfall gradient is largest along the southern margins of the Sahara (i.e. the Sahel) where the mean annual rainfall varies by more than 1000mm over about 750km. As a result of the tight rainfall gradient, a slight change in the position of the ITCZ can have large consequences for rainfall in the Sahel region; thus, this region is a sensitive indicator of climate change in Africa. The coefficients of rainfall variability in Africa is above 200% in the deserts, about 40% in most semiarid regions and between 5% and 20% in the wettest areas (Watson, Zinyowera, Moss, & Dokken, 2001).

Several studies in sub-sahara Africa used time series data from different parts to analyze trend of rainfall. Findings from

the analysis of the studies showed that inter-annual rainfall variability was large over most Africa, and in some regions multi-decadal variability was also substantial. In West Africa, a decline in annual rainfall has been observed since the end of 1960s, with decrease of 20% to 40% noted between 1931-1960 and 1968-1990 (Mithcell and Jones, 2005; Nicholson 2013;). In the tropical rainforest zone, decline in the mean annual precipitation of around 4% in west Africa, 3% in north Congo and 2% in southern Congo for the period 1960 to 1998 was noted (Malhi & Wright, 2004). A 10% increase in annual rainfall along the Guinea coast during the long-term trend was noted. However, increased inter-annual variability was observed in the post-1970 period, with higher rainfall anomalies and more intense and wide spread droughts reported (Fauchereau et al., 2003).

In Nigeria, a downward shifts of 8.8% rainfall from the long-term mean of 1968 to 2008 was recorded in the north-Western Nigeria (Ekpoh and Nsa 2011), also a consistent decrease in annual rainfall of 8mm year⁻¹ in the north-Eastern part has been reported (Hess et al., 1995), also a significant positive increase of 2.16mm in rainfall was recorded in the entire northern Nigeria within the period of 1970-2012 (Abdullah et al., 2015). Also a positive increase of annual rainfall of 17.1mm was observed in North-Eastern Nigeria for the period of 1984-2013 (Yahaya, 2015).

Rainfall is one of the key climatic resources of Gombe, hence the need to foster and examine its implications toward achieving the (SDGS). As of 2014 about 795 million people are estimated to be chronically undernourished. And still one person in every four still goes hungry in Africa. About 6 million still die before their fifth birthday, 16,000 children die each day in developing regions. Water scarcity affects more than 40% of people globally and said to be on alarming increase due to consequences of climate- change. Greenhouse gas emission continous to rise, and are now more than 50% higher than their 1990 level.

Today we are seeing unprecedented land degradation, and loss of arable land, drought and desertification is also on the rise each year, amounting to the loss of 12 million hectares globally. The goals will only be achieved through strong commitment partnership and cooperation, by coordinating policies to help developing nation managed their debt; and more investment opportunities. <http://www.un.org/sustainabledevelopment-goals>

It is against these highlight for the post- 2015 (MDGs) goals and recently flood of 2004, 2007 and 2014 that rendered thousands of people homeless and their means of livelihood destroyed in the study area have shown how important to analyzed the trend in rainfall towards achieving the recently 2016 sustainable development goals (SDGs).

II. STUDY AREA

Gombe town (Jewel in the Savannah) is located in the Sudan savannah region of the country at the north-east of river Benue and east of Yankari Game Reserve bordering with Adamawa, Bauchi, Borno and Yobe states covering the total area of 52sq/km with a population of 268.000 at 2006 census. The approximate altitude of Gombe ranges from 400-500m above mean sea level. Topography is mainly moutaineous, undulating and hilly to the southeast and open plains in the central north east,west and northwest.(Bello, 2009).

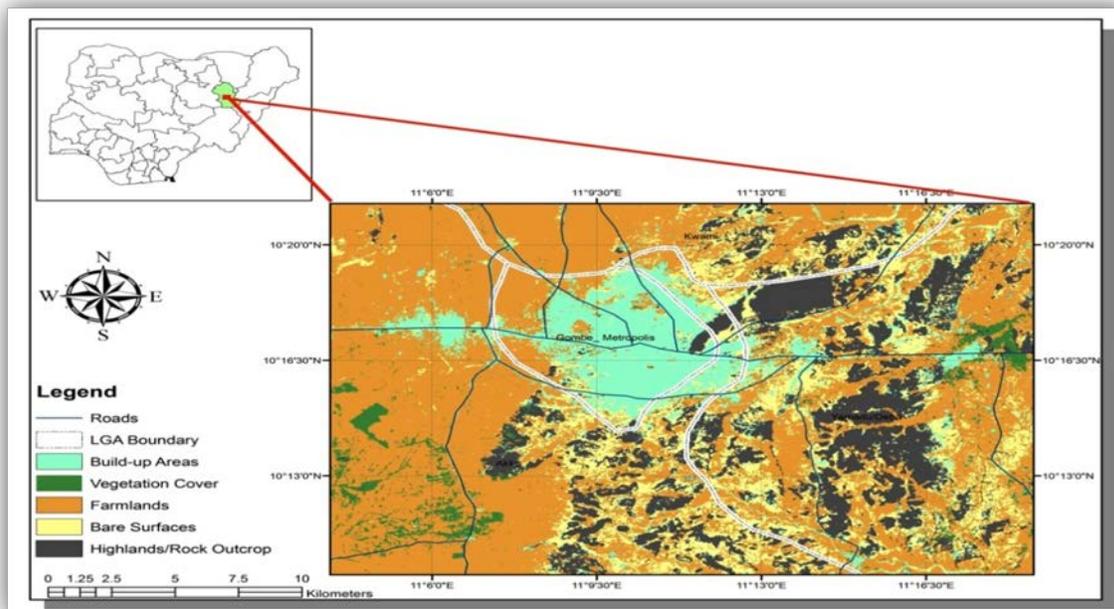
Gombe town is located between latitudes $10^{\circ}18'25.0''N$ and longitude $11^{\circ}10'29.6''E$ (Figure 1). It shares common boundary with Akko LGA in the South and West; Yamaltu-Deba to the East and Kwami to the North. It is the capital of Gombe State and occupies an area of about $45km^2$ (Ministry of Land and Survey, Gombe, 2008). Gombe town is well linked by road to other regional centres like Biu / Maiduguri, Potiskum / Damaturu, Bauchi /Jos and Yola /Jalingo. A single gauge railway line on the Bauchi – Maiduguri route also links the town, in addition to an international airport. (Mbaya, et.al 2012)

The climate of Gombe is characterized by a dry season of six months, alternating with a six months rainy season. As in

other parts of the Nigerian Savanna this precipitation distribution is mainly triggered by a seasonal shift of the Inter -Tropical Convergence Zone (ITCZ). For the years 1984 to 2013, the mean annual precipitation is 969.7mm the arrival of the rainy season starts around April or May; however, heavy rainfall may put in an appearance until June or even July. By October, the amounts of rainfall begin to decrease. (Yahaya, 2015). The mean annual temperature is about $32^{\circ}C$ weather tends to be very hot between November and March with average high temperature can reach $32^{\circ}C$ or more. The hamattan wind from around Febuary makes the temperature cooler, although with dusty conditions, where as relative humidity has some pattern being 90% in August and dropping to less than 10% during the hamattan period (Balzerek et,al 2003).

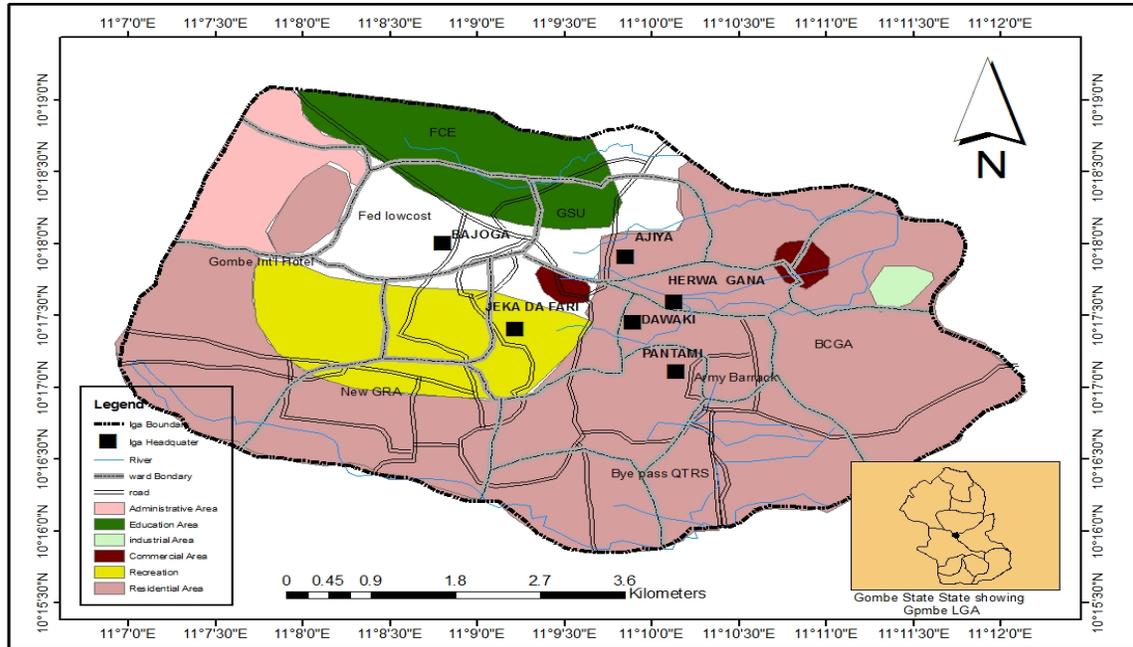
Figure 2.Gombe town area is divided into different residential quarters which include, GRA, Federal Low Coast, Arawa, State Low Coast, Kumbiya- Kumbiya, Pantami, Jekadafari, Tudunwada, Madaki, Dawaki, Bolari, Yalanguruza, Shamaki. etc (Bello, 2014)

The natural vegetation cover consist of complex, composite of thick acacia shrub and open grassland, however, the vegetation has been altered with very much degraded as a result of several human activities such as urbanization, cultivation, livestock grazing etc. feeling of trees as a means of employment which serves as a major source of fuel (charcoal and firewood) for the inhabitants by the unemployed youths without any plan to replace them. The predominant species consist of fine leaf, thorny trees such as *bulaniteagyrica* (Aduwa), *TamarindusIndica* (Tsamiya), *adasoniadegitata* (Kuka) and *Parkiabuglungosa* (Daurowa).



Fig

ure 1: Map of Gombe showing study area
Source: Adopted from B.L Gadiga, (2015)



Figure, 2 Map of Gombe Metropolis
Source: Adopted from M.B. Bashir (2014)

Today there is no country in the world that is not seeing first-hand drastic effects of climate change, which raised the question of more to be done than ever before, by improving access to technology and knowledge being an important way to share ideas and foster innovation to reduce the magnitude of climate related disasters.
<http://www.un.org/sustainabledevelopment-goals>

III. MATERIALS AND METHODS

Rainfall data for Gombe station from 1984-2013 (30 years) were collected from the Nigerian Meteorological Agency. NIMET is vested with the responsibility of documenting meteorological and climatological data in the country. In this study, the standardized coefficient of Skewness (Z_1) and Kurtosis (Z_2) statistics as defined by Brazel and Balling (1986) were used to test for the normality in rainfall totals for the study area. The standardized coefficient of Skewness (Z_1) was calculated as:

$$Z_1 = \left[\frac{\sum_{i=1}^N (x_i - \bar{x})^3 / N}{\left(\sum_{i=1}^N (x_i - \bar{x})^2 / N \right)^{3/2}} \right] / (6/N)^{1/2}$$

And the standardized coefficient of Kurtosis (Z_2) will be determined as:

$$Z_2 = \left[\frac{\sum_{i=1}^N (x_i - \bar{x})^4 / N}{\left(\sum_{i=1}^N (x_i - \bar{x})^2 / N \right)^2} \right] - 3 / (24/N)^{1/2}$$

Where: \bar{X} represents the long term mean of X_1 values, and N is the number of years in the samples. These statistics were used to test the null hypothesis that the individual temporal samples came from a population with a normal (Gaussian) distribution. If the absolute value of Z_1 or Z_2 is greater than 1.96, a significant deviation from the normal curve is indicated at the 95% confidence level.

To examine the nature of the rainfall pattern, the standardized Anomaly index (SAI) is then used. It was calculated as:

$$Z = \frac{x - \bar{x}}{S}$$

Where X is the rainfall observation for the year and, \bar{X} and S is the mean and standard deviation of the entire series respectively in the study area. This statistic enable the researcher to determine the dry (-ve values) and wet (+ve values) years in the record as reported by Hulme, (1990). It was then smoothed with 3-year running mean.

To further examine the nature of the trends in the rainfall series, linear trend lines were also plotted for the annuals and for the months of April to October using Microsoft Excel statistical tool, and estimation of changes in the rainfall series was determined. Comparisons were then made with the long-term mean totals.

The linear regression method has been used to investigate trends in many climatic time series (e.g Abaje et., al 2009

Sabbaramayya and Kumar 1987; Hutchinson 1985; Ayoade 1973).

(Z_2), Minimum, Maximum and range of rainfall for Gombe are presented in Table 2 for the months of April to October and the annual.

Result and Discussion

The mean (\bar{X}), standard deviation (SD), coefficients of variation (CV), standardized coefficients of Skewness (Z_1) and Kurtosis

Table 2: General statistics of monthly and annual rainfall for Gombe.

Statistics	April	May	June	July	August	September	October	Annual
X	27.74	81.37	135.93	223.77	289.56	168.54	39.54	969.67
SD	26.21	36.82	49.37	77.47	87.98	72.85	30.47	149.25
CV	94.48	45.25	36.32	34.62	30.38	43.22	77.06	15.39
Min	00	25.10	56.40	107.30	162.20	31.20	00	725.60
Max	106.90	149.10	236.10	440.00	578.30	300.50	113.10	1283.50
Range	106.90	124.00	179.70	332.70	416.10	269.30	113.10	557.90
Z_1	1.46	0.40	0.51	0.77	1.31	0.14	0.95	0.32
Z_2	2.01*	-0.84	-0.51	0.50	2.89*	-0.50	0.40	-0.48

* Statistically significant at 95% confidence level

The results of the standardized coefficients of Skewness (Z_1) and Kurtosis (Z_2) show that all the months and the annual were accepted as indicative of normality at the 95% significant level, with the exception of Z_2 for the months of April and August that show a significant deviation from normal. Based on this no transformation was done to the data. Therefore, the data were not transformed.

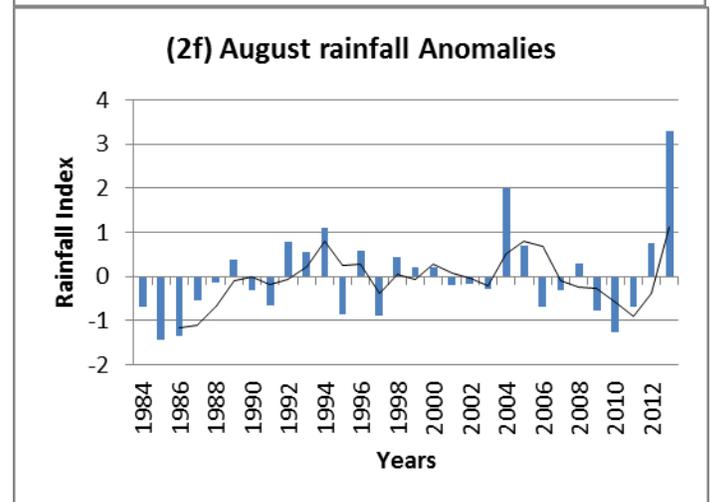
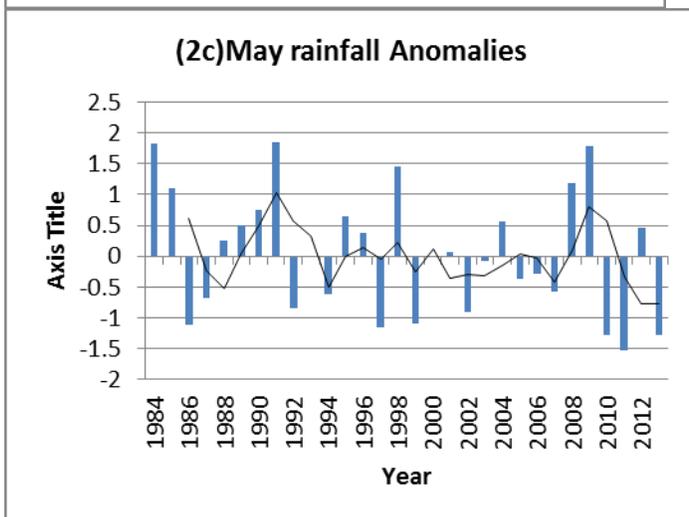
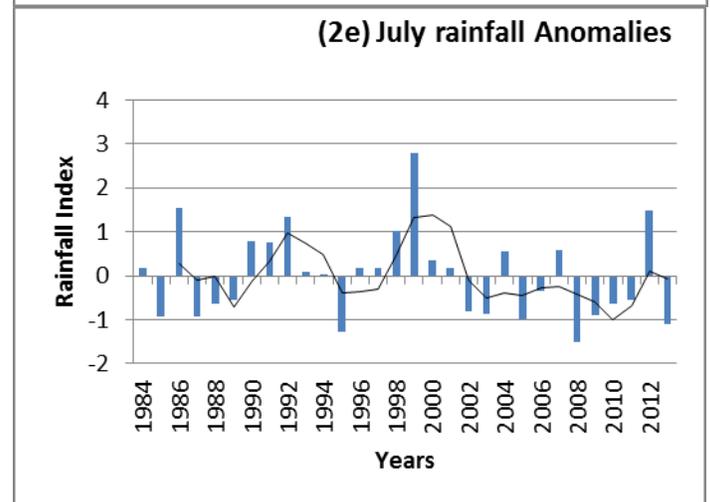
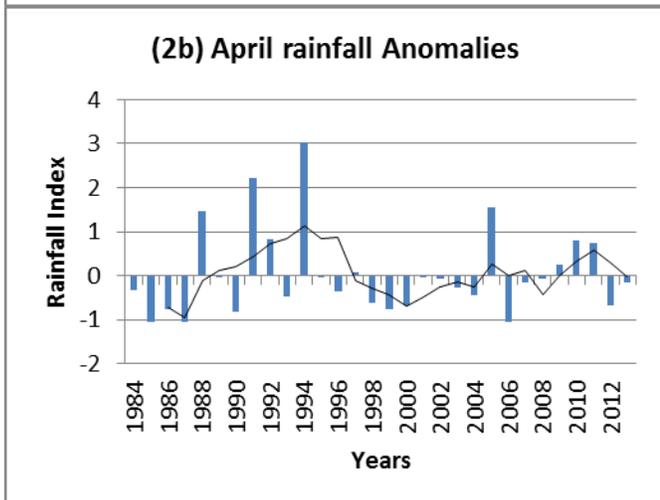
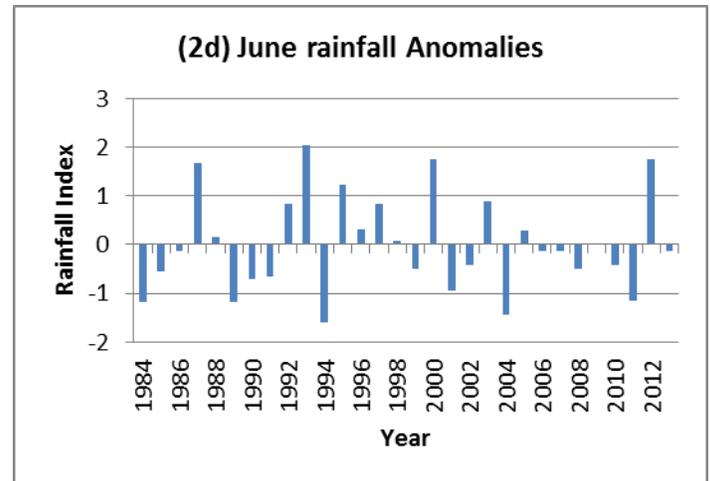
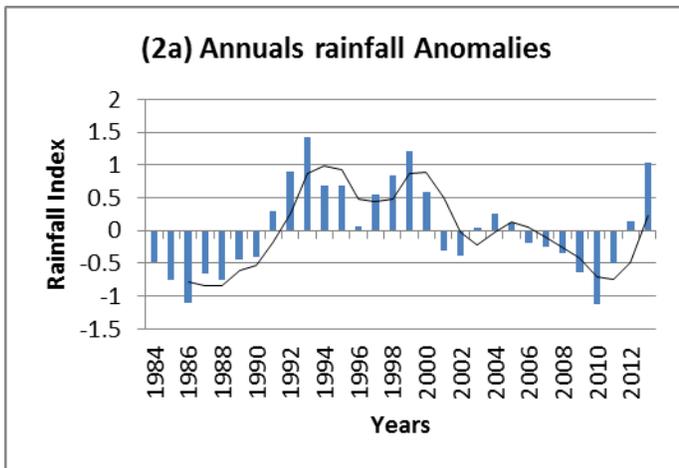
Fig. 2 shows the graphical presentation of the standardized anomaly index for both the annual and monthly rainfall smoothed out with 3- year running mean. It is clear from these results that rainfall yield is increasing in the study area. (Fig 2a) shows that the highest rainfall was recorded in 1993, whereas 1986 was a year of extremely low rainfall. This was the period of the intense drought that ravages the Northern Nigeria. The 3-year running mean shows that the recent increasing total of annual rainfall started from early 1990s to date. The increase does not show a distinct trend because there are fluctuations.

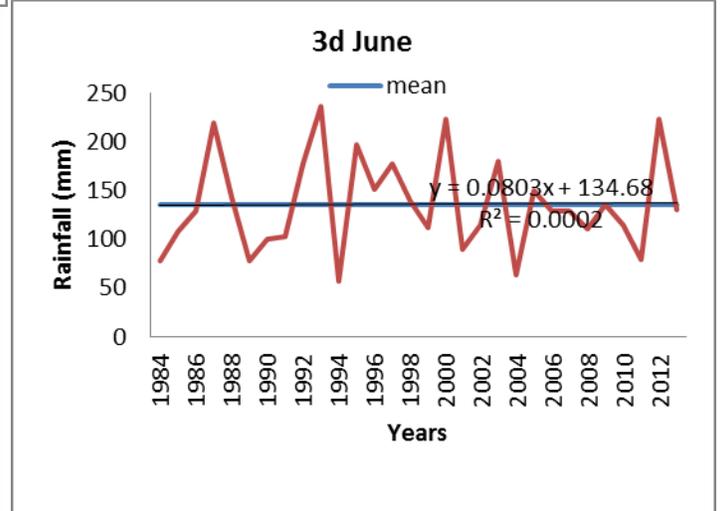
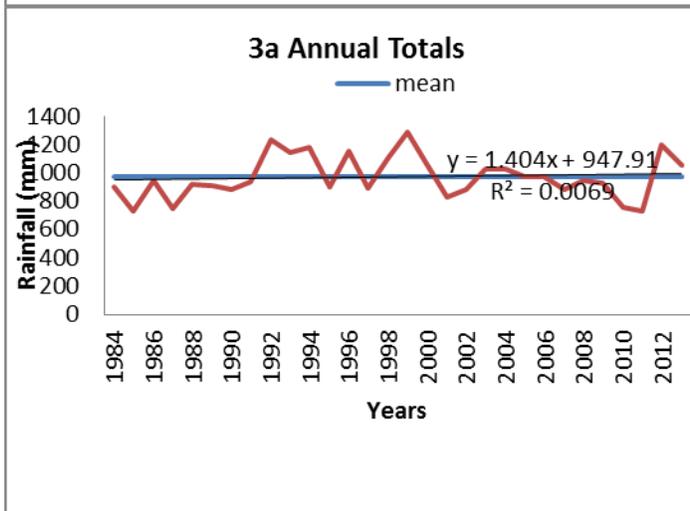
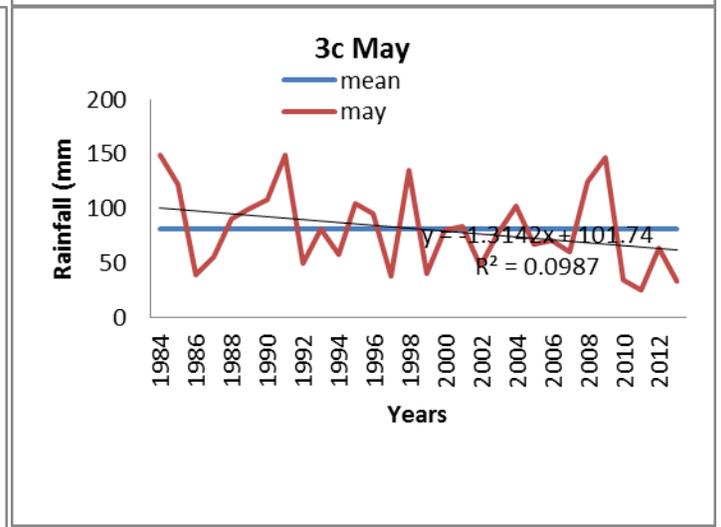
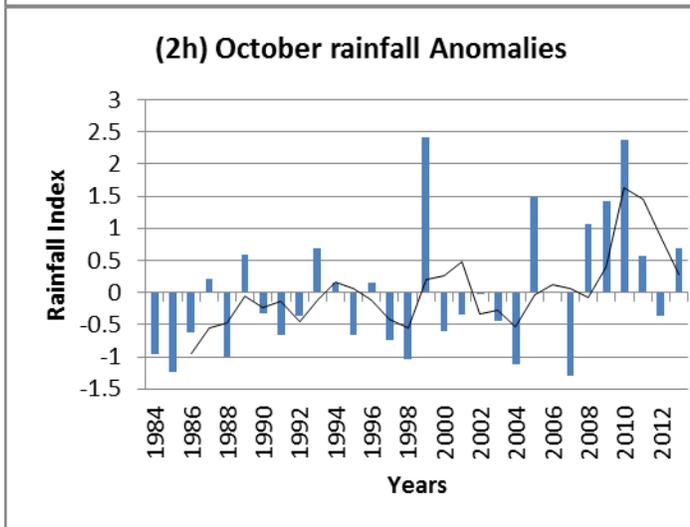
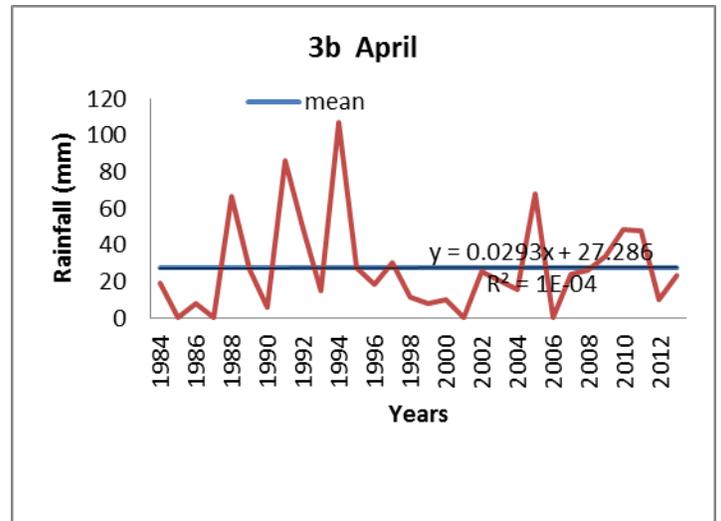
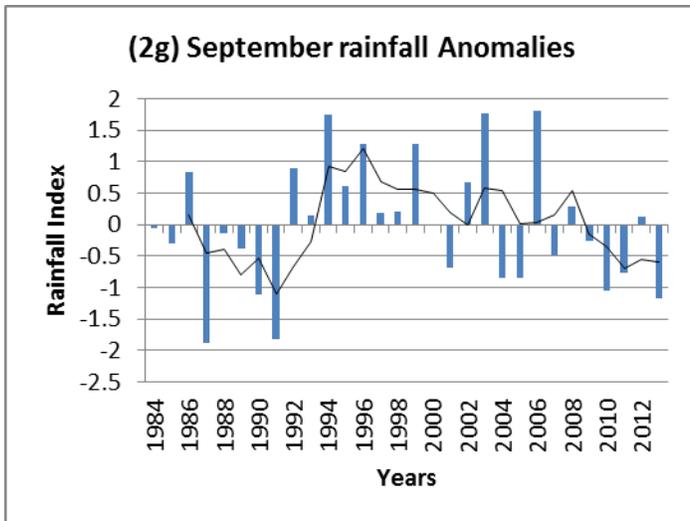
Monthly rainfall total reach their maximum between July and September. (Fig.2b-h). It is clear from these results that the substantial increase in the annual rainfall yield is predominantly as a result of the increase in August and September rainfall. This result seems to be in good agreement with the study of Nafisat (2011) for Kumo Area in Gombe state that the rainfall yield is increasing in the area.

The result of the linear trend lines for the period of study (1984-2013) clearly demonstrates a general tendency for an increase in rainfall in the area (Fig 3). From the linear trend lines of the monthly rainfall there is a clear indication of an increase in rainfall amounts over time. Estimation of changes in the monthly expressed in mm for the period of study shows little or no change in the month of April. For the month of May, there is a decrease of approximately 131.4mm at the rate of 4.38 mm year⁻¹. Compared with the long-term mean, it means

that May rainfall was decreasing at the rate of 9.8% per year. The month of June also shows little or no change. (See fig 3). The month of July show a significant decrease in rainfall of approximately 155mm at the rate of 5.2 mm per year -1. When compared with the long-term mean, it means that July rainfall was decreasing at the rate of 3.1% per year. There is a significant increase in rainfall of approximately 325.3 mm at the rate of 10.8 mm year⁻¹ for the month of August, a decrease of approximately 14.1 mm at the rate of 0.5 mm year⁻¹ for the month of September, an increase of approximately 141.8 mm at the rate of 4.7 mm year⁻¹ for the month of October. When compared with the long-term mean totals, it is also clear that the monthly rainfall was increasing at the rate of 10.6% per year in August, decrease of 0% per year in September and increase of 16.8% per year in October. From the result the maxima of rainfall in June and September is still very much established, while April that use to be the beginning of the rainy season is tending towards dry month and October that used to be the beginning of dry season is also tending toward raining month. The shift in the beginning of rainfall from April/March and ending of raining season from October/November has significant implication on the ecosystem. These are critical months for annual agricultural cycles where early and late crops are planted, causes crop failure, food shortages and more prone to pest attacks.

Estimation of changes of the annual rainfall for the period of study indicates an increase of approximately 140.4mm at the rate of 4.6 mm year⁻¹. Compared with the long-term average totals, it means that the annual rainfall was increasing at the rate of 0.6% per year⁻¹. It is clear from the result of the linear trend lines that the increase in the annual rainfall yield is predominantly as a result of the substantial increase in August and October rainfall





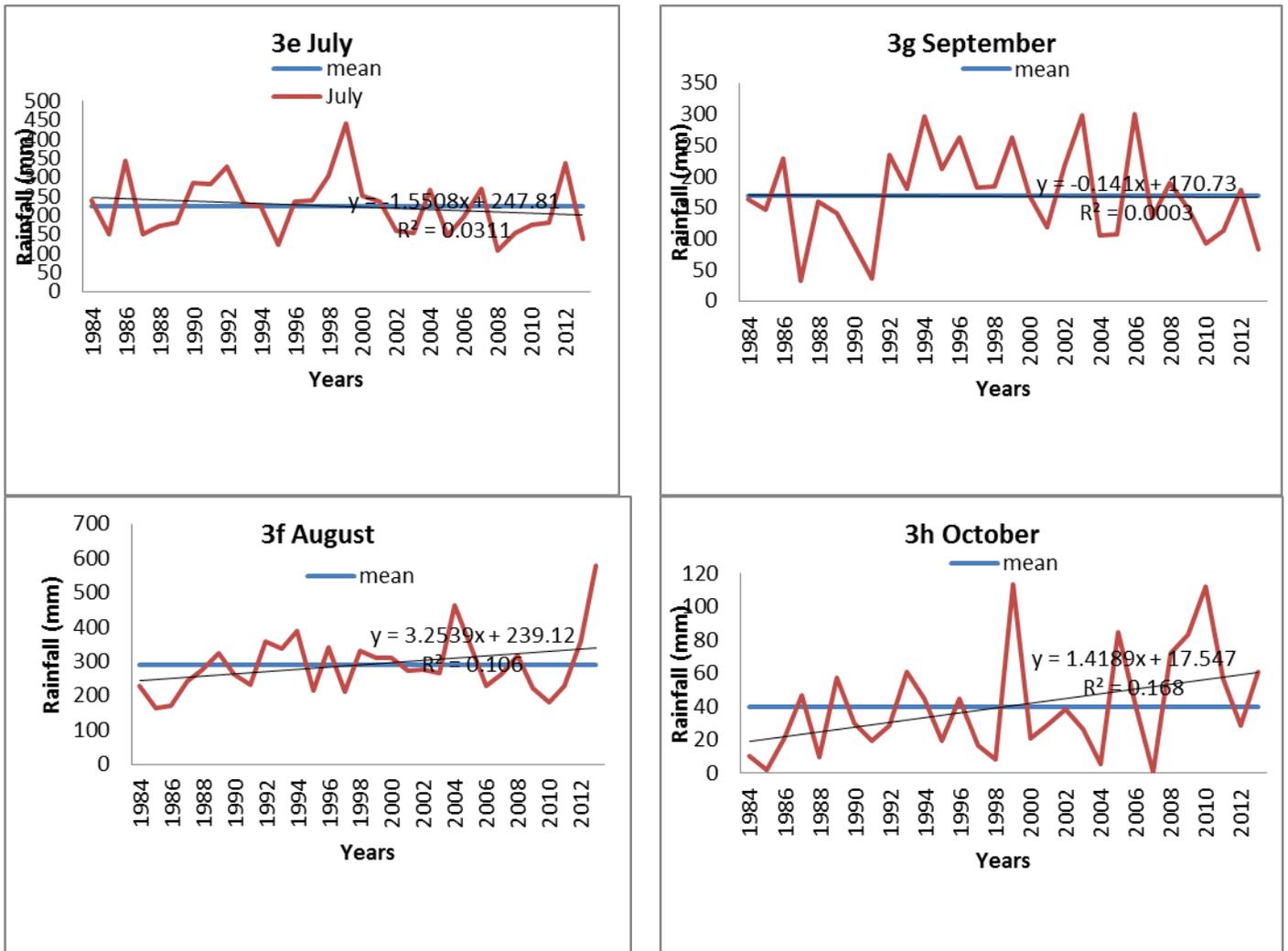


Fig. 2: Rainfall anomalies for (2a) Annual totals, (2b) April, (2c) May, (2d) June, (2e) July, (2f) August, (2g) September, (2h) October

Fig.3 Monthly and Annual Rainfall Trend and Fluctuations (2a) Annual totals, (2b) April, (2c) May, (2d) June, (2e) July, (2f) August, (2g) September, (2h) October

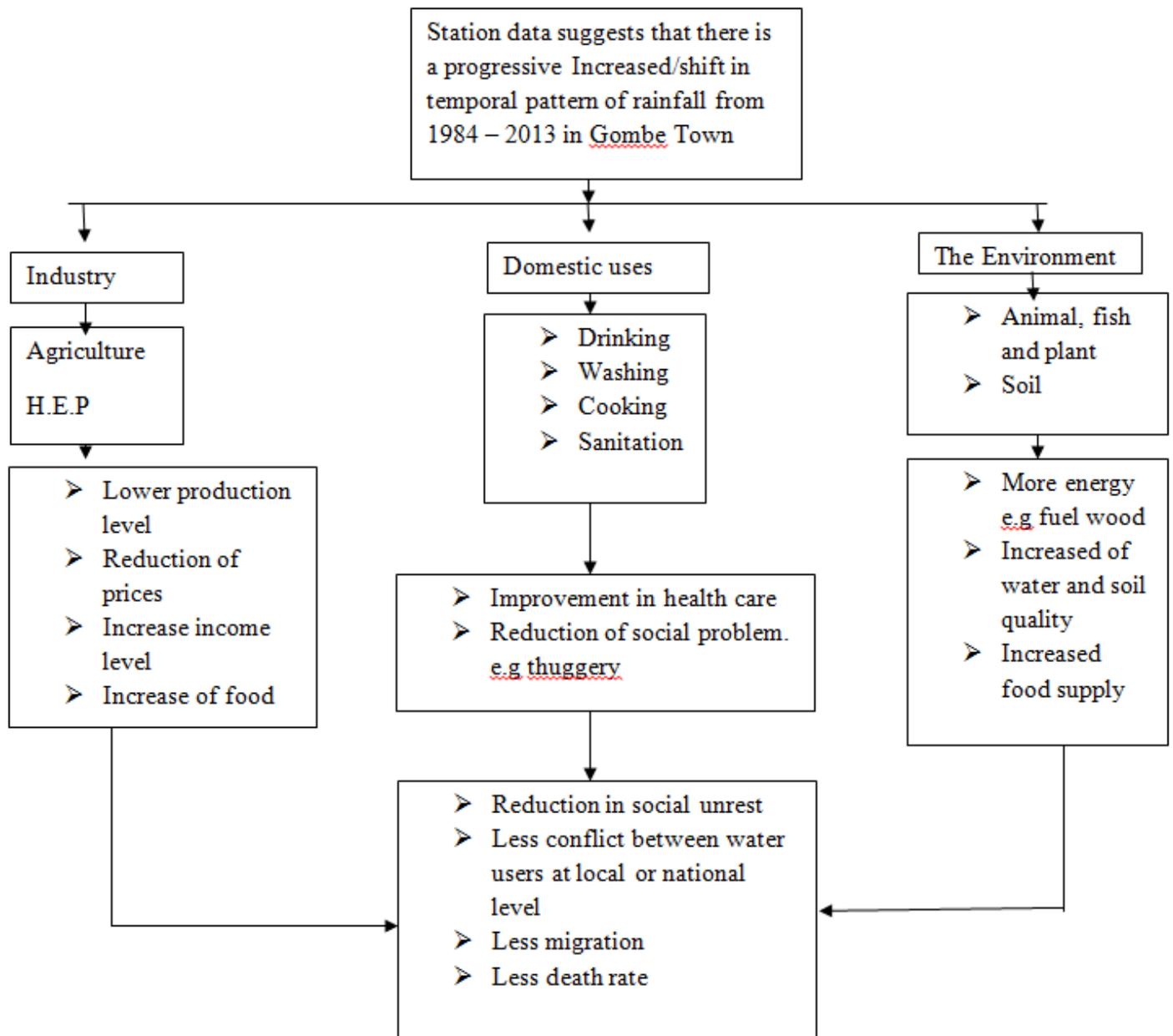


Fig (4) Illustrating some of the implications of increased of rainfall total on the environment and the society

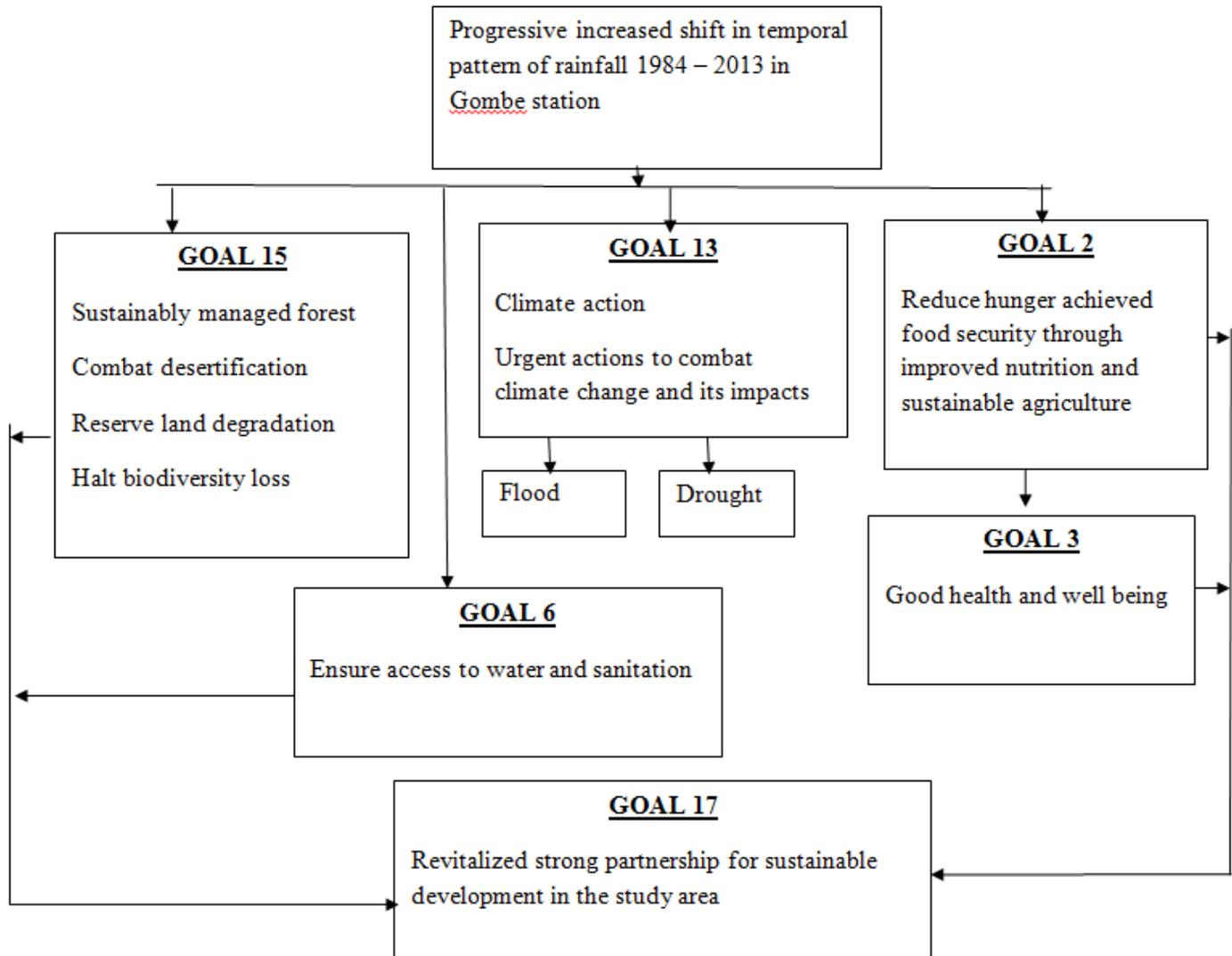


Fig (5) Illustration of some implications of rainfall trend for sustainable development goals (SDGs)

Fig 4 and 5 highlight some of the implications of the increased rainfall totals on the environment and society and the sustainable development goals (SDGs). Hence, the present study reveals the progressive increased shift in temporal pattern of rainfall in Gombe station that has a multiplying factor at local level towards achieving the (SDGs).

According to Oladipo, (2016) argue that extreme weather event are already impacting negatively on the country economy, social, environmental and infrastructural fabrics. Since there is a paradigm shift from the post-2015 MDGs for the achievement of SDGs, Nigeria need to move its economy toward a more environmentally friendly, low carbon, climate resilient, green and sustainable path.

IV. CONCLUSION

Evidence of change in the distribution and characteristics of rainfall can be examined in terms of frequency, intensity and amounts e.t.c. Present study brings out some of the interesting

and also significant changes in the rainfall pattern of Gombe town. The monthly and annual series have been examined for fluctuations, trend and its implication on sustainable development goals (SDGs) based on data collected from 1984-2013 period.

It is clear from the results of the analysis that the trend in the rainfall total is increasing on annual basis. The recent increase in the annual rainfall totals is predominantly as a result of the increase in August and October rainfall.

The result of the standardized anomaly index shows a fluctuating rainfall pattern across the months under consideration; the delay in rainfall till April and the high rainfall in October might have serious agricultural implications because most agricultural activities in this area rely on rainfall of this period might cause flooding and food production in the area to be late e.g maize, beans and millet. e.t.c

Base on the findings from this study it is recommended that, there is need for government to embark on total commitment and integrated approach toward achieving the SDGs and monitoring

of rainfall trend as its plays a significant role in the interface of economy, means of livelihood, poverty index and food security.

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Exploring Consumers Footwear's Brand Preference and Its Antecedents between age groups and gender: In Case of Dire Dawa administration

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Abstract- The research was aimed to explore the pattern of brand preference towards domestic and foreign footwear products and its antecedents taking age and gender as a case among Dire Dawa administration residences. A mixed approach with 319 usable samples were collected from respondents randomly and relevant data on purchase preference; normative influences, emotional values, brand consciousness and perceived quality were gathered presented and analyzed using both inferential and descriptive statistical techniques. The finding revealed that the emotional value of the brand and normative influences are the most and least significant antecedents respectively for brand preference also as age increase the preference toward local brand are increased where as the emotional value of the brand significantly affect male youths and females as a whole.

Index Terms- Brand preference; normative influence; emotional values; and perceived quality; brand consciousness

I. INTRODUCTION

As the world is turning into a global village, new products from abroad are finding their way into the country, the trend of consumption by native people is changing becoming more prone to buying foreign and international brands than the local ones since the advance in communications and information systems technology have shrunk distance and homogenized the values, fashion preferences and attitudes of the world's population. It has now been observed that consumers buy foreign brands more frequently than the local ones and feel proud in purchasing imported goods (Han, C.M., 1988). As result it is significant to understand the consumers' perception of foreign brands to local brands because studying consumer perceptions towards foreign and local brands and factors that affect their brand preference have substantial implications in marketing (Wong & Smith, 2002). Also it is vital time for marketers to connect brand preference with demographic group, because as the demographic especially age and gender varies, so does their consumption for different size style and brand of products (Babin, B.J., et al., 2004). Moreover, as age increase, aside from its direct buying power, it influence others preferences too (Wong & Smith, 2002). In order to reach the all age category of market, one of the most essential aspects for marketers is to know what customers prefer and understand factors that influence purchase preferences and purchasing decisions based there profile. Thus, it is interesting to study consumer brand preference and its antecedence taking age and gender as baseline

since no previous published study existed and there is need from marketer to clarify the market illusion of consumers' preference and factor affecting their preference between foreign and local brand in Dire Dawa footwear product market.

1.2. Statement of the Problem

As the world is turning into a global village, new products from abroad are finding their way into the country, the trend of consumption by native people is slowly changing (Samiee S., 1994). According to Samiee S, (1994), native or local customers are becoming more prone to buy international brands than the local ones since the influence by the western world is becoming stronger. Studies show that consumers of developing countries prefer foreign brands, especially from the west, for reasons of perceived quality and social status (Han, C.M., 1988; Zeithmal, 1988) and it has now been observed consumers buy foreign brands more frequently than the local ones and feel proud in purchasing imported goods (Iyer, G. & Kalita, J.K. 1997). Also according to Wong and smith, (2002), consumer perceptions towards foreign and local brands affect brand preference and have substantial implications in marketing (Wong & Smith, 2002). Furthermore, study by Bake-well, C. & Mitchell, V. W., (2006) portrayed, demographic variable such as age and gender has significantly affect brand preferences. Moreover, as age increase, aside from its direct buying power, it influence others preferences too (Wong & Smith, 2002) consequently knowing what customers prefer and understand factors that influence purchase preferences and purchasing decisions "what they buy" and "why they buy it" is vital for marketers though no study still existed in Dire Dawa on brand preference and its antecedence of footwear products. Therefore, this study explore Consumers brand preference and its antecedence for local and foreign footwear's and the difference among age groups and gender; and further expected to answer the following research question

- Which footwear brand i.e. foreign or local is preferred in Dire Dawa?
- Which factors determine the preference of foot wear whether it is foreign or local brand?
- What are the key and most significant determinants that influence residents' footwear buying decision?
- What are the least significant determinants that influence residents' footwear buying decision?
- Do the preference of residents' and factors affecting their purchase vary across profile i.e. age and gender of respondents?

1.3. Objectives of the Study

The objective of the study is to explore factor affecting consumer footwear brand preference taking age and gender as a base line so as to identify determinants in decision making process particularly it expected to

- Identify key determinants that influence Dire Dawa city dwellers to buy (local or foreign) footwear products
- explain the most significant determinant that influence footwear buying decision
- explain the relationship between respondents' profile and brand preference
- explain the relationship between respondents' profile and determinants of brand preference
- investigate if there is a relationship within groups of respondents
- provide suggestive strategies to local manufacturers which is helpful to their marketing operations

II. LITERATURE REVIEW

Brand is a symbolic embodiment of all the information connected to the product and service to create associations and expectations around it and can deliver product attribute, benefits, value and personality (Kotler P, 1999) so that, it can help on developing positioning platform and help on developing desired self-images to consumer. Meanwhile, Brand Preference is the penchant of the consumer for one brand in relation to other brands of the same product available in the market (Holbrook, 2001), whereas Purchase intention is the willingness of a consumer to buy a particular product (Dodd, *et al.*, 1991). Research confirmed that, it is best predictor of individual behavior, as it reflects the consumer's own expression of purchase probability, independently of other relevant factors (Young *et al.*, 2008 and Lin y Chen, 2006).

Antecedents of Brand Preference: A brand has many functions which can facilitate the choice for consumers. Kapferer, (1997) enumerate that consumers can have many reasons for buying a given brand; the reasons could be rational, emotional or self expressive or the combination of three (Uggla, 2001). Also study by Williams (2002) concluded that the criteria for brand/product choice may relate to either utilitarian criteria *i.e.* objective, economic, rational and functional or hedonic criteria *i.e.* subjective, emotional, irrational and symbolic (Baltas & Papastathopoulou, 2003 : Fishbein, M., & Ajzen, I., 1975).

Emotional Value: - it is the benefit derived from the feeling or affective states *i.e.* enjoyment or pleasure that a product generates by experiencing something new or different (Lee *et al.*, 2006). Having this, the distinctiveness of fashion features such as designer brand is consistently associated with emotional value expressions and plays the strongest role in the buying behavior among consumers (Sweeney and Soutar, 2001).

1.1. Factors That Enhance Emotional Value of the Brand

There are different types of factors that enhance emotional value of the brand these are; Image and identity is the first one which is defined as consumer perceptions of a brand as reflected by the brand associations held in memory (Girma M. 2016: Kotler *et al.* 1999, p 218). Uggla, (2001) explains that identity is what the company is sending out and image is the consumers' view of the brand in their minds. As of Kapferer (1999), image is

on the receiver's and consumer's side and identity is on the sender's side (Girma, M., 2016); second we have Style and fashion consciousness; which define Style as visual appearance, that includes line, silhouette and details (Frings, 2005 and Duff, 1999), where as fashion consciousness is an awareness of new styles, changing fashions and attractive styling as well as the desire to buy something exciting and trendy (Sproles and Kendall (1986); on third there is status which related with brand personality that provides links to the brand's emotional and self-expressive benefits (Cadogan and Foster, 2000).

Normative and Interpersonal Influences: - personal influence plays a distinctive role in the consumers' decision process and consult each other for opinions of new products and brands and the advice of others can strongly influence the buying behavior (Schiffman LG, *et. al.*, 2007) Influences of other categorized in to three types *i.e.* informational, value expressive and utilitarian influence (Bearden and Etzel, 1982; Childers and Rao, 1989; Lessig and Park, 1977 & 1978). Informational influence is "the tendency to learn about products and services by observing others or seeking information from others and it perceived as enhancing one's knowledge of the environment and ability to cope with the aspect of the environment (Childers and Rao, 1989 and Park and Lessig, 1977). Utilitarian influence is occur when an individual comply with the preferences or expectations of others to avoid punishments or achieve rewards (Bearden and Etzel, 1982) and value expressive influence concerned with an individual's motive to enhance own self concept (Park and Lessig, 1977) finally, normative influence; defined as the tendency to comply with the positive expectations of others (Bachmann, *et al.*, 1993; Bearden *et al.*, 1989; Grimm *et al.*, 1999). In addition, peer influence, (Bristol and Mangleburg, 2005), interpersonal relationships, (Money *et al.*, 1998), Perceived Quality (Yoo *et al.*, 2000: Darden and Babin, 1994: Wakefield and Baker, 1998) and country image (Ahmed and d'Astous, 1996 and Han, C. M., 1989) are significantly affect consumer preference between foreign and local brand and purchase decision.

III. MATERIAL AND METHODS

3.1. Description of the study area

Dire Dawa is second capital city and populous city of Ethiopia. It located between 9°27N and 9°49 S longitude and Between 49°38 E and 42°19 W latitude with the total land size of 1288 km, of which nearly 2.27% covers the land size of the urban areas of the administration with The total estimated population 225,000 (SCA, 2013/14).

3.2. Sampling, Data Collection and Analysis

The study implemented descriptive research design together with mixed research approach (Hair *et al.*, 2007) to triangulate data and map out the characteristics respondents brand antecedence and preference of foot wears based on demographic variables *i.e.* age and gender.

The total populations for the study were Dire Dawa administration residents in the nine urban kebeles whereas age groups who become equal or above 18-years-old considered as target population of the study. On this regard, there are 130215 populations whose age groups are greater or equal to eighteen years old (CSA, 2013/14) and by taking 95% confidence interval

and 20% of non response error on the total sample it become 336.

$$n = \frac{x^2 \times N \times P(1-P)}{(ME^2 \times (N-1)) + x^2 \times P(1-P)} \text{ (Krejcie \& Morgan 1970, pp. 607-610).}$$

$$336 = \left(\frac{3.84^2 \times 130,215 \times .05(1 - .05)}{(.05^2 \times (130,215 - 1)) + 3.84^2 \times .05(1 - .05)} \right) \cdot 20\%$$

According to Hair et al., (2007), sample size 30-500 is already adequate for most of the research, in multivariate research even a samples size of 100 can give more than adequate reliability correlation coefficients. Although there were 22 five scaled items of questionnaires which intended to analysis consumer brand preference and its antecedence in Dire Dawa. Meanwhile, 3- 6 questions were developed for each dimension and grouped according to the constructs they were intended to

measure. Finally by adopting convenience sampling, all questionnaires were collected from January 1-15, 2016 and were analyzed using the latest version of SPSS by applying descriptive and inferential statistical techniques.

IV. DATA ANALYSIS AND DISCUSSION

4.1. General Information of Respondents'

Table 4.1.Shows, 40.1%, of respondents were categorized under age groups of 18-35 and the rest 37.6% and 22.3% were grouped as age 36- 50 and >50 respectively .Particularly 41.1%, and 37.6% male respondents were taken from 18-35 and 36- 50 age groups and 39.3% and 37.6% female respondents were obtained from 18-35 and 36- 50 age groups.

Table 4.1: Profile of Respondents'

Age vs. Gender of Respondents'						
Gender						
	Male		Female		Total	
Age	Count (A)	N %	Count (B)	N %	Count (A+B)	N %
18-35	58	41.1%	70	39.3%	128	40.1%
36- 50	53	37.6%	67	37.6%	120	37.6%
>50	30	21.3%	41	23.0%	71	22.3%
Total	141	100.0%	178	100.0%	319	100.0%

Source; survey data 2016

4.2. Brand Preference and Antecedents Base on Profile of Respondents

4.2. Brand preference and its antecedence based on gender

Determinants	Gender Of Respondents	N	Mean	Std. Deviation
Normative Influences	Male	141	3.0496	.47003
	Female	178	3.4663	.34643
Brand Consciousness	Male	141	3.7092	.72249
	Female	178	3.3034	.64977
Emotional Value	Male	141	3.7648	.43373
	Female	178	4.0281	.40805
Perceived Quality	Male	141	3.9362	.60164
	Female	178	3.9017	.65324
Brand Preference	Male	141	4.0473	.60760
	Female	178	3.9925	.57348

Source; survey data 2016

Table 4.2 shows normative influence for male was lower than female with mean of 3.0496 where as regarding to brand consciousness, males are highly conscious than females with mean of 3.7092 also emotional values of the product are much more considered by females than male with mean 4.02 81

however on consideration of perceived quality both male and females are scoring the highest mean with 3.9017.Meanwhile on brand preference, though there is no significant difference between gender.

4.3. Brand preference based on age category using 4 determinants

Determinants	Age category	N	Mean	Std. Deviation
Normative Influences	18-35	128	4.3464	.42071
	36-45	120	4.3764	.44716
	>45	71	1.1451	.09867
	Total	319	3.2821	.45499
Brand Consciousness	18-35	128	4.9766	.49879
	36-50	120	4.9944	.07389
	>50	71	2.2488	.55981
	Total	319	3.4828	.71102
Emotional Value	18-35	128	4.8672	.43690
	36-50	120	3.6292	.44051
	>50	71	1.7934	.39688
	Total	319	3.9117	.43892
Perceived Quality	18-35	128	3.2676	.45483
	36-50	120	3.9104	.35798
	>50	71	4.3099	.44614
	Total	319	3.9169	.63021

Source; survey data 2016

Table 4.3 shows, the normative influence of age category 18-35 and 36-45 with (Mean = 4.3464) and (Mean = 4.3764) respectively are influenced by friends, relatives and colleagues. While, the influence of norm in the preference of footwear of age group greater than 45 is low. In the case of brand consciousness, age group 18-35 and 35- 45 attain the highest score (Mean = 4.3464 and 4.9944) showing they are more brand consciousness. However, those age groups greater than 45 are less conscious on brand preference. Similarly, from the dimension of emotional

value, age group of 18-35 and 36-45 scores (Mean = 4.8672, and 3.6292) respectively showing brands that are new, fashionable and unique significantly affect their footwear preference. Finally on perceived quality, age group of greater 35 scores high mean, reflecting product qualities highly affect purchase decision.

Brand Preference between Local and Foreign Footwear

4.4. Level of agreement on preferring foreign footwear brands

		Frequency	Percent	Cumulative Percent
Valid	Strongly Disagree	9	6	6
	Disagree	19	13.15	19.15
	Neutral	42	2.8	21.95
	Agree	138	43.26	65.21
	Strongly Agree	111	34.79	100
	Total		319	100

Source, survey data 2016

Table4.4. shows, of 319 respondents 78.9% respondents prefer foreign footwear than domestic one and the rest 19.15% of respondent's prefer domestic footwear brands than foreign.

4.5. Independent T-Test of Male and Female in Their foreign vs. local Brand Preference

N	Mean	SD	Mean Difference	T	P
Brand Preference	Male	3.9925	.60760	.05477	.825
	Female	4.0473	.57348		

Source, survey data 2016

Table 4.5show, brand preference between male and female is no significant in choosing local vs. foreign brands (mean difference = .05477 and t = .825, P > 0.05).

Table 4.6. Independent sample t-test of male and female in each determinant

Determinant	N		Mean	SD	Mean Difference	T	P
Normative Influence	Male	141	3.0496	.47003	-.41665	-8.801	.000
	Female	178	3.4663	.34643			
Brand Consciousness	Male	141	3.7092	.72249	.40585	5.272	.188
	Female	178	3.3034	.64977			
Emotional Value	Male	141	3.7648	.43373	-.26331	-5.566	.225
	Female	178	4.0281	.40805			
Perceived Quality	Male	141	3.9362	.60164	.03448	.485	.305
	Female	178	3.9017	.65324			

Sources survey data 2016

From the results of independent sample t-test on table 4.6., the normative influence between male and female respondents, there is significant mean difference between male respondents normative influence and female respondents normative influence (t=-8.801, P < 0.01) Indicating that normative influence on male respondent's footwear purchase decision is lower than normative influence on female; the difference between the two is significant. Also the results of t-test on brand consciousness between male and female respondents identified that there is no significant mean difference between male respondents brand

consciousness and female respondents brand consciousness though males are bit higher than females mean score (t=5.272, P > 0.05). For emotional values, the results of independent samples t-test for male and female show (t= -5.566, P > 0.05). Showing females are much concerned with emotional value. Finally, for perceived quality, the independent samples t-testis (t=.485, P > 0.05) reflected that there is no significant mean difference between gender.

Variation between Respondents Profile and Preference Determinants

Table 4.7. ANOVA between age group in each determinant

		\sum^2	Df.	Mean Sq.	F	Sig.
Normative Influences	Between Groups	2.151	2	1.075	5.337	.005
Within Groups		63.679	316	.202		
Total		65.830	318			
Brand Consciousness	Between Groups	53.192	2	26.596	78.125	.000
Within Groups		107.574	316	.340		
Total		160.766	318			
Emotional Value	Between Groups	2.903	2	1.451	7.858	.000
Within Groups		58.360	316	.185		
Total		61.263	318			
Perceived Quality	Between Groups	70.843	2	35.422	201.84	.000
Within Groups		55.456	316	.175		
Total		126.299	318			
Brand Preference	Between Groups	37.786	2	18.893	82.521	.000
Within Groups		72.347	316	.229		
Total		110.133	318			

Source, survey data 2016

The one-way ANOVA in table 4.7 shows the test whether the groups' mean are the same is represented by the F-ratio. For brand preference the value of F-ratio is 82.521 and the significant value (.000). Therefore, there is significant difference between three age groups; for normative influence the value of F-ratio is 5.337 and the significant value is .05 which is exactly equal to the desired significant level in statistical term. Hence, there is significant mean difference between age group on their normative influence; for brand consciousness, F-ratio =78.125 the significant value is .000 which is less than 0.01. Thus, the

mean difference between age groups on their brand consciousness is significant; the emotional value of F-ratio is 7.858 (p < 0.01). So, there is significant mean difference between age group on their emotional value. Finally For perceived quality, the result shows that (F-201.841, p < 0.01) and the mean difference between three ages groups respondents is significant indicating perceived quality as a preference factor are not the same.

4.8. Statistics That Indicate the Significant Factor That Affect Brand Preference

	Factor of Brand Loyalty	Rank	Mean	St. d.
1	Normative influence			
	Feeling belongingness by buying brands as friends		3.2476	.74698
	Feeling belongingness by buying and using the same brands others purchase		2.6991	.81863
	Buying footwear brands when friends like that		4.0408	.74915
	If others see me using a product, I buy the brand that they expect me to buy		2.7868	.99291
	Preferring brands that have good impression on others		4.2163	.91128
	If I want to be like someone, I try to buy same brands that they buy		2.7022	.89848
	Average mean	4th	3.2821	0.8529
2	Brand consciousness			
	Prefer and buy well-known footwear brands		3.6520	.91524
	Try to stick to certain footwear brands		3.1160	1.13922
	Pay more attention to the brand name		3.6803	1.06308
	Average mean	3rd	3.4827	1.03918
3	Emotional value			
	Considering footwear brands that make me feel good		4.3793	.73780
	Intention to prefer footwear brands that make me feel comfortable		4.1599	.74574
	Deciding to buy brands that bring satisfaction by latest fashion & style		3.9906	.80285
	Considering the novelty features while choosing between footwear brands		3.7837	.89386
	Preferring footwear brand which increase my status and esteem		3.7837	.89386
	Choosing footwear brands that satisfy my fashion conscious need		3.5643	1.1360
	Average mean	1st	3.9435	0.86836
4	Perceived quality			
	Considering the reliability of brand when buying footwear brands		3.8527	.83190
	Preferring footwear brands that have high quality		4.0376	.87873
	Considering the durability of the brand at the time of purchase decision		3.9718	1.0999
	Preferring brands that have the ability to satisfy stated or implied needs		3.8056	.60903
	Average mean	2nd	3.9169	0.8549

Source, survey data 2016

Table 4.7 explains 4 factors that affect brand referencing having this; emotional value score the highest mean (3.94), perceived quality of the brand is the second determinant of purchase decision by scoring 3.91 mean value. Brand consciousness and normative influence are ranked at the 3rd and 4th step by accounting 3.48 and 3.28 mean values respectively.

4.8 Relationship of Antecedents and Brand Preference

Determinants	Brand preference	
	Pearson correlation	Sig (2-tailed)
Normative Influence	.201**	.000
Brand Consciousness	.589	.000
Emotional Value	.765**	.000
Perceived Quality	.708	.000

** Correlation is significant at the 0.01 level (2-tailed).

Source, survey data 2016

Table 4.8. Illustrates the relationship between each determinants & brand preference, the results indicate that there are significant correlations between normative influence and brand preference ($r = 0.201$, $p < 0.01$) as well as between emotional value and brand preference ($r = 0.765$, $p < 0.05$). Similarly There were significant correlations between brand consciousness and brand preference ($r = .589$, $p < 0.01$) as well as between perceived quality and brand preference ($r = .708$, $p < 0.01$). The purchase of foreign footwear brands has relation with the brand consciousness and perceived quality of the product.

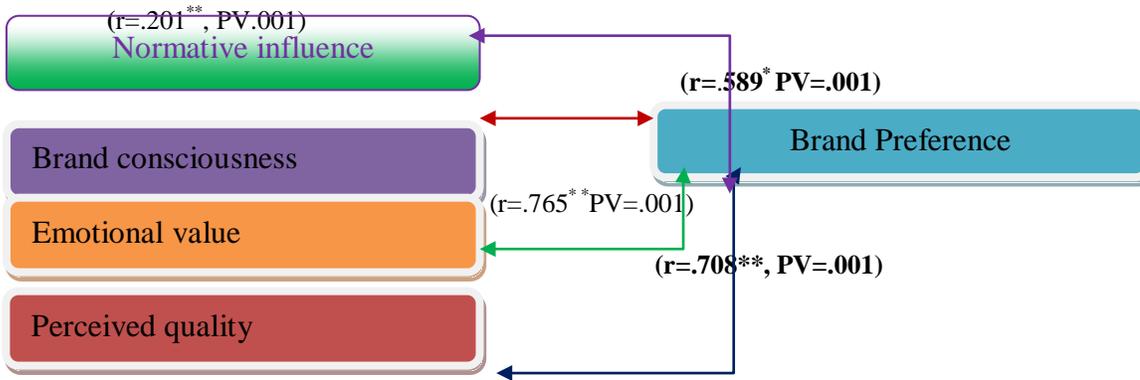


Figure 4.1. Relationship of Antecedents and Brand Preference

V. CONCLUSION AND RECOMMENDATION

4.2. Conclusion

The primary purpose of this study was to explore the brand preference and its antecedents taking age and gender as baseline. The study empirically examines Dire Dawa administration residents' footwear preference given foreign and domestic brands and the determinants behind their preference. The research considers two broad variables. One is from the consumers' side (normative influences and brand consciousness) and the other is from the manufacturer and provider side (emotional value and perceived quality). Totally, 4 dimensions were applied to understand factors that affect students brand preference. Having this, given domestic and foreign footwear brands, females and age group of 18-35 have more interested to foreign footwear brands which is similar with previous study done by Johansson, J.K. and Ilkka A. Ronkainen, 2004: O'Cass, A. and Lim, K., 2002. Not only this country's image are significantly affect perceived product cues which make this finding similar with Iyer, G. & Kalita, J.K., (1997) and Papadopoulos, N., et.al., 1993). Likewise footwear purchases decision by females and males with age groups of 18- 35 who live in Dire Dawa is influenced by the style, fashion, newness and novelty features of the brand.

Those brands that provide high status and esteem force females male with age group between 18-45 to prefer brand reveling emotional expressions plays the strongest role in the buying foot wear among consumers also youths were more fashion conscious and demanding products with more style and are strongly influenced by the emotional value with no significant mean difference (.05477) between male and female respondents'. Besides, norms have less effect on male youths footwear brand preference which is also similar with the finding of Bake well, C. & Mitchell, V. W. (2004) but it affect females' preference that is related with Safrah H. & Safiek S.,(2009)/finding . Although, the effect of friends, relatives and colleagues on purchase decision is lower for males and higher to females. Finally product quality and perceived appropriateness plays a significant role in influencing older and Middle Ages category and as age increase the influence of perceived quality also increase which is similar with previous finding of Wong & Smith, 2002: Babin, B.J., et al., 2004).

On relationship between purchase intention determinants and brand preference, the results indicate there are significant

correlations between normative influence and brand preference ($r = 0.201$, $p < 0.01$) as well as between emotional value and brand preference ($r = 0.765$, $p < 0.05$), brand consciousness and brand preference ($r = .589$, $p < 0.01$) perceived quality and brand preference ($r = .708$, $p < 0.01$). The purchase of foreign footwear brands has relation with the brand consciousness and perceived quality of the product showed all determinant affect purchase intension though there degree of choosing either foreign or local one varies.

4.3. Recommendation

Based on the findings of the study and conclusions made, the following possible recommendations are given Footwear manufacturers.

- Domestic footwear manufacturers have to incorporate emotional value and quality on their shoe because these factors highly influence the purchase of footwear. Particularly they have to provide brands that have a novelty features, stylish, fashionable, and reliable and that fulfill its functional benefits.
- Because factors that affect brand preference vary based on customers' personality and demographic characteristics, footwear manufacturers have to adopt their products by consideration of age group and gender since, their feelings are varies on selection of style, fashion, novelty, reliable, durable and functional benefit and potentially affect purchase intension and decision.
- Retailers' and manufacturers' promotions have to concentrate on the emotion, feelings, symbolic characteristics, and perceived status (Eastman, 1999; Shim, S. & Kotsiopoulos, A., 1993 and O'Shaughnessy, 1992) of audiences for youth and middle age groups. For older consumers, the message should reflect the Faber content, sizing, durability, comfort, safety and sex fit of the product. Also the promotion of footwear manufacturers should be tailored to specific customer's gender i.e. those shoe messages communicate to girls and ladies should focus on the audiences', comfort, safety, sex fit, Price, Brand, country of origin (Shim, S. & Kotsiopoulos, A., 1993) (for importers); Store image, Salesperson's evaluation, and approval of others(Grewal, D., et al .1998).Messages that describe the products functional benefits, which explain the long lasting features of the product, should be launched to

male though preferences are still varies across age categories.

- Also manufacture need to understand consumer variables such as the influence of friends, their attention to brand names, and their stickiness to certain brands so that it is possible to develop effective branding strategies that heavily influence the preference of young and middle age groups as well female customers by reflecting the novelty features, fashionably, style and newness.

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Study On The Role Of NT-pro-BNP (Brain Natriuretic Peptide) And Troponin I In The Detection Of Anthracycline Induced Cardiotoxicity

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Abstract- Introduction- Anthracyclines are commonly used anticancer drugs because of their proven potency but cardiotoxicity represents their most devastating effect. The present study was undertaken to explore the role of biomarkers (NT pro BNP & troponin I) for the detection of chemotherapy induced cardiotoxicity. **Methods-** Twenty two patients of malignancy who previously underwent anthracycline chemotherapy were enrolled after informed and written consent. Detailed two-dimensional echocardiography was done to detect left ventricular dysfunction. A single point estimation of either plasma NT pro BNP or troponin I was done. Fourteen age and sex matched healthy controls were taken for analysis too. **Results** - Although all patients were clinically asymptomatic, echocardiographic evidence of Left Ventricular Dysfunction (LVD) was present in 20 (91%) study subjects. LV diastolic dysfunction was prevalent (77%) from where as systolic dysfunction was present only in 14% subjects. There was a statistically significant decline in echocardiographic parameters (E/A ratio, IVRT and LVEF) following anthracycline chemotherapy vis-à-vis controls. In patients who developed LV dysfunction the mean dose of anthracycline was higher as compared to those who did not. The mean level of NT-pro BNP was higher in the study population as compared to controls, though not statistically significant (431 ± 597.13 pg/ml vs. 68.28 ± 28.39 pg/ml, $p=0.11$). However, the level of troponin I in study population was significantly higher as compared to controls (0.16 ± 0.27 ng/ml vs. 0.02 ± 0.01 ng/ml, $p=0.02$). There was a negative correlation of NT pro BNP levels with LVEF ($r=-0.11$) and peak E velocity ($r=-0.35$). A similar positive correlation between NT pro BNP & IVRT ($r=.006$) was also seen. As regards to Troponin I, similar positive and negative correlation with IVRT ($r=+0.08$) and LVEF ($r=-0.2$) were seen respectively. The mean levels of NT pro BNP and troponin I were higher in patients who were co-administered additional chemotherapy. In the study, both plasma NT pro BNP and troponin I had a low Sensitivity (40% & 10% respectively) but high Specificity (100%) in predicting LV dysfunction on echocardiography.

Conclusions- There is high prevalence of left ventricular dysfunction on echocardiography after anthracycline chemotherapy. LV diastolic dysfunction is more common than LV systolic dysfunction. Plasma NT pro BNP and Troponin-I levels are higher in patients who developed LV dysfunction following Chemotherapy. Both NT pro BNP and Troponin-I levels have low sensitivity and high specificity for detecting LV dysfunction following anthracycline chemotherapy. Biomarker levels showed a significant correlation with various echocardiographic parameters too.

Index Terms- Anthracycline, Cardiotoxicity, Left ventricular dysfunction, NT pro BNP, Troponin I

I. INTRODUCTION

In the era of chronic diseases cancer has become the commonest cause of death second only to coronary artery disease. Of the vast armamentarium available to fight cancer, chemotherapy remains the most potent and viable option. But because cancer chemotherapy is highly toxic, addressing complications of both disease and therapy have paramount importance. Due to their proven antineoplastic activity and efficacy, anthracyclines are widely used in oncological practice in systemic neoplasms (acute leukemia, malignant lymphoma) and various solid tumors, mainly the cancer of breast, lungs, thyroid gland and ovary as well as osteosarcoma, and soft tissue sarcomas. However, the clinical use of anthracyclines is limited by unique cumulative dose-limiting cardio-toxicity.¹⁻²

The spectrum of Anthracycline-induced cardiac damage varies from arrhythmias, Left ventricular dysfunction (LVD) and pericarditis in acute stage to chronic heart failure in long term. The damage is dose related and incidence rises sharply when cumulative dose more than 450 mg/m^2 are administered. Although the causes of anthracycline-induced cardiotoxicity are probably many, a large body of evidence points to free-radical-mediated myocyte damage.³ Proven risk factors apart from dose include advanced age, preexisting cardiac disease, and mediastinal irradiation. Hence early detection of anthracycline induced cardiotoxicity is vital before the complete syndrome of

cardiomyopathy or heart failure develops. Monitoring of drug induced myocardial damage becomes more significant in the wake of finding that dexrazoxane, an antioxidant that functions by chelating iron has significant cardio protection.⁴ The role of routine cardiac biomarker in this scenario is unclear.⁵⁻⁸ The present study was undertaken to evaluate the role of NT pro-BNP and Troponin I as markers of anthracycline induced cardiotoxicity. We also tried to evaluate the impact of total cumulative dose of anthracyclines. The effects of radiotherapy and other chemotherapeutic agents on development of anthracycline -induced cardiotoxicity were also studied.

II. METHODS

2.1 STUDY POPULATION:

Patients of malignancy who had received anthracycline chemotherapy in Department of Internal Medicine, Radiotherapy & Oncology were enrolled for study after obtaining written and informed consent. The following patients were excluded for the study:-

- Acute inflammatory states- sepsis, multi organ dysfunction
- Prior cardiac dysfunction- acute myocardial infarction, coronary artery disease, cardiomyopathy, rheumatic heart disease, severe hypertension.
- Renal dysfunction- Raised serum creatinine (>2.0gm%), decreased glomerular filtration rate (e-GFR < 60 ml/min).
- Diseases of lung
- Patients on other Cardiotoxic drugs
- Anemia (Hb <9.0 gm%)
- Metabolic disorders

1.2 METHODOLOGY

Our study group consisted of 22 patients of cancer on anthracycline chemotherapy, preferably at least three months elapsed after start of chemotherapy. In this study group a point study comprising of clinical evaluation and detailed 2D-echocardiographic examination evaluation of LV systolic and diastolic functions was done. Simultaneously patients were randomized for measurement of either plasma NT-pro BNP or Troponin I. We also enrolled 14 age and gender matched healthy controls (after proper clinical and 2D echocardiographic exam) and measured plasma NT-proBNP and Troponin I in them.

1.3 EVALUATION

A. Clinical evaluation:

1. History taking focusing mainly on:
 - Cancer type and stage
 - Time of starting chemotherapy
 - History suggestive of cardiac failure in past or present
 - Family history suggestive of cardiac disease
 - Dose of chemotherapy- dose/cycle frequency.
2. Complete General Physical Examination.

B. INVESTIGATIONS

1. Biochemical:

- Complete Hemogram

- Urea, creatinine
 - Liver function test
 - Blood sugar
2. Chest X-ray
 3. ECG
 4. Echocardiography

Two-dimensional, M-mode, spectral, and color flow Doppler echocardiograms were obtained for evaluation of patients. Two-dimensional imaging examinations were performed in the standard fashion in parasternal long- and short-axis views and apical four and two chamber views.

Left ventricular ejection fraction (LVEF) were derived from biplane apical (two and four chamber) views using a modified Simpson's rule algorithm.

The transmitral pulsed Doppler velocity recordings from three consecutive cardiac cycles were used to derive measurements as follows: E and A velocities as the peak values reached in the early diastole and following atrial contraction, respectively, and deceleration time as the interval from the E wave to the decline of the velocity to baseline.

Finally, the left ventricular isovolumetric relaxation time (IVRT) was obtained from the apical five-chamber view with a continuous wave cursor or, if possible, a pulsed Doppler sample volume positioned to straddle the left ventricular outflow tract and mitral orifice so as to obtain signals from aortic valve closure, the termination of ejection and mitral valve opening, or the onset of trans-mitral flow. IVRT was taken as the time in the milliseconds (or seconds) from the end of ejection to the onset of left ventricular filling. Experienced cardiologists who were blinded to the BNP and troponin-I levels interpreted all echocardiograms.

ECHOCARDIOGRAPHIC CLASSIFICATIONS^{9,10}

Normal ventricular function was defined as LVEF \geq 50%, absence of diastolic dysfunction. Systolic dysfunction was defined as ejection fraction <50%. Diastolic dysfunction was defined as impaired relaxation and restrictive and pseudo-normal pattern, based on the following definition.

Parameter	Normal	Delayed Relaxation	Pseudonormal	Restrictive
E/A	>1	<1	1-2	2
DT	<220	>220	150-200	<150
IVRT	<100	>100	60-100	<60
AR(cm/sec)	<35	<35	\geq 35	\geq 25
S/D	Young <1, adult \geq 1	\geq 1	<1	<1

Systolic and diastolic dysfunction was defined as ejection fraction <50% with diastolic dysfunction as described above.

5. NT-pro BNP Estimation

Estimation of plasma NT-proBNP levels were done by Electrochemiluminescence sandwich immunoassay using two polyclonal antibodies directed against NT-proBNP amino acid 1-

21 and amino acid 39-50, respectively. Synthetic NT-proBNP (amino acid 1-76) was used as calibrator. The measuring ranges of the system was 5-35,000 pg/ml. normal values were as follows:

NT-proBNP (pg/ml)	Men	Women
Age <50 yrs	<88	<153
Age >50 yrs	<227	<334

6. Troponin-I Estimation

Troponin-I estimation was done by immunometric assay (IMMULITE analyzer) utilizing murine monoclonal Troponin-I antibody. Lyophilized troponin-I was used as Calibrator. The measuring range of the system was upto 180 ng/ml. Normal value 98% values were below 1ng/ml.

7. Statistical Analysis

Data were analyzed using statistical software package, STATA 9.2 (StataCorp, College station ,Texas, USA). A difference between the two values was considered to be significant only if 'p' value was found to be <0.05. χ^2 statistics was used to test the association between two or more categorical variables. Two sample t-test was used to see the difference between the mean to two different groups, if data was normal distributed. If data was not found to be normally distributed, a non-parametric equivalent to two sample t-test, Mann Whitney test used to test the level of significance between two values. One way analysis of variance (Oneway ANOVA) was used to test the difference among >2 groups in case of normally distributed data otherwise its non-parametric equivalent Kruskal Wallis.

III. OBSERVATIONS AND RESULTS

3.1 Demographic Profile

A total of 22 patients of anthracycline chemotherapy and 14 age and sex matched healthy controls were enrolled in study. At the time of enrollment into study all of the patients were asymptomatic with respect to cardiovascular system.

As seen in table 1, the mean age in study population was 40.68 ± 15.5 years which was similar to that of control group (36.78 ± 13.85 years. Maximum patients in the study group (50%) belonged to 41-60 age group and a similar distribution was present in control group also. The sex distribution in control group is equal while males outnumbered females in study population, the male to female ratio being 3:2. The maximum number of patients enrolled in the study received anthracycline treatment for Non-Hodgkin's lymphoma (41%) followed by Carcinoma of breast. (Figure 1)

1.4 Anthracycline profile of study population

In the study 73% of the patients were given Doxorubicin (Adriamycin) as the chemotherapeutic agent whereas rest 27% received epirubicin for their disease. The median cumulative dose of anthracycline used in the study was 420mg and the drugs were administered at a median frequency of every 4 weeks. The median time between end of chemotherapy and enrollment in study was a median period of 3.5 months.

3.3 Echocardiographic Observation

Echocardiographic evidence of Left Ventricular dysfunction (LVD) was present in 91% of cases.(Figure 2) LV

diastolic dysfunction was prevalent (77%) from where as systolic dysfunction was present in only 14%.

The mitral inflow E/A ratio was found to be significantly decreased in study group after receiving chemotherapy (1.08 ± 0.28 vs. 1.54 ± 0.31 , $p=0.0001$)

Table:-1. Demographic Profile of Study Population

	Study (n=22)	Control (n=14)
Age (Mean \pm SD, years)	40.68 ± 15.5	36.78 ± 13.85
Age Group		
0-20	1(4.5%)	1(7%)
21-40	8 (36.5%)	6(43%)
41-60	11(50%)	7(50%)
>61	2(9%)	0
Sex		
Male	13(59%)	9(41%)
Female	7(50%)	7(50%)
Disease		
Hodgkin's Lymphoma	4(18%)	N.A
Non-Hodgkin's Lymphoma	9(41%)	
Multiple Myeloma	2(10%)	
Carcinoma Breast	7(31%)	
Anthracycline		
Doxorubicin	16(73%)	
Epirubicin	6(27%)	
Parameters of anthracycline administration		
Total Cumulative dose	420(mg)	N.A
Frequency of drug administration	4(weeks)	
Time of enrollment following completion of chemotherapy	3.5(months)	

Table 2:- Echocardiographic & Biochemical parameters comparison between Patients & Control (N=22)

	Study	Control
Mitral pulse Doppler ratio* E/A	1.08 ± 0.28	1.54 ± 0.31
IVRT*(seconds)	0.11 ± 0.06	0.07 ± 0.01
LVEF* (%)	53.7 ± 4.6	58.2 ± 2.1
NT pro BNP (pg/ml)	431 ± 597.13	68.28 ± 28.39
Troponin I*	0.16 ± 0.27	0.02 ± 0.01

(ng/ml)		
* Indicates a statistically significant difference		

The mean IVRT in significant he study group was significantly increased following anthracycline administration as compared to control (0.11± 0.06s vs. 0.07±0.01s, p=0.0044). There was also statistically significant decline in mean LVEF following anthracycline administration as compared to control and the decrease is statistically significant (53.7± 4.6 % vs. 58.2± 2.1 %,p= 0.0003, Table 2 & Figure 3).

The mean age patient with diastolic dysfunction was 38.6 ± 15.6 years while that of systolic dysfunction was 45.66 ± 4.04 years. While diastolic dysfunction was seen almost equally on both sexes, systolic dysfunction was exclusively seen in females.

Regarding factors affecting development LVD, incidence was higher with Epirubicin (99.9%) than with Adriamycin (87.5%) but the result was not statistically significant. In addition, systolic dysfunction was more common in Epirubin group. In the study group diastolic dysfunction was present among all irrespective of disease but systolic dysfunction more prevalent in patients of Non-hodgkin’s lymphoma and carcinoma breast. In patients who developed LV dysfunction the mean dose was higher as compared to those who did not. LV systolic dysfunction developed as a mean dose of 480 mg, which is higher than the mean dose of 399.4 ± 120 mg at which patient developed diastolic dysfunction, as expected. But the result were not statistically significant (p=0.15).

The development of LV systolic dysfunction is more common when drug was given at longer intervals of 4 weeks but LV diastolic dysfunction developed at a frequency of 3.4 ± 0.9 weeks. In patients with LV systolic dysfunction median time of enrollment in study following chemotherapy completion was 5 months. In patients with LV diastolic dysfunction the duration was 4 months.

3.4 Effect of other Chemotherapeutic Agents and Radiotherapy on Echocardiography parameters

The administration of additional chemotherapeutic agents led a trend towards higher incidence LVD as compared to anthracycline alone, though not statistically significant (89% vs. 80%, p= 0.42). LV systolic dysfunction was seen only when additional anti neoplastic agents were given. LV systolic dysfunction was more common when cyclophosphamide was used as additional chemotherapeutic agent. Vincristine use as additional chemotherapeutic agent resulted in LV diastolic dysfunction only.

In patients who received radiotherapy in addition to anthracycline, all developed LVD on echocardiography.

3.5 Biomarkers Profile

The mean level of NT-pro BNP is 431 ± 597.13 pg/ml in the study population as compared to 68.28 ± 28.39 pg/ml in the controls. But the increase is not statistically significant (p=0.11), when Mann Whitney test was applied.

The levels of plasma NT pro BNP were abnormal in 40% of patients with LVD dysfunction. NT pro BNP was abnormal in 60% cases of LV diastolic dysfunction. The mean and median values were overall higher in diastolic dysfunction but the result are not statistically significant (p=0.3)

The mean level of troponin I in study population was 0.16 ± 0.27 ng/ml while that of control was 0.02 ± 0.01 ng/ml.(p=0.02)

Abnormal levels of troponin I were found only in 10% cases of LVD although the mean levels and medium levels of patients with LVD were significantly higher than patients without LVD.

The correlation analysis revealed a negative correlation between NT pro BNP and LVEF (r=-0.11). Also, there is also a negative correlation between NT pro BNP and peak E velocity (r=-0.35). A similar positive correlation between NT pro BNP & IVRT of (+ .006) is also seen (Table 3).

As regards to Troponin I similar positive and negative correlation with IVRT (r= +0.08) and LVEF (r= -0.2) are seen respective. A negative correlation between E/A ratio and Troponin-I is also seen (r= -0.11). None of the values were statistically significant.

The mean levels of NT pro BNP were higher in patients who were co-administered additional chemotherapy.

The mean Troponin-I levels were higher in patients who were co-administered additional chemotherapy.(Table 4)

Median plasma NT pro BNP level did not rise with co-administration of radiotherapy.

Median values of troponin-I were higher in patients given additional radiotherapy.

In the study plasma NT pro BNP had a Sensitivity of 40% and Specificity of 100% in predicting LV dysfunction on echocardiography. The positive predictive value was 100% and Negative predictive value was 54%.

In the study plasma Troponin-I had a Sensitivity of 10% and Specificity of 100% in predicting LV dysfunction on echocardiography. The positive predictive value was 100% and Negative predictive value was 50%.

Table: 3. Correlation analysis of NT pro BNP and Troponin I with Various Echocardiographic parameters

	BNP	LVEF	Mitral Valve flow E/A ratio	LV IVRT	Mitral valve flow peak E Velocity	Troponin I
BNP	1.000					
LVEF	- 0.1114 0.7592	1.0000				

Mitral Valve flow E/A ratio	0.5038 0.1376	0.3018 0.1723	1.0000			
LVIVRT	0.0067 0.9854	- 0.3328 0.1302	- 0.2038 0.3523	1.0000		
Mitral valve flow peak E velocity	- 0.3503 0.3211	0.0825 0.7151	- 0.0586 0.7955	- 0.2878 0.1940	1.0000	
Troponin I	0.0000	- .02045 0.5238	- 0.1151 0.7218	0.0800 0.8049	0.2527 0.4280	1.0000

IV. DISCUSSION

Cardiotoxicity is the most devastating side effect of anthracycline administration. In this study we tried to evaluate the cardiotoxic effects of anthracyclines in twenty-two patients by clinical examination and echocardiography. We also probed into the role of two plasma markers NT pro BNP and Troponin I in the scenario of anthracycline cardiotoxicity. Many studies have focused on case of symptomatic LV dysfunction following anthracycline chemotherapy but only a few of the have concentrated on asymptomatic LV dysfunction.

The majority (50%) of our patients belonged to age group 41-60 years. Most (41%) of the patients enrolled in the study were given anthracycline chemotherapy for Non-Hodgkin's lymphoma. All of our patients were clinically asymptomatic, but left ventricular dysfunction was alarmingly detected in majority of the patients on echocardiography. LV Diastolic dysfunction was present in 77% of patients and LV systolic dysfunction in 14% patients after anthracycline administration. Various studies by Murat et al¹¹, Bonnetterre et al¹³ & Hequet et al¹⁴ have shown that the incidence of asymptomatic LV dysfunction following chemotherapy is between 13%-50%. Higher incidence of LV dysfunction in our study could be explained on the basis of larger mean total cumulative dose of anthracycline (420mg) used in our study.

Anthracycline chemotherapy patients developed statistically significant alterations in Echocardiographic parameters. In patients with LV diastolic dysfunction an increase in mean left Ventricular IVRT and decrease in mitral valve flow E/A ratio was observed on echocardiography. The mean LVEF of the anthracycline group was significantly lower than their healthy counterparts. Nousianen et al¹⁴ observed a similar decrease in LVEF and mitral E/A ratio following anthracycline chemotherapy. Maria et al¹⁵ also observed similar alteration in LV diastolic parameter (E/A ratio & IVRT) and LV systolic parameters (LVEF) following chemotherapy.

LV diastolic dysfunction occurred at a mean dose of 399 ± 120 mg and LV systolic dysfunction occurred at a dose of 480 mg. In patients with LV Diastolic dysfunction median time of enrollment in study after chemotherapy was 4 months. LV

systolic dysfunction patients entered the study after a median period of 5 months following chemotherapy.

Epirubicin cause a higher incidence (of LVD vis-à-vis Doxorubicin. Incidence of systolic dysfunction was also higher in patients of Epirubicin group. This can be explained on the difference in pharmacokinetic properties.¹⁶ Corollary to this observation, high incidence of systolic dysfunction was seen in Carcinoma Breast where Epirubicin was used.

Mean Plasma NT pro BNP levels were higher in anthracycline chemotherapy patients than in control, though values did not attain statistical significance. **Patrick et al.** found elevated mean BNP levels about 3 times and abnormal values in 26% of their patients after a mean follow up of 6.5 years.⁸

In patients with LV dysfunction on echocardiography, plasma NT pro BNP had sensitivity of 40% and specificity of 100% in detection of LV dysfunction. This low sensitivity in the study can be explained on the basis of low sample size (N=10) in which test was performed. In patients with LV diastolic dysfunction, the levels of plasma NT pro BNP had a negative correlation with mitral valve flow Peak E velocity and positive correlation with IVRT on echocardiography. In patients with LV diastolic dysfunction levels of this marker had a negative correlation with LVEF. These results indicate a trend between rising NT pro BNP level and deteriorating LV function indices on echocardiograph. Median levels of NT pro BNP were high when additional anticancer drugs were given.

Troponin I, other serum marker used in the study showed a similar trend. The mean levels were significantly higher in the anthracycline chemotherapy population (0.15 ± 0.24 vs 0.02 ± 0.01). In patients with LVD, abnormal valve were found only in 1 out of 10 patients. In the study Troponin I had a sensitivity of 10% and specificity of 100% in detection of LV dysfunction. There was also a negative correlation between rising Troponin I levels and LVEF in patients with LV systolic dysfunction. In patients with LV diastolic dysfunction negative correlation between mitral valve flow E/A ratio ($r = -0.11$) and positive correlation with IVRT ($r = 0.08$) was present. These observations indicate toward a correlation between rising troponin I early echocardiography changes in LV diastolic and systolic function. With additional echocardiography and radiotherapy the mean levels were higher than the cohort which received anthracycline alone.

V. LIMITATIONS

Total sample size was small and the study involved a single point estimation of plasma NT pro BNP and Troponin I following anthracycline chemotherapy.

VI. CONCLUSIONS

There is high prevalence of asymptomatic left ventricular dysfunction on echocardiography after anthracycline chemotherapy. LV diastolic dysfunction was more common than LV systolic dysfunction. Left ventricular dysfunction was related to total cumulative dose of anthracycline.

Co-administration of Additional chemotherapeutic agents (cyclophosphamide and vincristine) & radiotherapy was associated with increased incidence of LV dysfunction. Plasma NT pro BNP and Troponin-I levels were higher in patients who developed LV dysfunction following Chemotherapy.

Both NT pro BNP and Troponin-I levels had low sensitivity and high specificity for detecting LV dysfunction following anthracycline chemotherapy.

Both NT pro BNP and Troponin-I levels showed a negative correlation with LVEF and mitral valve flow peak E velocity on echocardiography. There was also a positive correlation with IVRT on echocardiography.

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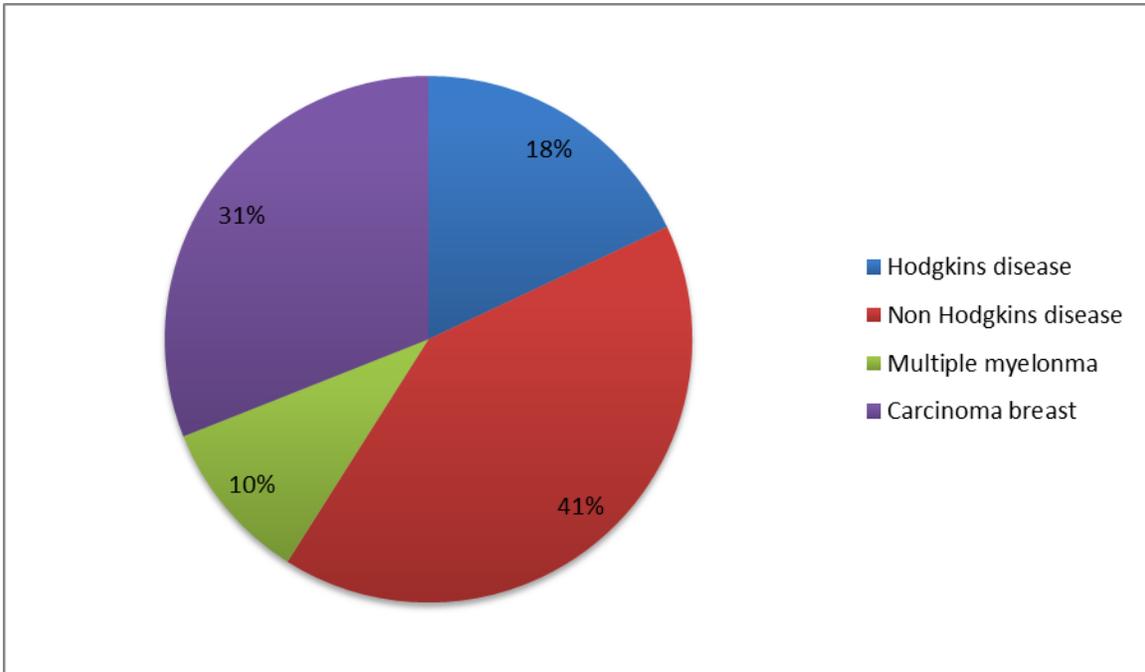


Figure 1. Distribution of Primary Neoplastic diagnoses for which chemotherapy was given in Study

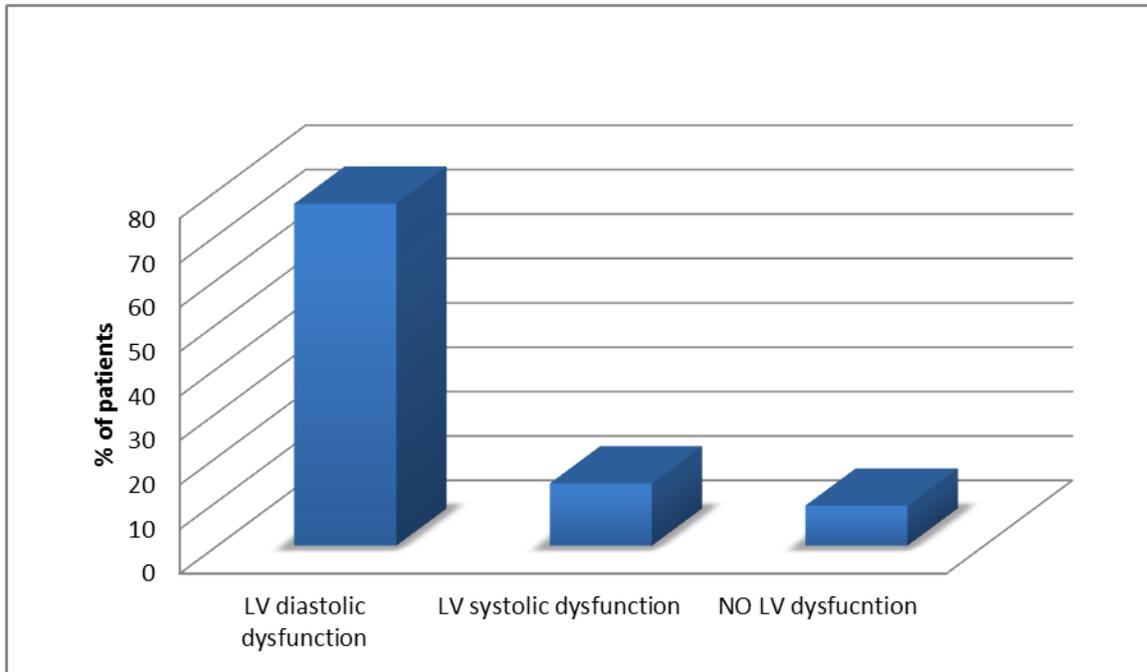


Figure 2. Distribution of Echocardiographic Left ventricular (LV) dysfunction in Study population
LV diastolic dysfunction on echocardiography was highly prevalent (77%) in patients following anthracycline chemotherapy.

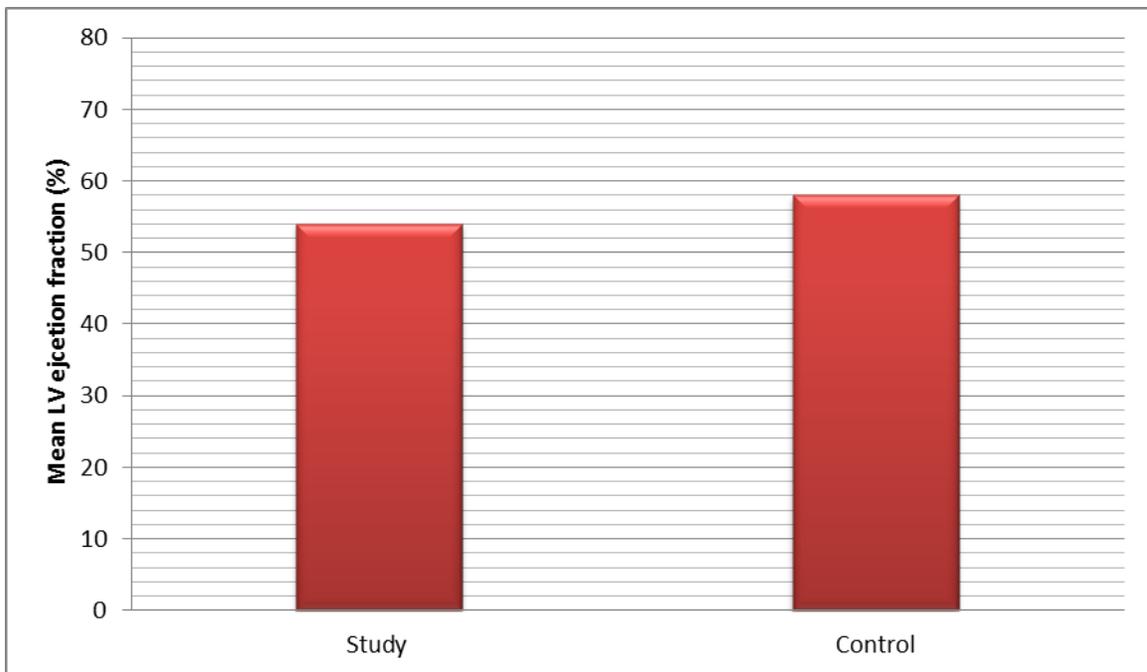


Figure 3. Distribution of Echocardiographic Left ventricular (LV) Ejection fraction between study population & controls
There was a significant fall in mean LV ejection fraction following chemotherapy (53.7 ± 4.2 % vs. 58.2 ± 2.1 % , p= .0003)

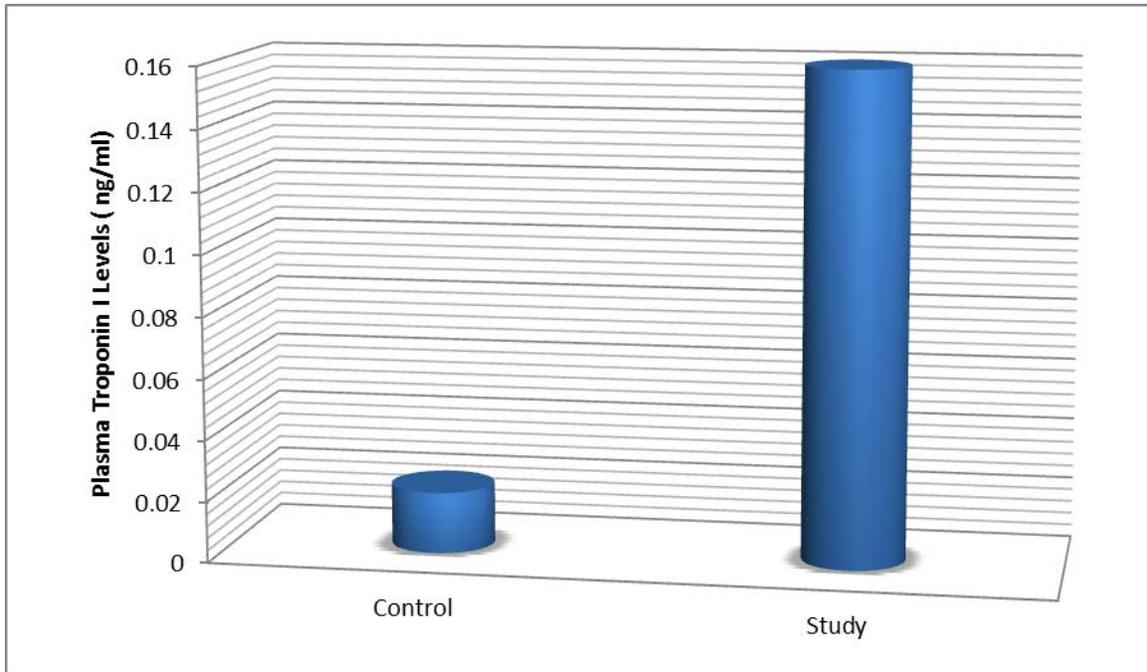


Figure 4. Distribution of Plasma Cardiac troponin I levels between study population & controls. There was a significant rise in plasma troponin I levels following anthracycline chemotherapy. (0.16 ± 0.27 ng/ml vs. 0.02 ± 0.01 ng/ml, $p=0.02$)

Decrease In Use of Natural Ventilation Techniques From Modern Day Construction of Buildings

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Abstract- Air Ventilation is defined as the intentional introduction of outside air for letting the fresh air inside and the hot air outside. Ventilators are the built terminology adopted for provision of ventilation, In general, Natural ventilators are provided by use of different types of openings viz.

1. At a Higher level just below the slab level and above the lintel level,
2. At Sill level in the form of Window openings
3. As louvers
4. As other types of openings like door arches etc.

The article would be mainly concentrating on the first category of Natural ventilators, which are provided at a higher level to let the hot air, which accumulates at the top, to get out and thereby allow the cool air come inside. Taking examples from History also, one can see use of ventilators in the form of Jharokhas, and clerestory windows which solved many other purposes too, In recent times with the increase in Mechanical ventilation techniques the use of natural ventilation techniques is getting decreased day by day, which as a result is causing a considerable amount of energy consumption and thereby causing environmental issues.

Index Terms- Ventilation techniques , Natural Ventilation , jharokhas, clerestory window

I. INTRODUCTION

Ventilation is a major topic studied under the subject of Services and Climatology in architecture studies, where the direction of wind flowing, the amount of air coming inside, the size and position of opening to be given is studied, As faculty members of Architecture and environmental related issues, it has been observed over the passing time that the things that are being taught during the course work are not actually followed when the student comes to practice.

The Ventilation inside a built space can be governed by many factors such as:

1. Quality of outside air.
2. Direction of flow of air that is from clean zone to dirty zone.
3. Outside direction of natural flowing air.

Also to ventilate a built space the provision of ventilators can be done by these types

1. Natural ventilation techniques
2. Mechanical ventilation techniques
3. Mixed or hybrid type

The article will focus only on the first type of ventilation technique in historical buildings with a specific purpose and its existing use today.

Body:

Natural ventilation techniques find their way long back, from the historical architecture where the built spaces, were designed to counter all types of weather changes occurring during the year, some examples from the old Mughal structures and structures from Rajasthan and also from Christian and Byzantine period are being shown where the openings were used for many different purposes. This opening was termed as Jharokha, which served the same purpose of providing steady and fresh airflow and also was a means of communication for the women with the outside world, this type is basically found in abundance in the Islamic architecture where the women had purdah system and were not allowed to interact directly with the outside world. So, the designers and artists that time evolved a technique that would solve both the purposes, Even now if we see some of the old Islamic Structures there is a significant use of jharokhas with proper study of wind direction and light also, The designers that time even took care of the shades and shadows formed thereafter, which in turn create aesthetically pleasing ambience.

The jharokhas that were provided, were beautifully carved out with intrinsic designs of floral motifs, serving the purpose of provision of natural ventilation, also apart from jharokhas in Mughal buildings and some Palaces during the king's rule in various territories in India.

Also in study of history one can see provision of clerestory windows in early Christian and Byzantine architecture, which were beautifully carved and aesthetically placed or positioned in the built space, the purpose again to admit light and fresh air and maintain privacy at the same time as they were provided above the eye level.

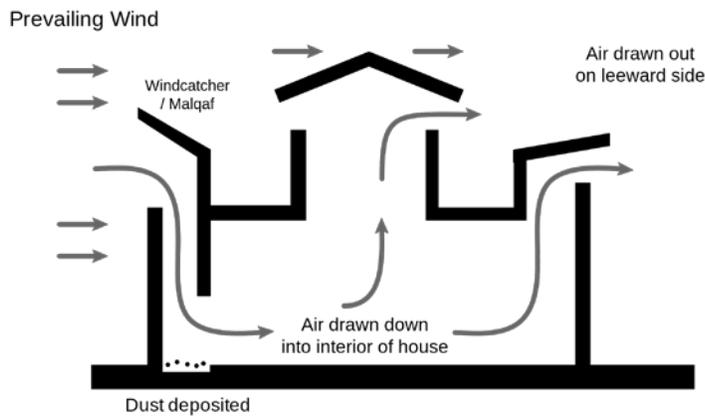


Examples from some of the Byzantine and Christian structures showing the clerestory window



Different types of jharokhas or openings in some of the palaces and forts

The theory of flow of air as taught is being shown in the figure below:



Here one more additional element is introduced that is a Wind Catcher, which again helps to catch the wind in more quantity and serves the purpose of a natural ventilator only.

These were some of the methods of provision of Natural ventilators.

Now, if we see the modern day construction, natural ventilation techniques are slowly getting decreased and are being replaced by the so called Elevation Treatment where the consideration of air movement, wind direction air flow is not taken, again here as an Architect, I would like to make clear that the same is not happening every where as there are many designers and Architects who take a note of climatic conditions and then design the structure,

The concern here is only the decrease in use of natural ventilation techniques, and increase in use of artificial ventilation techniques.

If we observe the modern day construction say for example Row Houses, we will see a typical standard planning with only a concern in mind of having elevation, there the placement of windows the use of ventilators is not studied, A ventilator has only found its place in the toilets and kitchen, as these places are supposed to be service areas so ventilator is must. Besides that one cannot find a ventilator any where else, which has resulted in use of mechanical ventilation techniques, which in turn cause harm to health also, as the flow of fresh air is missing, only mechanized air flows in and out.

Also one of the major reasons for cutting down the natural ventilation is the use of Mechanical ventilators such as air-conditioners and other types of forced artificial techniques like exhaust fans that help the hot air let out more swiftly and fast, thereby consuming a major portion of electricity which can be saved by proper provision of ventilation techniques, and systematic use of natural landscape and well planned outdoors, so that fresh air is in abundance.

II. CONCLUSION

To conclude here, in this growing pace of Commercialization of works and jobs one should not forget the designer's aim should always be to think of the users comfort and at the same time also about the consequences that can arise because of the constant use of mechanical ventilation techniques that may cause environmental as well as health issues.

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Economic Effects of Bad Roads on Vehicle Maintenance in Nigeria

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Abstract- In Nigerian, most roads are in bad shapes leading to negative economic effects. One of the factors affecting vehicle maintenance is bad road network in Nigeria. The economic effects of bad road networks in Nigeria are studied. The estimated current total road network in Nigeria is about 194,000 kilometers. The analysis showed that about 19% of Nigerian roads are paved. All unpaved roads which is about 13% are bad roads. Both the paved and the unpaved roads in Nigeria are deteriorating by the day and has become a source of worry to all vehicle users. Annual losses (from vehicle maintenance), due to bad roads is valued at over N133.8billion. This is outside all other economic losses from bad roads in the areas of air Pollution, delayed movements, armed robbery and incessant accidents on the roads. Out of a total of 703 respondents, over 51 % had their cars damaged in a month due to bad roads in their areas. By extension, about 51% of vehicle users in Nigeria will experience one or more damages to the vehicles in a month. This should be of great concern to any serious government.

Index Terms- Bad roads, Vehicle Maintenance, Economic Effects, Losses.

I. INTRODUCTION

A road is a [thoroughfare](#), route, or way on land between two [places](#), which has been [paved](#) or otherwise improved to allow travel by some [conveyance](#), including a horse, cart, or [motor vehicle](#) (<https://en.wikipedia.org/wiki/Road>). Road could be referred to a facility that provide access for the movement of man, goods and services, animals with use of vehicles, motor bikes, horse, carts etc. between two locations. According to CBN (2003), current total road network in Nigeria is about 194,000 kilometers out of which about 17% belongs to the Federal Government (trunk 'A' roads), 16% belongs to the State Government (trunk 'B' roads), and while the remaining 67% are Local Government roads- trunk 'C' roads (see Table 1). World Fact Book of Central Intelligence Agency (2004) has it that out 193200km of total road network in Nigeria, 28,980 km are paved while 164,220 km are not. The unpaved are bad roads.

Nigeria has the status of a developing country where road facilities are grossly inadequate to cater for the teeming population of road users (Agbonkhese *et al.*, 2013). There are many potholes and detours on most Nigerian roads and this means that vehicles keep breaking down so that on many of Nigeria's roads emergency mechanics have sprung up to assist stranded commuters sometimes with disastrous consequences. Apart from disrupting the smooth flow of traffic, the dug up roads in the city are also adding to the financial burden on

citizens. Therefore, this study aims at analyzing the economic and social effects of bad roads in Nigeria and the extent of deterioration of Nigerian roads; the effects of poor investment in the maintenance of Nigerian roads. It also show the economic effects on the maintenance of vehicles used on Nigerian roads.

II. ROAD TRANSPORTATION

Roadways are the means of transportation on land. It not only includes the modern highway system, but also the city streets, feeder roads and village roads, catering for a wide range of vehicles and the pedestrians. Transportation by road is one of the best modes which can give maximum service to one and all. This mode of transportation has the maximum flexibility for travel with respect to route, direction, time and speed of travel etc (Gupta, 2009). The passengers and the goods have to be transported first by road before reaching a railway station or airport for further journey. Hence, according Singh (2008) it can be said that out of all types of transport systems, road is nearest to the man.

Many types of roads exist around the world, all of which are thoroughfares which can be used by motorized traffic. Different terms are used in different countries for broadly the same design, although there are differences.

- i. **Driveway:** Driveway is a type of private road for local access to one or a small group of structures, and is owned and maintained by an individual or group. Driveways rarely have traffic lights, but some that bear heavy traffic, especially those leading to commercial businesses and parks, do.
- ii. **Arterial Road:** An arterial road or arterial thoroughfare is a high-capacity urban road. The primary function of an arterial road is to deliver from collector roads to freeways or expressways and between urban centres at the highest level of service possible.
- iii. **Highway:** A highway is any public or other public way on land. It is used for major roads, but also includes other public roads and public tracks. It is not an equivalent term to freeway or a translation for autobahn, autoroute etc.
- iv. **Expressway:** This may be refer to as a controlled-access highway, the highest grade type of highway with access ramps, lane dividers etc for high speed traffic.

- v. **Street:** A Street is a public thoroughfare (usually paved) in a built environment. It is a public parcel of land adjoining buildings in an urban context, on which people may freely assemble, interact and move about. A Street can be as simple as a level patch of dirt, but is more often paved with a hard, durable surface such as concrete, cobblestone or brick. Portions may also be smoothed with asphalt, embedded with rails, or otherwise prepared to accommodate non-pedestrian traffic (Wikipedia, 2014).

Most roads in Nigeria are poorly maintained. Figure 1 below shows the traffic situation in a typical Nigerian road.



Figure 1: A typical road traffic gridlock in Lagos, Nigeria

Source: Agbonkhese *et al.*, (2003)

Before passengers and goods get to the railway station, airport and seaports, they have to be transported through the road. Hence it can be said that the road is the nearest to all people among the systems of transportation. Characteristics of road are as follows:

- **Adaptability:** Different types of vehicles can be adapted to move on the roads. For example, bicycles, motor bikes, cars buses and trucks make use of the roads.

- **Initial Investment Cost..** The construction of roads is much cheaper than railway tracks, docks, harbors and airports.
- **Flexibility:** Road offers a complete freedom to road users to transfer their vehicles from one lane to another or from one road to another as per convenience and need of user. The flexibility of changes in direction, speed and timings of travel is not available in other modes of transportation. (Gupta, 2009)
- **Accident Rate:** It is subjected to a high degree of accidents due to the flexibility of movements offered to road users. The speed of movement is directly related with the degree of causality
- **Accessibility:** Road is the only mode transportation that offer easy accessibility to all communities alike. (Singh, 2008)

2.1 BENEFITS OF GOOD SYSTEM OF ROAD

- Road are essential for economic development of a country. For speedy transportation of commodities and quick movements, a good road network is essential.
- Good system of roads helps to save time considerably in all of our daily activities.
- Good system of roads serves as feeder line for other modes of transport and thus helps indirectly in their development.
- For the efficient defense of the country during wars, good system of roads is an essential.
- Good system of roads helps in the growth of trade and other economic activities all over the country.
- During emergency conditions like accident, the injured persons can be rushed immediately to hospital through good system of roads and have the life saved. (Singh, 2008).
- Improvement in the living standard of the people in that community
- Lower cost of maintenance of vehicles used on such roads

2.3 CAUSES OF BAD ROADS

Structural failure of roads is due to some or all of the following reasons carefully structured in the figure 2 below.

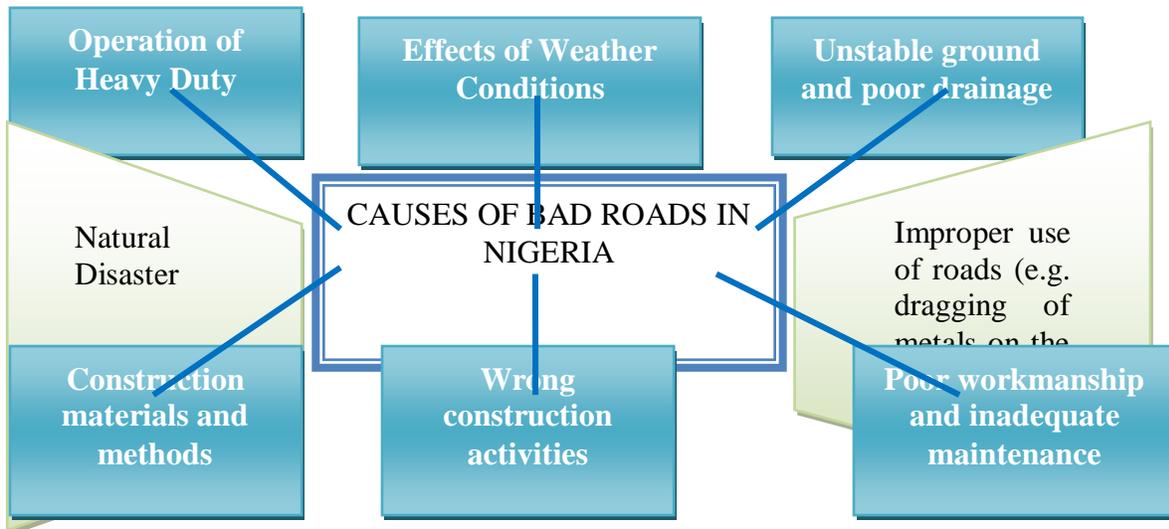


Figure 2: Causes of Bad roads in Nigeria

appropriate services, maintenance cost must be kept as low as possible.

The Total Cost (T_c) of maintenance comprises three parts which include:

- * Corrective maintenance cost (CMC)
- * Preventive maintenance cost (PMC)
- * Indirect maintenance cost (IMC)

Hence, the total cost of maintenance is given by:

$$\therefore T_c = CMC + PMC + IMC$$

The Indirect cost involves costs due to loss of production output through breakdown, extra cost of production due to badly maintained vehicle and defective output due to poor maintenance. (Enwerem G.C., 2005)

3.2 ROAD OWNERSHIP STRUCTURE IN NIGERIA

Road networks in Nigeria belong to the three tiers of Government: the Federal, State, and Local Government. This road ownership structure in Nigeria is shown in the chart below.

III. METHODOLOGY

A review of literature on effects of bad roads on vehicle maintenance in Nigeria and its impact was done. Data were collected from libraries, as well as online through internet search engines and relevant information extracted from other writer's report. Maintenance cost due to bad roads in Nigeria was considered as a factor during the research. For the purpose of analysis the data presented by Austin (2011) whose locational analysis covered some cities in the commercial hub of Nigeria (Lagos State), was also considered.

3.1 MAINTENANCE COST

Maintenance demands enormous resources of manpower and materials. Therefore, to remain in business, and render

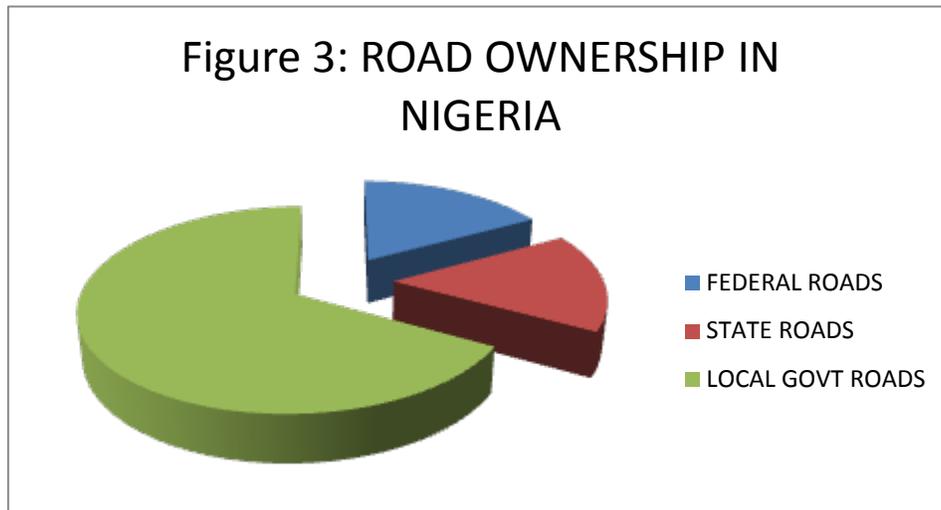


Table 1 below shows the state of the roads (Trunks A, B and C) in the different tiers of Government.

Table 1: Structure of road ownership

	Federal	State roads	L. G. Roads	Total	Percent
Paved main roads	26,500	10,400	-	36,900	19%
Unpaved main roads	5,600	20,100	-	25,700	13%
Urban roads	-	-	21,900	21,900	11%
Main rural roads	-	-	72,800	72,800	38%
Village Access Roads	-	-	35,900	35,900	19%
Total	32,100	30,500	130,600	193,200	100%
Percent	17%	16%	67%	100%	

Source: CBN, (2003)

IV. ANALYSIS

The growth of economic activities prompted the need, for improvement in roads. Consequent upon this, the quality of road constructions over the years has improved as the length and network continued to increase. According to CBN (2003), the estimated current total road network in Nigeria is about 194,000 kilometers. Only 19% of these roads are paved, while the rest are at different stages of dilapidation.

Bad roads exert wear and tier on the vehicles. Eight (8) cities in Lagos State were analysed and the effects of bad roads on vehicles plying the roads in such were presented by Austin (2011) in table 2 below.

Table 2: Effects of bad roads on vehicle maintenance

	Damage to car	Delay in movement	Robbery	Air pollution	Car accident	Total
Alimosho	67	28	1	0	0	96
	69.8%	29.2%	1.0%	0.0%	0.0%	100%

Apapa	30	20	0	0	0	50
	60.0%	40.0%	0.0%	0.0%	0.0%	100%
Eti-osa	50	40	2	1	1	97
	51.5%	44.3%	2.1%	1.1%	1.1%	100%
Ikeja	44	31	3	4	2	84
	52.4%	36.9%	3.6%	1.2%	3.6%	100%
Kosofe	34	42	3	1	3	83
	41.0%	50.6%	3.6%	1.2%	3.6%	100%
Shomolu	90	10	0	0	0	100
	90.0%	10.0%	0.0%	0.0%	0.0%	100%
Mushin	25	39	10	9	15	98
	25.5%	39.8%	10.2%	9.2%	15.3%	100%
Surulere	19	40	12	14	13	98
	19.4%	40.8%	12.2%	14.3%	13.3%	100%

Source: Austin, (2011)

Further analysis will give rise to table 3 below. Table 3 shows that more than half of the respondents (51.07%) have had specific damages done to their cars due to bad roads. By extension if one million (1,000,000) Nigerians own a car, over

500,000 cars will experience one damage or the other in a month due to bad roads.

Table 3. Effects from bad roads

	Bad road Effects	Number of respondents	% respondents
1	Damage to cars	359	51.07
2	Delay in movements	250	35.56
3	Robbery	31	4.41
4	Air Pollution	29	4.13
5	Accidents	34	4.83
	TOTAL	703	100

From CBN reports of 2003, the annual loss due to bad roads is valued at N80 billion, while additional vehicle operating cost resulting from bad roads is valued at N53.8 billion, bringing the total loss per annum to N133.8 billion. This is outside all other economic losses from bad roads in the area of Air Pollution, delayed movements, armed robbery and incessant accidents on the roads.

V. CONCLUSION

Most Nigerian roads are in bad shapes leading to negative economic effects. The total economic effects of such bad roads to the nation, the health of the citizens, operation of businesses, safety of lives and properties are unquantifiable. Any investment in the reconstruction and proper maintenance of Nigerian roads (at all levels) will enormously ease road transportation of goods

and services and improve on the standard of living of the citizens.

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Transformation Process Cultural Values in Local Government Bureaucracy Jayapura

(Case study of Licensing Services Agency One Stop)

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Abstract- Transformation is the transfer from one place to another, and cause changes on an object that has been plagued by such things. So the transformation can cause changes in a particular object. Such changes also occurred in the local community who are able to transform the values of the local culture, especially the culture of Papua. Cultural values in the form of: 1) the work ethic; 2) mutual cooperation; 3) openness; 4) preservation of value; 5) kinship; and 6) the pattern of consumption, it is very attached and form a distinctive characteristic of social behavior ethnic Papuans. This study aims to analyze the process of transformation of local cultural values takes place within the Office of Licensing Services Agency One Stop (BPPTSP) Jayapura city government. The approach used is a qualitative approach. The focus of this study examines the process of transformation of local cultural values takes place in the Integrated Licensing Services Agency One Stop (BPPTSP) Jayapura city government. This study uses depth interview, observation and documentation. Data were analyzed through qualitative data analysis include data reduction, organizing data, and interpretation of data. The results of this study indicate that the process of transformation of local culture into the culture of the organization BPPTSP happen through two ways; first, through the design and local government intervention, both, through a process of acculturation.

Index Terms- culture, transformation, public services, organizations.

I. INTRODUCTION

The changes are part of humanitarian entities inherent in human beings with minds that drives these changes. This means that in the process of change that took place, man becomes the main individual which improves the process of construction of reality universe. In the process of change known as transformation, man is at the core of the process. Changes taking place in various fields such as economic, political, social, cultural and even religious. Transformation means of social change. One of the theories of social change is the theory of human action developed by Talcott Parsons in (Ritzer, 2010). Parson distinguish four subsystems that are part of the change process, namely: a) Organisms; b) Personality; c) The social system and; d) cultural system (Ritzer, 2010). The fourth element

is arranged in the description of cybernetics (cybernetics order) and controlling human action.

Cultural system is a source of ideas, knowledge, values, beliefs and symbols. Cultural systems provide direction, guidance, and meaning to human action in the social system. Cultural symbols rendered in a social system which is then delivered to the individual citizens of the social system through the process of socialization and internalization. Social systems work in social action. The social action that creates social change. Social actions are called personality that characterize the organisms in it. Transformation is a displacement or shift something in a new direction without changing the structure contained therein, albeit in a new form has changed. Framework of cultural transformation is the structure and culture. Transformation involves changing social relationships and ecological webs. If the structure of the web is changed, there will be in it a transformation of social institutions, values and ideas. Cultural transformation with regard to the evolution of human culture. This transformation is typically preceded by a variety of social indicators. This kind of cultural transformation are essential steps in the development of civilization. All civilizations runs through the similarity cycle processes occurrence, growth, unity and integrity.

With the passing of a special autonomy demands in today's era of reform, to some extent has affected the changing demands of the organization at the local level, which leads to the need for an effective and efficient organization. In response to the dynamics of the organization and the demands of competition and facing an organizational environment that is constantly changing, the challenges of increasingly complex issues, it is time for local governments to implement the Political Will to fix the organization at the local level with the transformation of the organization. In the transformation of the organization itself, must do the changing role of the apparatus functions as an intellectual actor of change. In the era of special autonomy, the changing role of the function of the apparatus becomes very important.

Work organization has shifted from working as individuals to work as a team. The difficulties of working in a team mainly experienced by many employees in Western countries, because of their national culture is very individualistic. In addition, before applying teamwork, working environment in western countries are competitive are the achievement of individual (Robbins, 2007). Therefore, the team is expected to grow in countries that

have high collectivistic values. According to Hofstede (1991), Indonesia is one of the countries that have a high collectivistic values where group interests are above the interests of individuals, so we can say teamwork system is well developed in Indonesia. It can be characterized by the values of the local culture that transformed the depths of bureaucracy for collectivistic cultures will always conduct its activities by interest groups, the protection of the group and the decision by the group. In the context of the Papuan people when changes will be made then require painstaking efforts to reconstruct human society Papua be able to become a strong and dignified. Strong human constructed of strong human resources as well. Therefore, need to change the values of human Papua that now exists with the main cultural values born of the power of philosophical values Papuan culture that essentially it has a value not less than the Balinese culture with customary village. Or is it more accurate to say that at this time, when his development is based on the values of modernity makes the Papuan community suffered a setback in various fields. Therefore, efforts are needed to identify the back indigenous people of Papua to support the development in Papua. In the transformation of the organization itself, must do the changing role of the human resource function as an intellectual actor of change. In the era of regional autonomy, the changing role of the human resource function becomes very important. Culture poor work ethic, attitude and knowledge that are not adaptive to the changing demands should be terminated immediately. We live in a time that is now forcing us to move after move the base changes and forces us to be bound in a thing called "Upside-down thinking". Then the main core problem is how these transformations occur within the Local Government organization that affects organizational performance.

In the process of organizational transformation Appears one common theme that characterizes the process of transformation itself and form items, namely: to work as a solid team and together support the non-hierarchical structure. Working as a team in the face of obstacles organization, is a sign for an organization that is in the process of transformation. Organization of Local Government (LG), decentralization should be Able to reduce some of the traditional barriers throughout the organization. The government can reduce functional effectiveness and are an impediment to the efficiency of the organization, job title and physical obstacles created by the organization. The role, functions and duties roomates are organized by a team of people who joined the team selected based on their competence and their passion for things that are being implemented. Each unit can select an organizational structure that is Able to create a reward tangible for the public, an organizational structure that Gives space for the creation of the control or the control of the government to the public (Top-Down Control) and control of the public to the government (Bottom-up Control).

Such changes also occurred in the local community who are able to transform the values of the local culture, especially the culture of Papua. Cultural values in the form of: 1) the work ethic; 2) mutual cooperation; 3) openness; 4) preservation of value; 5) kinship; and 6) the pattern of consumption, the stretcher is very attached and form a distinctive characteristic of social behavior ethnic Papuans.

Public service is one of the main functions of the bureaucracy is the duty officers. Public services are a problem that always accompany the everyday people. In various local media Papua explain the negative image of bureaucracy and poor quality of public services is reflected in the rise of feedback, complaints and scorn in the media. Community complained the quality of service, their corruption, extortion or pull funds out the provisions set forth sluggish performance of staff, number of tables that must be passed when issuing prescriptions, health insurance ethnic Papuans, the uncertainty of the length of the due completion of affairs and so on.

Good Research Development Service (GDS) from 2002 to 2004 found some problems in the public service are, first, the uncertainty of public services, the time, the usual method of service. Second; discrimination in services by friendship, instance, ethical religion; Third, the bureaucratic bribery, extortion became considered reasonable and acceptable; and Fourth, the orientation is not on the user but on the interests of the service for the officials.

Implementation of poor public service in the Department of Technical associated in Jayapura city government has been an open secret for any society as a recipient of the service, this expression is not excessive when looking at the fact that the civil rights of citizens are often violated in the process to obtain the identity of the population such as the National Identity Card (KTP). Making Family Card (KK), manufacture of Birth Certificate, which should be easy, complicated by the number of tables, the wait time and a series of procedures to go through. Such complaints that often arise from the public in the administration of public services, especially of the poor quality of public service delivery.

Based on preliminary observations, the officials at the office of Licensing Services Agency One Stop (BPPTSP) Jayapura city government is still low discipline, it is seen from the coming hours and hours of employees who did not return according to the rules. In general, the existing staff came late but came home early from office hours. This condition is clearly hindered BPPTSP service at the office.

II. RESEARCH METHODS

This study used qualitative research methods. The location of research carried out at the office of Licensing Services Agency One Stop (BPPSTP) Jayapura, Papua province, Indonesia. In this study the focus is directed to assessing the process of transformation of local cultural values that take place in the Integrated Licensing Services Agency One Stop (BPPTSP) Jayapura city government.

Types of data collected in this study are primary data and secondary data. Primary data were obtained from the data collected from the data source or key informants (key informant) in the Office of the City BPPTSP Jayapura. While secondary data obtained from various sources such as documents, results of previous studies, print and electronic media as well as from various other sources deemed able to contribute and complement the primary data analysis. Data collection techniques used were interviews, observation and study of the document. Qualitative

data analysis techniques used include: reduction of data, organizing data, and interpretation of data.

III. RESULTS AND DISCUSSION

Process Transformation Values Into Local Culture System In The Public Services Office of Licensing Services Agency One Stop (BPPTSP) in Jayapura

Citing the views Capra (Praise Leksono, 2009) that the transformation process will involve changes in social relationships and ecological networks. If Netting structure is changed, there will be in it a transformation of social institutions, values and ideas. Its transformation process runs according to the cycle of events, growth, unity and integrity. The process of transformation of cultural values of local Papuans into the value system of the public service in the office of the Office of Licensing Services Agency One Stop BPPTSP Jayapura City when analyzed also experiencing such conditions have been disclosed by Capra. The government bureaucracy actually also formed with the cultural values of the organization in accordance with the features and characteristics of the bureaucracy. In general characteristics of bureaucracy can be assessed by several aspects, especially in the context of public service, namely: 1) the existence of a clear division of tasks each employee so it is clear who is in charge of giving direct service (line staff) and where the employee or unit in charge of providing support to the function line (supporting staff), this is called the Clear division of labor; 2) each of the tasks assigned to the employee; 3) work in design based on common tasks and jobs that may not overlap (specialization); 4) every position in the organization constantly monitored through the chain of command in which the low position is supervised by the higher position (Hierarchical arrangement of positions / Chain of Command); 5) employee behavior is always guided by formal rules and regulations (Uniformly guide employee behavior by formal rules and regulations); 6) tasks constantly conditioned work environment for stable and continuous (Reduce uncertainty about task performance); 7) leadership is not involved in the selection of subordinates, so there is no emotional connection so as to create justice (No emotional attachments and Provides for fairness); 8) staffing is based entirely on the competence (Rigid selection criteria).

The characteristics of the bureaucracy has implications on what values prevailing in the bureaucracy. The principles that apply in this bureaucratic organization that is seen by Max Weber as a form of efforts to prevent bureaucracy is not professional and neutral. Thus, of course, the values that are developed and used in the bureaucracy, especially in the delivery of services promoting non-discrimination, diversity and always prioritize professionalism. Not tolerated the delivery of services that do not have a rationale that has been determined by the mechanism and regulation that has been determined, usually through standard operating procedures (SOP), technical instructions (technical guidelines), and operational guidelines (Guidelines).

When the values of the local culture transformed into public service system then causes a change to the values used by the organization that exists, then it is not something that is not strange, because the transformation does cause changes to the

organization with. The question is how the values of the local culture transformed into the bureaucracy and shifting the values of the existing bureaucracy? This can happen when the values of the local culture is stronger than the influence of cultural values existing bureaucracy.

The process of transformation of the cultural values of the people of Papua into the public service system in the Office of the Licensing Service Agency One Stop (BPPTSP) Jayapura city happens in some way or form. 1) the transformation process occurs because the motives of the employees where previously this organization very bad image in the eyes of the people that need to be changed; 2) the public should be regarded as a family should be served well; and 3) local wisdom that puts a sense of security in their daily lives should also be manifested in providing services; 4) command Medium Term Development Plan (RPJMD) and Vision Jayapura city to use local wisdom as an operational basis for the government in Jayapura has implications for the entire working units (SKPD) in the city of Jayapura should adopt the values of the local people of Papua to in the public service system in the Office of Licensing services Agency One Stop (BPPTSP); 5) local cultural products such as ornaments of buildings and traditional ceremonies depicting togetherness and family into a medium that enables the transformation process; 6) networks between individuals within the organization with outside parties also adds new values for the Office of Licensing Services Agency One Stop (BPPTSP), mainly due to the new values of the individual / organization that has long practiced with good values the value of public services considered good; 7) the process of transformation of the new values also occur through education and training, which in the process of improving the competence of employees also emphasized the importance of having the awareness to use the values of the local culture; 8) socialization of the new members of the organization also become a place that is quite effective in the transformation process of cultural values organization that is in the existing local values as the basis to act and behave in providing public services in the Office of Licensing Services One Stop (BPPTSP) Jayapura city.

As a result of these motives, the then members of the organization are determined to change the way in providing services by basing itself on the view that society when people served should be viewed as a family that should be cherished. As befits Papua community who honored guests come to your home, is seen as a family, received with suave. Values and local wisdom of the people of Papua are then transformed into the values of the organization when providing services. Very clearly the adoption of the values and local wisdom in the public service system in the Office of Licensing Services Agency One Stop (BPPTSP) is strongly influenced by environmental factors surrounding where Licensing Services Agency One Stop (BPPTSP) operate and perform its functions.

Efforts to encourage a change in the system at the service of the Office of Licensing Services Agency One Stop (BPPTSP) Also through the involvement of the employees to design Reviews their behavior roomates first included in the comparative study to the office of the Regional Government of Sragen , See and witness how the mechanisms and public service system in Sragen encourage them to be Able to Also apply them. However, based on the information Obtained, they Agreed to

modify the related systems and service mechanism they have seen in Sragen. So there is a combination of the process of transformation to change the values in the public service system in the Office of Licensing Services Agency One Stop (BPPTSP) Jayapura city. On one side there is the need to a make improvements and differences in public service Compared with the previous organization, and on the other hand they do modify the values of public service by Adopting the values of the culture and local wisdom as the values underlying the public service system in the organization Licensing Services Agency One Stop (BPPTSP) Jayapura city. Even in order to provide better service to the public, the use of the local language is Often used, reason than Because people are still many who do not speak fluent Indonesian as well in order to get closer to being served. The process of transformation is the result of a combination as described above are expected to impact on the performance of public services of the Office of Licensing Services Agency One Stop (BPPTSP) Jayapura city, the better. Conceptually, this condition can be positive if the notion of service delivery is more convenient Because it is coming to be seen as a guest the which must be respected. But it can also have negative consequences when understanding that comes is living and family who have served in advance or do not use a standard procedure, while the family were not getting the service must be in accordance with the formal procedures have been defined.

Jayapura City Vision, Vision mayor and vision Licensing Services Agency One Stop (BPPTSP) is driving the transformation of cultural values of indigenous people of Papua into the public service system in the office of Licensing Services Agency One Stop (BPPTSP). Vision Jayapura city which instructs that in running the bureaucracy in Jayapura city should always be based on the values of local wisdom. Because it is the vision of the city of Jayapura then requires the entire vision of officials and work units (SKPD) always well in running the bureaucracy based on local wisdom. Licensing Services Agency One Stop (BPPTSP) follow the mandate of the vision and the Medium Term Development Plan (RPJMD) Jayapura city into the Strategic Plan of the Integrated Licensing Services Agency One Stop (BPPTSP) where the main runway in carrying on education should be based on local wisdom. Momentum is what causes Licensing Services Agency One Stop (BPPTSP) Jayapura City must adopt local values into the public service system. So it can be concluded that the process of transformation of local values into the public service system occurs because of an order of the Medium Term Development Plan (RPJMD) and Jayapura City Vision. This condition is different from the usual habits of the transformation process in which individuals of the officials who knowingly and does not carry the values of the Medium Term Development Plan (RPJMD) people into the organization and eventually thrown into the values within the organization.

The transformation of local cultural values into the bureaucracy basically already long ago been put forward by F.W. Riggs (1964) in which he stated that in a transitional society (prismatic society) the likelihood of the process of transformation of local cultural values with the organization (bureaucracy) is very likely to occur because in such a society tend to no characteristics that blend when compared to modern society. As a result, according to Riggs (1964), the community like this when entering the world of bureaucracy encounter situations where

difficult to distinguish between the formal rules of the organization with the rules in force in the community. As a result of cultural values of society affect the values of the organization in which the shape of the heterogeneity practice, overlapping, and formalism. The occurrence of such practices affect the organization is no longer able to distinguish where the rules of formal and non-formal where the rule. Even at such a transition society tends to practice the old habit than formal rules of the organization. As a result, there are overlaps between the rules of social custom (local values) with the formal rules of the organization. Even further R.K. Sapru (2013), states that the traditional ideas and modern exist together and conflicting between each other. In giving the waiter principle who is first come first served basis so, he would, but in many such communities judgment based on the values of the society that prioritizes kinship, group, ethnically and even clicks.

The values of the local culture in the public service system in the Office of Licensing Services One Stop (BPPTSP) has been able to transform the organization into an organization working units (SKPD) differentiator of Work Unit (SKPD) to another in the Jayapura City (Mangkunagara, 2005). Kotter and Heskett (1997) explains that classify cultures into three categories. One very important category in terms of performance is the importance of culture that is in harmony with the organization's performance. Cultural values of the organization, especially in the public service system in the office Licensing Service Agency One Stop (BPPTSP) representing the values of the local culture is not an issue for the organization if the values of the local culture are aligned with organizational goals to improve organizational performance. Most of the values of the local culture in the public service system in the office of Licensing Services Agency One Stop (BPPTSP) Jayapura City has even been able to be a value which is positive because it is able to push the performance of the organization.

Local cultural products such as ornaments of buildings and traditional ceremonies depicting togetherness and family into a medium that enables the transformation process. Ornaments are cultural products of the Papuan people is typical. Nowadays everywhere both office-government offices, hotels and clothing typical of the people of Papua has become a differentiator with other regions in Indonesia. This happens because it is stipulated in the Regulations area of the building, where each applicant building permit (IMB) had to make ornaments tribe in Jayapura, whether it was in the hotel, or even a fence at Sentani airport in Jayapura. The goal is to preserve the culture of the people of Papua. Jayapura city government's willingness to make the products of the local culture an integral part of the everyday people and Jayapura city government seems to be transformed into a system of public service performed by the Office of Licensing Services Agency One Stop (BPPTSP). Traditional ceremonies that show the importance of the values of togetherness and family transformed into a value on a daily basis the employees in carrying out its mission as a public servant. On any given day all employees are required to wear clothing patterned Papua. Common values transformed into a way of providing services based on the spirit of family and togetherness. The process of transformation of cultural values usually through networking between the parties within the organization from outside the organization. Similarly, what happened in the Office

of Licensing Services Agency One Stop (BPPTSP). Networks between individuals within the organization with outside parties also turned out helped add new values to the Office of the Licensing Service Agency One Stop (BPPTSP), mainly due to the new values of the individual / organization that has long practiced with good values public services are considered good. The values of the public service that has been practiced in other places, in this case the existing agency in Sragen apparently want to be replicated and be one way to change the system in the service of the Office of Licensing Services Agency One Stop (BPPTSP). The process of transformation of values going through the process of changing the mindset of the employees either through a direct view the best service practices (best practices) as well as through education and training, led by the infrastructure of Sragen local government. Systems and procedures that exist in Sragen is further modified by adding the values of the local culture of the people of Papua.

Socialization of the new members of the organization Also typically can be a means to instill cultural values that already exist in the organization. in the Office of Licensing Services Agency One Stop (BPPTSP) means of socialization of the culture of the organization IS ALSO applied to employees who had entered. This method is fairly effective Considered in the transformation process of organizational culture that values are already local values as the basis to act and behave in providing public services in the Office of Licensing Services Agency One Stop (BPPTSP) in the city of Jayapura. This has been stated by Kotter and Heskett (1997) that represent cultural behavior patterns or style of an organization, that the new employees are automatically driven to follow the behavior of the employees who have been there.

It can be concluded that the process of transformation of the values of the local culture into the public service system organized by the Office of Licensing Services One Stop (BPPTSP) in Jayapura happen in two ways: first through the intervention of the government through its policies, and secondly through the grades local cultures brought by members of the organization into the organization and through a process called acculturation process. Acculturation process significantly grow and develop along with the culture that comes from outside. In general terms of acculturation (acculturation) is a mix of cultures which then produces a new culture without losing the original elements in the culture. This condition occurs in the context of the process of cultural transformation of local people of Papua into bureaucracy Licensing Services Agency One Stop (BPPTSP).

Proposition

If the values of the local culture has the power to transform into the cultural values of bureaucracy, whether caused intentionally designed through-led military intervention, or through policy, the process of acculturation cultural values local to the organization through the members of the organization can be made easily.

IV. CONCLUSION

The process of transformation of local culture into the organization's culture Licensing Services Agency One Stop (BPPTSP) occurs in two ways namely; first, through the design

and local government intervention, both, through a process of acculturation. Further, the process namely through: 1) the transformation occurred because the motives of the employees where previously this organization very bad image in the eyes of the people that need to be changed; 2) the public should be regarded as a family should be served well; and 3) local wisdom that puts a sense of security in their daily lives should also be manifested in providing services; 4) command Medium Term Development Plan (RPJMD) and Vision Jayapura city to use local wisdom as an operational basis for the government in Jayapura has implications for the entire working units (SKPD) in the city of Jayapura should adopt the values of the local people of Papua to in the public service system in the Office of Licensing services Agency One Stop (BPPTSP); 5) local cultural products such as ornaments of buildings and traditional ceremonies depicting togetherness and family into the media that motivates the transformation process; 6) networks between individuals within the organization with outside parties also adds new values for the Office of Licensing Services Agency One Stop (BPPTSP), mainly due to the new values of the individual / organization that has long practiced with good values the value of public services considered good; 7) the process of transformation of the new values also occur through education and training, which in the process of improving the competence of employees also emphasized the importance of having the awareness to use the values of the local culture; 8) socialization to the new members of the organization also become a place that is quite effective in the transformation process of cultural values organization that is in the organization existing local values as the basis to act and behave in providing public services Licensing Service Agency One Stop (BPPTSP) in Jayapura.

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Organizational Culture In Perspective Anthropology

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Abstract- This article describes the anthropological perspective in the study of the organization, particularly related to the culture of the organization. Organizational culture is a reflection of the organization itself. Anthropology as a science that covers the study of culture takes an important role in the development of cultural studies organization. An ethnographic approach that looks at the phenomenon based on what the owner or the perpetrator of culture will provide a positive contribution in the study of organizational culture in the form of findings regarding the ambiguous attitude, political dynamics, creation, modification, and the role of actors in the organization. Ethnographic analysis will explain the differentiation of attitudes and behavior of members of the organization are understood as a cultural organization. Paradigm competing in this study from the perspective of anthropology is the functionalist form of assessment of the functional elements in the organization as a whole that make up the organization, interpretivism that studies the form of meaning basic assumption, the value system and philosophy of the organization to guide the work on every member of the organization and interactionism in the form of studies on the interaction of members based on the meaning of the symbols of the organization that is widely understood by members of the organization. Various paradigms are emphasizing that how anthropology contribute in the study of the organization, especially in today's modern organizations.

Index Terms- Culture, Organization, Anthropology

I. INTRODUCTION

The organization is an integral part in the study of anthropology, because the organization is not only understood as a group of people who have common goals in the group have a constitution and bylaws, but the organization in anthropology wider scope in the form of patterns of social networks in people who can form social groups. In this case the organization can also be a social process and setting the action in a row according to the chosen destination. Anthropology contribute to the study of the organization in the form of studies of organizational culture, organizational change, and form a strong culture to sustain the organization. The review was initiated on 1980-1990an era, when caused distrust modernization by Western policy based on a third-world country. The purpose of this study introduce a model of organizational studies in anthropology perspective that is different from the model studies that have been conducted from various disciplines beyond anthropology. Changes were introduced on the differences in the style of association which western bureaucratic model is considered to have a weakness when applied in the Third World, not in the West (Wright, 2005).

Conformity assessment of anthropology in the context of the organization in the form of anthropological approach in the study of culture, starting from the thinking and practice of management and organizational scope is understood as part of the construction of meaning (Wright, 2005). Further by Sinha (2008) has a cultural community as well as an organization. In an organization called the soul of the organization, spirit and ethos that filters all organizational behavior and guiding how and why people work as well as the function of culture in society.

The next major issue related to the definition and method used multiple disciplines to explain the culture of the organization related to the perspective put forward by Schein (1993) that organizational culture is viewed culture as a system of shared values, norms, underlying assumptions, and expectations is expected to control the behavior of members of the organization. However, this model has a weakness in explaining the heterogeneity of the members of the organization who have different cultural backgrounds, where the differences in this background will have an impact on the cultural acceptance in the internalization of the organization. Some assumptions may be understood differently.

Nevertheless the concept of Schein was a referral from a variety of research on organizational culture of these different disciplines. This definition is also in line with the flow Cognitivism in the study of anthropology who explained that culture is a system of meaning that is understood and shared by supporters of a culture. However that may be different or the same meaning by different individuals. This definition can be used to describe the organizational culture by being able to provide an explanation that can purport to be a symbol differently by different individuals because they are not empty vessels before joining the organization. The interpretation of symbols or phenomenon is a mental contestation that covers all the knowledge that has already become a reference and individual action as a reflection of the culture before

II. ANTHROPOLOGICAL CONTRIBUTIONS IN THE STUDY OF ORGANIZATIONAL CULTURE; SEVERAL COMPETING PARADIGMS.

Various paradigms in anthropology studies to date continue to concentrate in explaining the various object of study. Anthropology today is no longer just concentrate on segments of rural communities, or communities in urban areas, but in the world of modern organizations also took part. Tamoko Hamada (2013) in his "Neurological Model of Organization Culture" explains that there are three paradigms in anthropology that is used in the study of organizational culture that is utilitarian, interpretivism and interactionism. Although in his writings

Hamada does not explain in detail. The third paradigm is also well used by various disciplines as a framework for the study of organizations. However, this paradigm can be briefly described as follows:

III. UTILITARIAN PARADIGM FUNCTIONALISM

The basic assumption of the structural functionalism theory is a theory of building the greatest influence in the social sciences in the present century. Characters who first coined the functional ie August Comte, Emile Durkheim and Spencer Herbet. Functional structural thinking is strongly influenced by biological thinking that considers society as a biological organism is composed of organs are interdependent, such dependence is the result or consequence that the organism can still survive. As with other approaches functional structural approach also aims to achieve social order.

Structural-functional theory was originally set of ideas Emile Durkheim, which Durkheim's thoughts are influenced by Auguste Comte and Herbert Spencer. Comte with his thoughts on the analogy of organismic then further developed by Herbert Spencer to compare and find similarities between communities of organisms, and eventually evolved into what is called the requisite functionalism, which is a guide for Spencer substantive analysis and functional analysis mover.

Durkheim firmly planted the organismic terminology. Durkheim said that the community is a unity in which there are parts distinguishable parts. The parts of the system has the function of each that makes the system balanced. The section is interdependent with one another and functional, so if something is not working it would destroy the balance of the system. Thought that is the contribution of Durkheim's theory of Parsons and Merton regarding structural functional. In addition, the functional anthropologist Malinowski and Radcliffe-Brown also help establish a modern functional perspective. Aside from Durkheim, structural-functional theory is also influenced by the ideas of Max Weber. In general, two aspects of the studies that have a strong influence Weber is a substantive vision and strategy regarding social action in analyzing social structure.

Weber thought regarding social action in the development of thinking is useful in explaining the actions Parsons actor in interpreting state. There is also the basic assumption by Talcott Parsons. According to Parson, there are four key components in the structural-functional theory, namely: Adaptation, Goal Attainment, Integration, and Latency (AGIL).

- a) Adaptation: the social system (society) is always changing to adapt to the changes that take place, both internally and externally.
- b) Goal Attainment: every social system (society) has always met the common goals to be achieved by the social system.
- c) Integration: every social system is always integrated and tend to persist in equilibrium (balance). This trend was maintained through the ability to survive for the sake of the system.
- d) Latency: social system always try to maintain the forms of interaction that are relatively fixed and any deviant behavior is always on accommodation through agreements renewed continuously.

Thought Malinowski and Brown in the functionalism influenced by sociologists who see society as a living organism, and both contribute their thoughts on the nature, functional analysis built on organic models. Within the limits of some of the basic concepts of functionalism in the social sciences, an understanding Radcliffe-Brown (1976), regarding structural functionalism is the basis for the functional analysis of contemporary : The function of any recurrent activity, such as the punishment of the crime, or funerals , is the part it plays in social life as a whole and, because it is a contribution that it provides for the maintenance of the structural continuity of Radcliffe-Brown (1976).

Functionalism in the study of the organization aim to differentiate functions maintain the continuity of the whole organization (eg planning, organizing, motivating, monitoring). Functional units and a balanced social system ensures a harmonious cooperation and peace within. Thus, in an organizational relationship of the parts in the organizational structure is described as something functional for the continuation of the organization. For example at various levels within the organization such as the level of director, manager, level of supervision and regular employees (administrative staff, marketing) to function properly, the existence of the organization would also be good.

However, in the functionalism cause deterministic methodology in understanding the patterns and repetitions social processes in organizations (Merton, 1982). Functionalist epistemologically thus characterized by orientation to create an integrated system, but does not explain that the system is not always going to go smoothly there will be interference due to external factors and internal associated with the organization.

IV. PARADIGM INTERPRETIVISM

Interpretive derived from German philosophy which focuses on the role of language, interpretation, and understanding in the social sciences. This approach focuses on the subjective nature of the social world and trying to understand it from the frame of the object being studied. The focus on the individual and the meaning of human perception on reality rather than an independent reality which is beyond them. Humans are kept - constantly creating their social reality in order to interact with others. The purpose is none other interpretive approach is to analyze the social reality of this kind of social reality and how it formed. To understand a specific social environment, researchers must explore the subjective experience of the principals.

Interpretative paradigm appears contrary to functionalism, interpretative is the most important source in the study of social sciences and humanities such as sociology, psychology, political science and cultural anthropology. Interpretive try to reconstruct the principles of interpretation / symbolic paradigms in management leads to several points including: social constructivism, aspects of cognitive activity and the role of language in shaping social reality and practice.

Referring to Geertz (1973) , suggests a definition of culture as: (1) a system regularity of meanings and symbols, with meanings and symbols are the individuals define their world, express reviews their feelings and make their judgments; (2) a

pattern of meanings transmitted historically contained in symbolic forms, through the symbolic forms of human communication, strengthen, and develop their knowledge of and attitude towards life; (3) a symbolic apparatus for controlling behavior, extra somatic sources of information; and (4) because the culture is a system of symbols, the culture process should be understood, translated and interpreted. The symbolic language of culture is public, and therefore researchers should not pretend to have gained some insight into the corners deep in the minds of individuals. The symbolic function universal, and people can not understand the culture of a society without this function, which works along the genetic code itself. (Geertz, 1973). So, being a man means cultured.

Then when Interpretive as Geertz argued, then in the context of formal organizations interpretive theory concentrates on explaining the complex linkages in the social structure and organization. The key to creating a scientific theory is the understanding, refers to a viewpoint in the observations or views of members of the organization involved. His approach is a must expose inter subjective multiplicity of meanings and interpretations submitted by various actors organizations. Multiplicity of meanings within the organization and then explain the diversity of behavior within the organization that have an impact on the contribution difference and goals and motives of any members of the organization. Even in this condition may explain the ambiguous, political behavior that might not be consistent with the value system of the organization or even on the ultimate goal of the organization.

V. PARADIGM INTERACTIONISTS

Symbolic interactionism is one model of cultural research that seeks to uncover the reality of human behavior. The basic philosophy of symbolic interactionism is phenomenology. Symbolic interactionism basing his studies on interpersonal cultural interaction that has been in touch with aspects of society or group. Symbolic interaction perspective seeks to understand culture through the human behavior reflected in the communication. Symbolic interaction more emphasis on the meaning of a community cultural interactions. The essential meaning will be reflected through cultural communication between local residents or in the context of an organization that is communication between members of the organization. At the time of communicating clearly a lot to ask meaningful symbols, hence the task of researchers found that meaning.

According Spradley (1997), there are a few premises of symbolic interactionism researchers need to understand the culture, which is as follows; First, humans do things on the basis of the meaning given by different it was to them. Suppose, managers, directors vehicles, account officer, marketing and others on as part of the organization. All of that is a symbol of the special significance in the context of the organization. Second, the basic symbolic interactionism is the "meaning of the various things that came from, or arising from a social interaction with others. Culture as a system of meaning that is shared, learned, repaired, maintained, and is defined in the context of people interacting. Third, that the meaning of the symbolic interactionism handled or modified through an interpretive process that is used by people in relation to the various things

that he faced. A policeman also uses culture to interpret the situation.

In addition to these three premises, Muhadjir (1996), added another seven propositions. The seven propositions associated with the figures of its predecessor inventor, namely: first, that human behavior has meaning behind being implicated. The second meaning of humanity necessary to find the source into the social interaction. Third, the human community is a process that develops a holistic, undivided, non-linear and unpredictable. Fourth, the meaning of applicable according to the interpretation of phenomenology, which is in line with the objective, purpose, and not by mechanics. Fifth, the mental concept of man developed dialectically. Sixth, human behavior was reasonable, constructive and creative and not elementary-reactive: Seventh, it is necessary to use methods of introspection sympathetic, emphasizing intuitive approach to capture the meaning.

Within the meaning of symbolic interaction, can be through the process: (1) translation (translation) by way of transfer my language of indigenous people and move the tape to the article; (2) interpretation, it should be sought background, context, that summarized a clear concept; (3) extrapolation, emphasizes the ability to uncover the power of human thought behind that is presented; (4) the meaning, demanding human integrative abilities, sensory, power she thought, and reason.

Meanings should indeed not rely on sight "purely subjective" from the owner of the culture, but rather use insights "intersubjective". That is, the researchers attempted to reconstruct the cultural reality that occurs through interaction between community members. At the time of the interaction that occurs, researchers can perform feedback of the questions are mutually supporting. Trick to-teaser questions that intrigued investigators, would bring the meaning of an interaction between cultural actors. The interpretation is not a free act, but need the help of others, namely an interaction. Through the interaction of a person with others, will form a full understanding. Such an interpretation, according Fedyani (2009), are essential in symbolic interaction. Therefore, the interaction becomes conceptual paradigm exceeds the "inner urge", "personal qualities", "motivation is not realized", "chance", "socioeconomic status", "role obligations", or the physical environment. Theoretical concept may be beneficial, but only relevant to the extent entered the process of defining.

The implications of symbolic interaction by Denzin (2009), need to consider seven issues: (1) the symbols and interaction should be incorporated before the study is complete, (2) researchers must look at the world on the basis of the viewpoint of the subject, (3) the researcher must associate symbols and subjects in an interaction, (4) setting and observations should be noted, (5) the method must reflect the change process, (6) the implementation must take the form of symbolic interaction, (7) the use of the initial concept to drive then to operational, a proposition which was built interactional and universal.

In every movement, cultural actors will interact with each other. At that time, they were directly or indirectly reveal the stock of culture are enormous. Inventories of cultural knowledge through interaction shown that the study focused on the symbolic interactionist models. From these interactions, there will be a number of signs, both verbal and non-verbal unique. Therefore increasingly rapid progress of time, researchers also need to pay

attention when cultural actors interact through advanced tools. Maybe once they interact using Mobile (HP), internet, fax, letter and others. All the activities of such a culture is nothing but a symbolic target interactionist researchers. What needs to be remembered by cultural researcher is, that the perpetrator himself was no less ingenious actors to cast. Therefore from time to time their interaction needs to be examined in depth. There must be no apparent interaction deliberately trapping researchers.

In the view of the interactionist model of a symbol of cultural behavior will try to enforce the rules, laws, and norms for the community. So, not the other way their interaction is framed by the rules of the dead, but through symbolic interaction will show up rules agreed upon collectively. Cultural significance will depend on interaction process. Meaning usually appear in units of complex interactions, and sometimes also in small interaction between individuals.

Thus, symbolic interactionist models will analyze various things about the symbols contained in the interaction of actors. It may well be cultural actors using symbols, unique or special that can only be understood when they interact. Say, a cup of milky coffee, sharing cigarettes, congratulations, if you stand alone yet to realize a meaningful symbols. However, when the object is placed on one of the cultural procession, given meaning in the form of friends or business associates, then the symbolic object is meaningful.

That is why there are some important notes to keep in mind for researchers interactionists symbolic, namely: (1) the symbol will be meaningful full when it is in the context of active interaction, (2) cultural actors will be able to change the symbol in the interaction that raises a different meaning with the meaning commonly, (3) the use of symbols in cultural interaction and sometimes bending depends language games perpetrator, (4) the meaning of the symbols in the interaction can be shifted from place and time.

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VI. CONCLUSION

Anthropology as a science that is actually born and developed with the main theme of study is very relevant culture and to contribute in the form of thought which theoretically and methodologically on the study of the organization. A theoretical approach with reference to the functionalist paradigm that

viewed elements in the organization as a functioning system in running the organization. Paradigm interpretivism describes organizational culture as a system of values that are shared by members of the organization and become individual meanings which then gives explanation on the diversity of behavior of members of the organization. Interactionists symbolic, illustrate that culture is a symbolic meaning in every interaction in the organization. Interactions that occur provide shared meanings in accordance with the purpose of the organization. While the methods of ethnography as a study that saw the helplessness culture actor's perspective so that the basic analysis is how actors understand, act and create. Perspectives and this method gives a different nuance to the study of organizational culture.

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Challenges and Prospectus of Ethiopian Tourism Industry

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Abstract- This study focuses on identifying the challenges and prospects of Ethiopian tourism industry. The primary data was collected from 501 foreign tourists in the study area. To do this, the researcher was used two types of probability sampling techniques such as stratified sampling and simple random sampling methods. The result of the study show that lack of promotion, lack of physical infrastructure (road, transportation system, network facility, availability of hotel accommodations especially tourist site), misperceptions the images of Ethiopia, shortage of human trained power are challenges of Ethiopian tourism industry. On the other side the Ethiopia is a capital city of Africa because the African union located in Ethiopia, Ethiopian airline the almost the leading airline from Africa and to be a member of a star alliance, Ethiopia now building the leading African man made dam, lastly Ethiopia is one the leading African country that registered heritage by UNISCO. All this are opportunities of the growth of Ethiopian tourism industry.

Index Terms- Physical infrastructure, human trained power, poor images

I. INTRODUCTION

Tourism is one of the largest and rapidly growing industries in the world. According to the latest World Tourism Organization (UNWTO, 2014) world tourism barometer there were *international tourists arrivals grew by 5% in 2013, reaching a record 1,087 million arrivals. Despite global economic challenges, international tourism results were well above expectations, with an additional 52 million international tourists travelling the world in 2013. For 2014, UNWTO forecasts 4% to 4.5% growth - again, above the long term projections.*

Demand for international tourism was strongest for destinations in Asia and the Pacific (+6%), Africa (+6%) and Europe (+5%). The leading sub-regions were South-East Asia (+10%), Central and Eastern Europe (+7%), Southern and Mediterranean Europe (+6%) and North Africa (+6%).

“2013 was an excellent year for international tourism” said UNWTO Secretary-General, Taleb Rifai “The tourism sector has shown a remarkable capacity to adjust to the changing market conditions, fuelling growth and job creation around the world, despite the lingering economic and geopolitical challenges. Indeed, tourism has been among the few sectors generating positive news for many economies”, he added.

UNWTO forecasts international arrivals to increase by 4% to 4.5% in 2014, again above its long-term forecast of +3.8% per

year between 2010 and 2020. The UNWTO Confidence Index, based on the feedback from over 300 experts worldwide, confirms this outlook with prospects for 2014 higher than in previous years.

“The positive results of 2013, and the expected global economic improvement in 2014, set the scene for another positive year for international tourism. Against this backdrop, UNWTO calls upon national governments to increasingly set up national strategies that support the sector and to deliver on their commitment to fair and sustainable growth”, added Mr. Rifai.

2014 regional prospects are strongest for Asia and the Pacific (+5% to +6%) and Africa (+4% to +6%), followed by Europe and the Americas (both +3% to +4%). In the Middle East (0% to +5%) prospects are positive yet volatile.

Though noted for its tourism potential, Africa's underdeveloped tourism sector is attracting only little number of the total tourist arrivals in the world. What makes the problem?

Severe is the fact that a considerable proportion of this number is taken by South Africa and Northern African countries.

As a service sector, tourism services are playing special importance's in boosting up the image of a nation and also in facilitating the economic growth and development of a nation (Mckercher, R, 1995). On the top of this issue, in fastest growing countries like Ethiopia, where the tourism sector is at its early stage and tourism tour operators are not plenty to meet the demand of their customers, it has become mandatory for government of a nation is to pay special attention for such sector –including thorough and periodic analysis over the trends in the growth of this sector, supplying this sector with the required skilled man power, furnishing this sector with the required infrastructure, and allocating financial resources, and also setting and practicing policies on how to deliver services in the tourism sector. (Nabil dabour, 2003). As indicated in the stock of literatures, though the tourism sector is one of the sectors contributing a lot towards the growth of the per capital income and cash inflow of a nation, provision of tourism services in Ethiopia is facing many constraints, and hence its trends become unattractive for those who want to run and offer tourism services to the local community and foreigners as well. For instance the official website of the Ethiopian Culture and tourism Minister provided the statics on the tourism service tour operators to various group of tourists' ratio in Ethiopia to be low, there by indicating the fact that much has to be done in the Ethiopian tourism sector. The official website of the Ethiopian culture and tourism minister there exist one state owned organization, and currently there are privately owned organizations which are delivering services in the Ethiopian tourism sector.

As it is known, the slogan of directives to be set by the government is to supervise, consult and regulate the tourism

market, thereby boosting up trends in the growth of tourism services and ensuring the realization of the national economic growth and development policy set by the existing government. As cited by World Bank (2006), ups and downs in licensing of tourism service operators, inconsistent and weak supervision of such organizations by the government, little awareness as to the benefits of tourism services by the local communities, shortages of reservation software indicating tourism sites to visitors and number of registered local and foreign visitors, who got the services and image of the nation by itself are among some of the key factors that not only determine the growth and trends of the tourism sector in Ethiopia but also make the tourism sector to be at its early stage, thereby further limiting the demand of local and foreign tourists towards the Ethiopian tourism sector. One reason why the study about tourism services is important is that the government cannot ensure consistent economic growth and development only from the manufacturing sector. Another reason is that currently, the government is pursuing free economic system there by allowing local privately owned organizations to take part in the delivery of tourism services in the Ethiopian tourism industry. The third reason is that provision of tourism services be it directly or indirectly are expected to contribute a lot towards the increment in the gross national product, economic growth, economic development and other policies, or objectives set by the government. The last reason is that, delivery of tourism services has its own contribution in building and sustaining the good image of a nation.

Now a day, Tourism sector is getting attention by developing countries since it is becoming a backup for their economy stability with the fact that their economic background mainly depends on exporting Agricultural products which has little contribution for earning hard currency (Usman A. Raheem, 2008).

Ethiopia's great potential for tourism development is mentioned everywhere and I do not go in to the details in this study. (See for example World Bank, 2006; www.tourismethiopia.org, www.ethiopia.com, various travel books and websites of tour operators). It suffices to say that it has almost all types of primary tourist products: historical attractions, national parks with endemic wild life and cultural and religious festivals. UNESCO recognizes nine world heritage sites (as many as Morocco, and South Africa and more than any other country in Africa): Axum's obelisks, the monolithic churches of Lalibela, Gondar's castles, the Omo Valley, Awash valley, Konso Cultural Land scape, Tia's carved standing Stones, Semien National, Park, and the walled city of Harar.

Ethiopia to the contrary of others four African countries (Egypt, South Africa, Kenya and Tanzania), is not strong enough to attract foreign tourist tourism market. However, as these all countries possess their own tourism supplies, Ethiopia also has its own supplies and yet the flow of international tourists to Ethiopia is very little. This claim comes out from the figure of WTO international tourist's statistics that is registered with in Ethiopian tourists' arrival for the last fifteen years. For example when it sees our neighbour countries Kenya are three times greater tourist arrival and gets 11.9% GDP contribution (Source: [World Travel and Tourism Council Data, 2013](#)). While in Ethiopia the tourist contribution for the GDP are 4.8% only. (Source: [World Travel and Tourism Council Data, 2013](#)

). Thus, the concern of this study is to question why this situation is happening and how it is going to be improved in the future Ethiopian Tourism industry. Hence, this study carried out to answer the following questions: What are the constraints of tourism industry in Ethiopia and what are the prospects of current operation of tourism industry in Ethiopia?

The general objective of this study was to identify challenges and prospects of Ethiopian tourism industry. Specifically, tries to separately identify the problems and opportunities of the tourism sector.

II. A BRIEF REVIEW EMPIRICAL LITERATURE

According to Jackie Odudoh (Associations Kenyan tour oprtours, 2013) said that safety and security, lack of adequate resources and infrastructure, Poor image and perception of Africa-political instability, limited connectivity, high operating costs -fuel prices and limited and expensive air access are the most challenges of Kenyan tourism industry.

Teshale Biazen 2010, also support that the above problems and based on his research political uncertainty or disruption of infrastructure has a major influence of the tourism sector. Essential wages in the tourism sector tend to be low in comparison to others sectors (although agriculture in many cases is an exceptional). This mostly happen as this sector income is seasonal and lost confidence of many professional experts with high salary. In return such kind of insecurity may discourage people to join this institution or to stay in for long period of time. (Bull, 1995) or employment problem is one of the bottleneck of Ethiopian tourism.

According to (Gezachew Andarege, 2013), on his finding of the study mentioned that lack infrastructure, problems of securities, lack of museum, lack of service and facilities, lack of preservation and protections of heritage, financial constraints are the major challenges of tourism development.

According to (Nabil dabour, 2003), on his study analysis lack knowledge and awareness, lack of technical knowhow and weak promotion activity, lack of tourism related infrastructure, lack of consistent tourism strategy and policy, lack of tourism safety and lack of tourism diversification is the main problems of OIC countries.

III. RESEARCH METHODOLOGY

a) Data Source, the Study Area and Sampling Technique

For this study, primary data was collected from foreign tourists, tour and travel companies and employees of ministry of tourism and culture during 2014/15. The information was obtained from foreign touriston challenges of Ethiopian tourism industry such as road infrastructure, transportation system, network facility, hotel accommodations, human trained power, misperception of the images, promotion, security and prospects of Ethiopian tourism industry etc obtained through the questioners and using the interviews for the domestic tour and travel companies and employees of ministry of tourism and culture.

The study area was on Ethiopia. Among the tourist attraction areas in Ethiopia, the researcher was taken the sample

from the UNESCO that registered the Ethiopian cultural and heritage place. From the registered list such as Axum's obelisks, the monolithic churches of Lalibela, Gondar's castles, the Omo Valley, Awash Valley, Konso Cultural Landscape, Tia's carved standing stones, Semien National Park, and the walled city of Harar the researcher was taken only four such as the monolithic churches of Lalibela from northern part of Ethiopia, Omo Valley from southern part of Ethiopia, the walled city of Harar from eastern part of Ethiopia and Tia's curved stone to collect the data from foreign tourist sites in Ethiopia.

The researcher has used instruments as open and closed ended questionnaires and unstructured interviews to collect primary data from the foreign tourists and ministry of tourism and culture employees, tour and travel companies respectively. To do this the researcher for foreign tourists use probability sampling techniques especially stratified sampling to create strata for tourist place. Then inside the strata the researcher was used simple random sampling techniques to collect the necessary data from the respondents. Under a simple random sampling approach, the tourist who emerged from tourist sites was chosen as the sample in this study. The researcher was distributed 150 questionnaires for each four tourist place.

b) Sample size determination

Under this research proposal sample size only necessary for foreign tourist. The researchers will take 600 as a sample from this amount of total population. Due to the infinite size of population the researchers will take a sample based on Bill Godden formula. The sample will take based on as follows:

Sample Size - Infinite Population (where the population is greater than 50,000)

$$SS = \frac{Z^2 \times P \times (1-P)}{2}$$

A) Challenges of Ethiopian tourism industry
i. Promotion

C

Z = Z-value A (e.g., 1.96 for a 95 percent confidence level)
P = Percentage of population picking a choice, expressed as decimal

C = Confidence interval, expressed as decimal (e.g., .05 = +/- 5 percentage points)

Z-values (Cumulative Normal Probability Table) represent the probability that a sample will fall within a certain distribution.

The Z-values for confidence levels are:

1.96 = 95 percent confidence level

$$SS = \frac{3.8416 \times 0.5 \times 0.5}{0.0016} = \underline{600}$$

c) Data Analysis Techniques

The data collected through the aforementioned research tools will be organized in a way suitable for analysis using computer software. A descriptive method of data analysis will be employed using Statistical Package for Social Scientists (SPSS) Version 16 for Windows Software.

III. DESCRIPTIVE AND EMPIRICAL RESULTS

This part is tried to discuss and identify the challenges and prospects of Ethiopian tourism industry. The study employed both quantitative and qualitative research tool in order to produce a richer and more factual report. From 600 total samples questionnaires the respondents are properly fill and returned 501 questionnaires.

Table 1 Promotions
1=Disagree 2=Neutral 3=Agree

		Item	Frequency	percent
1	Ethiopian tourism Promotion sufficient enough to promote and providing information.			
		Disagree	301	60
		Neutral	2	1
		Agree	198	39
		Total	501	100%
2	I have seen better promotional way when I compare other African countries			
		Disagree	275	51
		Neutral	10	6
		Agree	214	43
		Total	501	100%
3	I have getting what it promoted			
		Disagree	211	42
		Neutral	0	0
		Agree	290	58
		Total	501	100%
4	I have an information Ethiopia is the leading heritage register by			

	UNISCO in Africa			
		Disagree	256	51
		Neutral	0	0
		Agree	245	49
		Total	501	100%

Source:-close ended questionnaires

The above table 1 can show that the experience of Ethiopian tourism Promotion. Among the respondent 60% said that Ethiopian government have a home assignment to promote Ethiopia and provide full information about the tourist destiny. Whereas 39% respondents said that Ethiopian government sufficiently promote and provide full information on the tourist destiny and the other 1% respondent keep silent to say anything. Based on the above result the researchers conclude that Ethiopian government were backward to promote Ethiopian tourism industry and expecting a lot from the government.

Apart from the above 51% respondent still put there strong comment and own experience. They said that other African countries are much better use deferent ways of promotion to attract customer than Ethiopia. Whereas 43% respondents said that Ethiopian government better promotional way when we compare other African countries. The reaming 6% respondent keeps silent instead of to say something. Based on the above results the researchers conclude that still Ethiopia poor in promoting Ethiopian tourism when it compare the other African countries. Another issue also their expectation, According to the respondent 58% tourist said that I had got what it already promoted but the other 42% respondent said that the actual status of tourist destiny and I previously seen by different means of promotion even by Tour Company packaging is totally different. The researcher also raise other issue to the respondent do you have an information that Ethiopia is the leading heritage register by UNISCO in Africa. Among the respondent 51% said they didn't have information while 49% respondents said I have information. Based on the above result the researchers conclude that most of the foreign tourists they didn't have any information Ethiopia is the leading African countries to registered heritage by UNISCO.

Based the above table, the researchers also asked that thetour and travel companies about the experience of Ethiopian tourism organization to promote Ethiopia. They said that there is poor experience to promote Ethiopian tourism places for the rest of the world in different means of promotion like international channel routinely. Even there is a gap to promote tourist area to domestic visitor.

The researchers also raised the question via interview for the marketing manager of ministry of tourism and culture about the promotions of Ethiopia tourism for the rest of the world. They said that in the past can say we are not better especially for promoting Ethiopian tourism destiny for internally and externally but for the future have a plan to promote and can said that one of the problems of Ethiopian tourism is lack of promotion

ii. Physical Infrastructure

a) Road

Table 2 Road

		Item	Frequency	Percent
1.	I can see completed road to visit tourist place in Ethiopia			
		Disagree	256	51
		Neutral	0	0
		Agree	245	49
		Total	501	100
2.	The road facility are convenient to visit tourist place			
		Disagree	367	73
		Neutral	0	0
		Agree	134	27
		Total	501	100
2.	I can see other African countries but Ethiopia are much better road facility			
		Disagree	246	49
		Neutral	151	30
		Agree	104	21
		Total	501	100

Source:-close ended questionnaires

The above table 2 shows that the overall road infrastructures in Ethiopia. The researcher also asked that completeness road infrastructure to visit tourist place in Ethiopia, among the respondents 51% said that the road infrastructure in Ethiopia are not complete to see the tourist destiny in all place. However 49% respondents said that road infrastructure in Ethiopia are complete to see the tourist destiny in all place. Apart from this it also raised the convenience of the road, 73% respondents said that Ethiopian road infrastructure are not paved. Whereas 27% respondents said that Ethiopian road infrastructure are paved. Based on the above result the researchers conclude that most of the road infrastructure in Ethiopia are not completed and convince to visit a tourist area.

b) Transportation system

Table 3 Transportation System

		Item	Frequency	Per cent
1.	The transportation system to visit the tourist destiny are very good			
		Disagree	275	55
		Neutral	26	5
		Agree	200	40
		Total	501	100
2	There are different and sufficient ways of alternatives to traveling (train, bus, air, ship etc.) system in inside the country.			
		Disagree	300	60
		Neutral	0	0
		Agree	201	40
		Total	501	100

Source:-close ended questionnaires

c) Information and Communication Technology

Table 4 Information and Communication System

		Item	Frequency	Per cent
1.	I can get the good internet facility, mobile phone network facility at everywhere when I was traveling to visit the tourist area			
		Disagree	501	100
		Neutral	0	0
		Agree	0	0
		Total	501	100

Source:-close ended questionnaires

As implied in the above table 4 the feeling of network facility in Ethiopia especially in the tourist area. From the respondent 100% said that there is no good internet and network facility at ever where when I travel to visit tourist destiny. Based on the above finding the researcher conclude that all of the respondent are confirmed that they disagree the overall network facility in Ethiopia epically when they travel it in the tourist area.

From the interview question also ministry of culture and tourism and tour and Travel Company marketing manager informed that the internet facility in Ethiopia is poor.

As shown in the above table 3 the respondents forward their feeling about the transportation system to visit the tourist destiny. Among the respondents 55% confirmed that the transportation system to visit the tourist destiny are very poor whereas the 40% said that the transportation system to visit the tourist destiny are good and the reaming 5% respondent said that keep in silent to say anything. Based on the above finding the researchers can conclude that most of the respondents are strongly disagree the transportation system to visit the tourist destiny are very good. The other issue also rise to the tourists about the alternative means of transportation system to visit a tourist area. Among the respondents, 60% tourists confirmed that strongly disagreed that there is sufficient ways of alternatives to traveling system in inside the country. Whereas 40% respondents said that strongly agree that there is sufficient ways of alternatives traveling system in inside the country to visit the tourist area. Based on the finding can conclude that there is an existence of poor traveling system in inside Ethiopia to visit tourist area.

From the interview question also ministry of culture and tourism and tour and travel company marketing manager informed that the Ethiopian transportation system are not many alternative to see the tourist attraction.

Table5: The Networked Readiness Index 2012 for sub-Saharan African country

No.		Infrastructure and Digital content	
		Rank	Score
1			
2	South Africa	1	3.58
3	Cape Verdi	8	2.78
4	Rwanda	6	2.89
5	Botswana	2	3.27
6	Kenya	5	2.9
7	Gahanna	12	2.62
8	Senegal	4	3.04
9	Gambia	7	2.82
10	Namibia	3	3.21
11	Zambia	10	2.73
12	Uganda	8	2.78

13	Nigeria	9	2.75
14	Malawi	11	2.68
15	Benin	7	2.8
16	Cote d'Ivoire	2	3.08
17	Tanzania	12	2.54
18	Zimbabwe	13	2.51
19	Cameron	15	2.21
20	Mali	20	1.86
21	Ethiopia	20	1.86
22	Lesotho	16	2.13
23	Madagascar	17	2.11
24	Burkina Faso	14	2.45

25	Burundi	15	2.28
26	Chad	21	1.77
27	Angola	19	1.98
28	Mozambique	18	2.05

Source: - The Networked Readiness Index 2012

The above table 5 shows that the Africans network readiness. Among them south Africa are the top one network readiness in Africa however on the other side Ethiopia, Mali and Chad is the lowest network readiness country in the Africa .so, this result support that the above tourist arguments.

d) Hotel Accommodation

Table 6 Hotel Accommodations

		Item	Frequency	Per cent
1.	I can get good hotel accommodation in Addis Ababa			
		Disagree	211	42
		Neutral	0	0
		Agree	290	58
		Total	501	100
2.	I can get good hotel accommodation outside Addis Ababa especially in visit area			
		Disagree	256	51
		Neutral	0	0
		Agree	245	49
		Total	501	100

Source:-Close ended questionnaires

Based on the above table 6 the researchers also asked that the availability of good hotel accommodation in Addis Ababa and outside Addis Ababa. From the given respondents 58% were agreed that the availability of good hotel accommodation in Addis Ababa and the 42% respondent disagreed that the availability of good hotel accommodation in Addis Ababa. The other issue the researcher checks the availability of good hotel accommodation outside Addis Ababa. Among the respondents 51% were disagreed the existence good hotel accommodation outside Addis Ababa. But the remaining 49% respondents were agreed the existence good hotel accommodation outside Addis Ababa. From the above finding the researcher can conclude that most of the respondents agreed and disagreed that the availability of good hotel accommodation in Addis Ababa and out of Addis Ababa especially tourist area respectively.

These questions also rise to the tour and travel company managers. According to them said that in Ethiopia especially in Addis Ababa almost all tourist are satisfied by the hotel accommodation. They get more than the expectation. Because in Addis Ababa have avail all-star hotel. So, they can reserve as they demand. However still sometimes a problem especially when exist African union is meeting and other international meeting. The hotel accommodations problems raised that when they are

move out-off AddisAbaba especially tourist destiny area. Example semen mountain when the tourists to visit the semenmountain, they will stay a couple of an hours. Even if they are interested to stay their however there is no hotel accommodation. The same things other most tourist destiny in Ethiopia

According to the ministry of culture and tourism organization report 123 hotels are eligible to the rating, 3 got five star ,11 got four star and 13 got three star, 10 awarded two star and 1 got one star rating. The retaining was made in accordance with the WTO standard which includes hotel grading training for 53 experts. The classification was made based on 12 international criteria. Bedrooms, bath and rest rooms, guest rooms, restaurants, kitchen, sustainability of hotel service, security and employ treatment, among others. (Source: Ministry of culture and tourism, 2015). This can show that there is no hotel accommodations problem in Addis Ababa.

From the interview question also ministry of culture and tourism and tour and Travel Company marketing manager said that the hotel accommodation in Addis Ababa is good but out of Addis Ababa especially tourist attraction area is poor.

iii. Security
Table 7 Security Issue

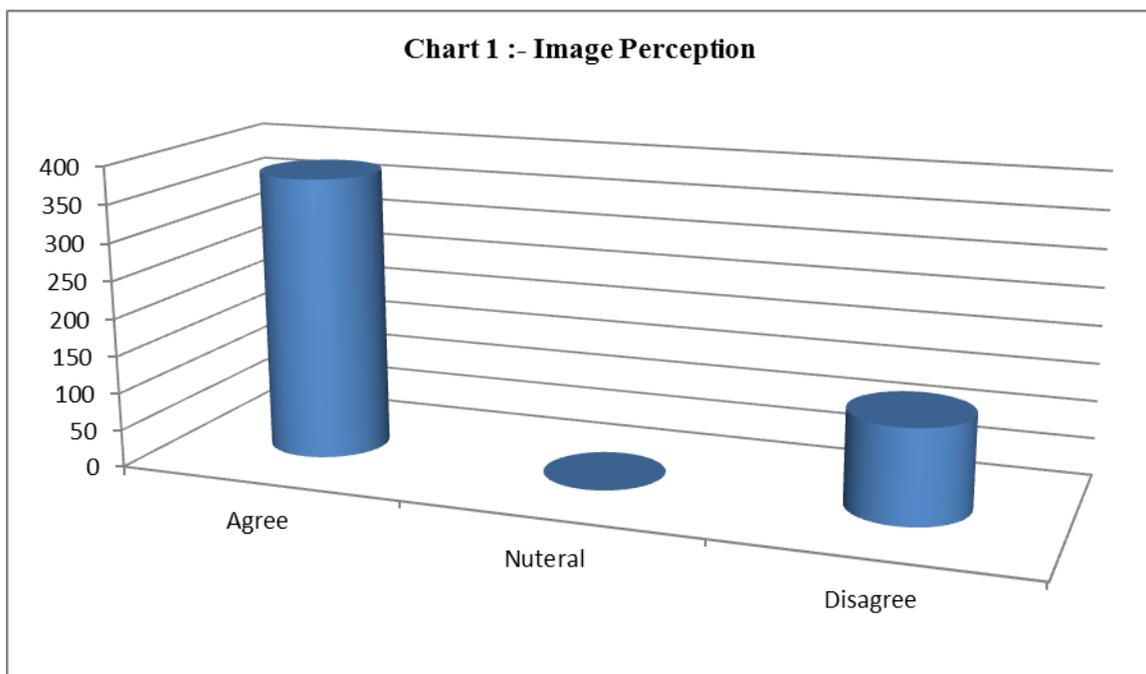
		Item	Frequency	Per cent
1.	There is no security problem in Addis Ababa	Disagree	410	82
		Neutral	16	3
		Agree	75	15
		Total	501	100
2.	There is a security problem in the visit areas in Ethiopia (outside of Addis Ababa).	Disagree	180	36
		Neutral	14	3
		Agree	307	61
		Total	501	100

Source:-close ended questionnaires

As shown in the above table 7 the researcher also raised that the security issue for foreign tourists. From the tourists 82% tourists assured that there is no security problem in Addis Ababa. Even though 15% respondents said that there is security problem in Addis Ababa. The remaining 3% respondents said that we are not an enough position to say anything about the security condition in Addis Ababa. Apart from this 61% foreign tourist also assured that there is no security problem out of Addis Ababa especially in tourist place. However 36 % respondents said that there is a security problem out of Addis Ababa and the remaining 3% respondents keep silent to say anything about the security

condition of out of Addis Ababa. Based on the above result the researchers conclude that most of the respondent confirmed that there is no security problem in inside and outside Addis Ababa. From the interviews of tour and travel company said that in Ethiopia generally can say that there is no a security problem. Tourist still said that there is a clear difference before come to Ethiopia and the reality in Ethiopia. Tourist hears and believes that Ethiopia are not all over secure however after traveling throughout Ethiopia they can assure that Ethiopia is one the secured country in Africa.

iv. Image perception



Source:-close ended questionnaires

The above chart 1 shows that the image perceptions of the tourist about Ethiopia. From the total respondents 76 % was feeling that Ethiopia is the place of indications of war, insured

and not this much have tourist attraction. Whereas 24% was not feeling of that Ethiopia is the place of an indications of war, insured and not this much have tourist attraction. Based on the

above data the researchers conclude that most of the foreign tourist was feeling that Ethiopia is the place of an indications of war, insured and not this much have tourist attraction.

From the interviews the researcher also asked that the marketing managers about the image perceptions of the foreign tourists. As he said that the foreign tourists are have a wrong image especially before coming to Ethiopia they feel that Ethiopia is an indications war and an examples of poor countries however after coming and travelling across the country they totally changed their images and make a promise to comeback for the second time and will tell the actual figures of Ethiopia for the rest of friends, relatives, colleagues etc. The other thing also told me ministry of tourism and culture, Ethiopian tourism organization have a home assignment to promote the other image of Ethiopia.

An image of a destination is one of the determinants of travel behaviour. The World Bank (2006:2) presented a relation between the poor image of Ethiopia and travel behaviour. The World Bank is stating that only 10% of 400 Africa focussed UK and European tour operators are selling Ethiopian tourism products partly due to its poor image. So, Ethiopia as a tourism destination seems to be contested because of the prevailing image causing an obstacle for a growing number of international tourist arrivals. Ethiopia's image in the international arena has been one of the darkest since 1974 revolution. "There is a widely held perception of Ethiopia that equates it with famine" (Shanka & Frost, 1999:1-3). This widely held perception comes even more clear when the Japanese government presented a feasibility study about Ethiopian tourism development stating: "The negative image of Ethiopia as a country of poverty, starvation, drought and floods is one of the main impediments to promoting Ethiopia as a tourism destination and therefore, image strategy will play a crucial role for the industry" (Japanese Embassy in Ethiopia 2007:3). Japan is sending every year more than 1.500 tourists to Ethiopia, this could be more according to the Japanese government. Shanka and Frost researched in 1999 the perception of tourists about Ethiopia as a tourist destination. A majority of the respondents, all potential tourists, indicated Ethiopia as: "famine stricken, political instable and poor marketed" (Shanka & Frost, 1999:9). This has to be seen in the light of conventional knowledge. The attention of the media on conflicts and disasters plays an important role in this. The majority of twenty tourists spoken to when in Ethiopia, in 2007, confirmed this as well. As one tourist (Interview 9-2007) put it: "Before arrival I thought to see a deserted country with hungry people, but that is not reality." Experiencing the real situation on tour changes tourist perception. The same happened in the research of Shanka and Frost. They showed their respondents video images of Ethiopia. After the video experience, perceptions changed.

IV. EDUCATIONAL AND PROFESSIONAL CAPACITIES

The limited understandings of responsible stakeholders are related to the educational capacities within the CRV tourism industry. Shared knowledge about tourism development by all stakeholders contributes to the realisation of common objectives. For example by understanding international tourism standards and the link between tourism and its environment or understanding tourists needs and expectations, especially those of

international tourists (HGL & GIRD 2007:107). Knowledge contributes to a proper management. Without a proper management cultural, ecological and social problems easily occur, challenging CRV's potentials.

None of the consulted regional government officials working for a department or commission responsible for tourism in the CRV has any education on tourism and/or related issues. The most close came a director of a tourism commission which was once a geography teacher. The average education of regional governmental representatives on tourism is secondary school. That is even rounded up, because many employees had not finished their secondary education. A group of consultants already concluded this in their report on the Rift Valley, stating: "low level of professional and trained people in the sector, relying on experience rather than professional training." (HGL & GIRD 2007:107). Tourism knowledge comes after working experience based upon secondary school education. Working experiences partly consist of conferences and workshops on tourism. Through those events tourism knowledge is transferred. Conferences and workshops are organised by committed NGO's and the Ethiopian government in the frame of the Ethiopian millennium. Specific subjects are mentioned during those conferences and workshops. Mostly directors visited those events. During the Ethiopian millennium the federal government focussed on tourism, because of high expectations of incoming tourists and visitors. Tourism authorities, also in the CRV, were prepared for this as a result of federal government's requirements. The preparation can be summarised as requiring hotels and restaurants to be ready to receive as many guests as possible.

In areas where tourism plays a significant role in the everyday economy more tourism related educational programs occur and are interconnected according to a director of a tour operator (Interview 11-2007). He claims that similar problems which show up in the CRV were the case on the northern tourist route before. As a result of education required after years of tourism development, for example community projects were established which changed attitudes. Especially problems in the relationship of locals and the tourism industry have been improved simply by teaching them the relevance of having a tourism industry in their region. This is an example of learning from experiences. But, the CRV tourism industry could use the experiences of the northern route in advance. Despite working experiences and education through conferences, workshops and preparing events, tourism knowledge within the CRV is low. As an experienced director of a tour-operator (Interview 12-2007) put it: "Ethiopia does not have tourism knowledge regionally, let alone locally. They lack advisors, professionals, experts etc. everywhere Also on the federal level. Those governmental representatives are just doing something. They are not advised or what so ever." National and international tourism professionals can be found in the offices of International NGO's and behind private investments. Ethiopia has a turbulent political history which had consequences for tourism development in terms human capacities. From the seventies of the twentieth century Ethiopian intelligentsia emigrated because of a chaotic society as a result of conflicting political ideologies and economic misery (Van Beurden 2004:19). The repressive Mengistu regime was ruthless in its treatment of both real and imagined opponents.

During the so-called Red Terror of 1977-78, government security forces killed thousands of students and urban professionals. Because human rights violations characterized the government's policy toward dissidents, there was a constant exodus of young and educated people¹³. In relation to tourism the emigration of Ethiopian intelligentsia has been important for Ethiopia's current stage of development. The group which is mostly described as The Ethiopian Diaspora in the United States of America and Europe did play an important role in the history of Ethiopia and still play that role now, even in the tourism industry. As an Ethiopia expert, owner of a tour-operator and co-writer (Interview 12-2007) of the first tourism policy said: "*The Ethiopian intelligentsia migrated abroad. Among them were many professionals, intellectuals and powerful businessmen who could lead Ethiopia to a more prosperous future. In this period the Ethiopian government decided to develop the tourism industry. But back then we were lacking knowledge and power to get a perfect tourism industry.*" Due to history Ethiopia lost human capacities which could lead the country towards a more prosperous future. For example, Kenya and Ethiopia were at the same position when the Derg took over in 1974. The current differences are a consequence of the fact that tourism knowledge left Ethiopia. Nowadays there is still a lack of professionals. Human capacities within the management of the Ethiopian tourism industry are still low as an advisor (Interview 9- 2007) of the Ministry of Culture and Tourism stated. There are some schools and universities, who provide an educational program on tourism, but those are not interconnected and the positive effects seem to be low. A few do approach tourism scientifically, like the Wondo Genet University in the CRV. They have an educational program on eco-tourism and wildlife management. The latter has a strong tourism component. Most of the educational programs are focussing on serving the tourism industry, like hotel and restaurant services. In some regional tourism commissions, educational institutes and in various institutes in Addis Ababa it is possible to follow an educational program for tour guiding. So, around Ethiopia there are educational programs supporting professional knowledge development in tourism. Despite this development, there is not a professional or tourism knowledge network within Ethiopia. Let alone a network which is supporting the sustainability of professional tourism knowledge. Most of the programs are unconnected. Especially in the CRV tourism knowledge is rather isolated, unconnected to each other. As a teacher on wildlife management and eco-tourism of the Wondo Genet University said: "*We have a good program but lack teachers; we do not know Ethiopian tourism professionals.*" Although tourism professional can be found close by or elsewhere in Ethiopia during conducting this research. Reasons for this can be found in the origin of each educational program. Origins of educational programs go back to the singular support and vision of organisations, as it is in Awassa where a German NGO established an educational program. The educational program of Wondo Genet also started on international donor money and program. As a teacher (10-2007) stated: "*we have to find professors who could teach us.*" It comes to the commitment of managements and the demands from students if tourism knowledge is imported. Educational programs funded by NGO's do establish the basics of the program itself, but lack support and commitment towards

interconnecting tourism knowledge in Ethiopia. Even governmental managed universities do focus on the graduation statistics of their students, instead of looking to its contribution to the tourism industry and surrounding society. The challenge is networking professionals, intellectuals and tourism knowledge. This would contribute the tourism industry in terms of educational and professional capacities.

Based on the interviews of the marketing manager of ministry of tourism and culture it said that as you know tourism industry needs sufficient and experienced human power however when you come to Ethiopia tourism industry there is a shortage of human trained power on the tourism sector and even the existence professionals are not well experienced.

B) Opportunities of Ethiopian tourism Industry

As we know Ethiopia is a capital city of Africa because African Union located in Ethiopia in the capital city of Addis Ababa that establish in 1963. Pan African countries are meeting for many times in a year for the issue of African. Therefore this is a good opportunity to promote Ethiopian tourism industry and invite guests to visit Ethiopian tourist area. This one we can count that promoting Ethiopia tourist site to the rest of Africa. Apart from this because of existence of African union in Ethiopia by itself creates different international organizations are located in Ethiopia. This also creates a good opportunity to Ethiopia to promote and invite to visit Ethiopian tourist area.

As we know Ethiopian airlines is one of the leading air lines in African and have a direct flight across the world. Apart from this from day to day he expands their own destiny and joined in the early past in a star alliance member. So, the tourists have an access to direct flight to Ethiopia this by itself creates convinces to for the passengers and avoids further transits. So this also creates a good opportunity to Ethiopian tourism industry.

As we know it is almost the leading African countries to registered heritage by UNISCO in Africa. This also creates a pressure to increase the flow of foreign tourist in Ethiopia.

Ethiopia was started to construct a huge and the leading African man made dam the name so called Grand renaissance dam which is inaugurated by former prime minister of Ethiopia by Atomeles Zenawi. After completed this projects it also one of the tourist destiny in Africa as well as the world.

V. CONCLUSION

Based on the above finding the researchers concluded that On the issue of promotion most of the respondents said that Ethiopian government were follow the backward system to promote Ethiopian tourism industry and expecting a lot from the government and still Ethiopia poor in promoting Ethiopian tourism when it compare the other African countries.

On the issue of physical infrastructure, the road infrastructures in Ethiopia are not completed and convince to visit a tourist area and there is an existence of poor travelling transportation system in inside Ethiopia to visit tourist area. On the other side the overall network facility in Ethiopia especially when they travel it in the tourist area are poor. However, there an existence good availability of good hotel accommodation in

Addis Ababa whereas out of Addis Ababa especially tourist destiny area not good hotel accommodation.

On the issue of security most of the respondent confirmed that there is no security problem in inside and outside Addis Ababa.

On the issue of image perception most of the foreign tourist was feeling that Ethiopia is the place of an indications of war, insured and not this much have tourist attraction.

On the issue of the availability of enough tourist attractions area, most the respondents said that Ethiopia have enough tourist destiny.

On the issue of human resource in Ethiopia tourism industry there is a shortage of human trained power on the tourism sector and even the existence professionals are not well experienced.

Finally when it comes to the conclusions part of opportunities of Ethiopian tourism industry, Ethiopia is a capital city of Africa because African union was established and located in Ethiopia. Apart from this Ethiopian airlines almost the leading African air lines and star alliance member and have many direct flight across the world. On the other side now Ethiopia build one of the first man made dam in Africa so called Grand Renaissance Dam to generate power. After completing the dam it can be one of the tourist destiny in Ethiopia as well as the world. Lastly Ethiopia is one the leading African country that registered heritage by UNESCO. More or less those are a good opportunity to boost Ethiopian tourism industry

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Synthesis and Characterization of Manganese (II), Nickel (II) and Zinc (II) Complexes of Uramido Benzoic Acid

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Abstract- The Manganese (II), Nickel (II) and Zinc (II) complexes of Uramido Benzoic acid were prepared and characterized by magnetic studies, molar conductance studies, thermal analysis and spectroscopic techniques (FTIR and UV). The IR spectral studies revealed that the Uramido Benzoic acid behaves as a tridentate ligand. Electronic spectral studies and magnetic studies suggest that the complexes are in octahedral geometry. The thermal study explained the stability of complexes and their decomposition.

Index Terms- Metal salts, ligand, thermal analysis.

I. INTRODUCTION

Newly synthesized organic ligand Uramido benzoic acid consisting of a benzene ring with two functional groups at ortho position namely carboxylic acid and NH-CO-NH₂ group is derived from anthranilic acid. There are many reports regarding metal- anthranilate complexes. A literature survey revealed the characterization of complexes of anthranilate ligands in which carboxylate anion and nitrogen or both involved in coordination,^[1-4] and oxygen of carbonyl and nitrogen of amino group of anthranilic acid bonded to the metal atom of the Terpolymer ligand.⁵

The present paper reports the synthesis and characterization of Mn(II), Ni (II) and Zn(II) complexes with unionized Uramido benzoic acid. The Uramido benzoic acid is also involved in coordination through the acid group and the NH-CO-NH₂

substituents. The TGA and DTA of Manganese (II) and Nickel (II) complexes were characterized.

II. EXPERIMENTAL METHOD

The FTIR spectra were recorded as KBr pellets using Fourier transform infrared spectrometer Shimadzu 24 FTIR 8400S. Electronic spectra of the prepared complexes were taken in the region (300 – 1100) nm for 10⁻³ M solution in ethanol at 25 °C using Shimadzu UV – 160 A Ultra-violet visible spectrometer with 1.000 ± 0.001 cm matched quartz cell. The magnetic susceptibility measurements were measured using Gouy apparatus using Gouy's method.

2.1 Preparation of Metal (II) perchlorate Complexes

Manganese, Nickel and Copper complexes of Uramido benzoic acid was prepared by the refluxion of Manganese(II) chloride, Nickel (II) chloride, Zinc (II) chloride and Uramido benzoic acid in ethanol taking 1: 2 molar ratio for six hours. The solutions were concentrated and cooled, to crystallize out the complexes and washed with ether to remove the excess ligand.

III. RESULTS AND DISCUSSION

3.1 Conductance Studies:

The molar conductance of the complexes in DMF is suggested that the complexes are of 1: 2 electrolytic nature.

Table 1. Characterization of metal complexes

Complex	Conductance Ohm ¹ cm ² mol ⁻¹	Electrolytic nature	μ_{eff} B.M.	Colour
[MnL ₂]Cl ₂	122.18	1:2	6.05	Light ash
[NiL ₂] Cl ₂	138	1:2	2.9	Light green
[ZnL ₂] Cl ₂	126	1:2	-	Dark ash

L= Uramido benzoic acid

3.2 IR Spectroscopy:

The IR spectrum of ligand Uramido benzoic acid showed a band at 3448cm^{-1} which is assigned to the hydroxyl group of carboxylic acid⁶ and band at 3336cm^{-1} is assigned to asymmetric stretching of NH_2 group of the ligand. The peak found at 3222cm^{-1} is assigned to the NH stretching of secondary amine⁷ group, which may be merged with the symmetric stretching of amide. The stretch found at 1689cm^{-1} is assigned to the C=O of acid group. 1323cm^{-1} is assigned to the C-N stretch of the secondary amine. The stretch found at 1658cm^{-1} is assigned to the C=O of amide group of the ligand.

The comparison of the IR spectra of the ligand and its complexes confirmed the complex formation and it is a tool to find out the mode of coordination. There were expected shifts in the IR spectra of the complexes. The presence of anion in the complex and the absence of symmetric and asymmetric stretch of the carboxylate anion suggest that the acid group of the ligand is not ionized and the shift of C=O stretch found at 1689cm^{-1} in the spectra of the ligand to lower wave number of about 20cm^{-1}

suggest that the carbonyl oxygen of the unionized carboxylic acid group is coordinated with metal ion⁸. The shift of the band of secondary amine NH group and the C-N stretch to the lower wave number suggest that the nitrogen of secondary amine is coordinated to the metal ion. The asymmetric stretch of NH_2 increasing in the spectra of the complexes is not involved in coordination. The stretch found at 1658cm^{-1} assigned to C=O of the amide group is also shifted to lower wave number by about 40cm^{-1} suggesting that the carbonyl oxygen of the amide group is also coordinated to the metal ion. The bands found at $528\text{--}523\text{cm}^{-1}$, 491cm^{-1} in the spectra of the complexes alone are assigned to M-O stretch and the band at $464\text{--}462\text{cm}^{-1}$ which is also absent in the spectrum of the ligand is assigned to the M-N stretch of the complexes. The other peaks are not much affected in the complexes including the stretch found at 1581cm^{-1} is assigned to the C=C of the benzene ring. Thus it is concluded that the Uramido Benzoic acid acts as a tridentate ligand from which the two carbonyl oxygen and secondary amine nitrogen is coordinated to the metal atom.

Table 2. FTIR spectra of metal complexes

Compound	$\nu_{\text{O-H}}$ Stretching for acid cm^{-1}	$\nu_{\text{C=O}}$ Acid cm^{-1}	$\nu_{\text{C=O}}$ Amide cm^{-1}	$\nu_{\text{C=C}}$ ring cm^{-1}	$\nu_{\text{C-N}}$ stretching cm^{-1}	$\nu_{\text{N-H}}$ stretching cm^{-1}	$\nu_{\text{M-O}}$ cm^{-1}	$\nu_{\text{M-N}}$ cm^{-1}
Ligand	3448	1689	1658	1581	1323	3224	-	-
$[\text{MnL}_2]\text{Cl}_2$	3776	1663	1616	1587	1299	3192	523, 491	464
$[\text{NiL}_2]\text{Cl}_2$	3780	1668	1616	1589	1295	3213	528, 491	462
$[\text{ZnL}_2]\text{Cl}_2$	3774	1665	1613	1594	1293	3147	525, 491	462

3.3 Magnetic susceptibility measurements:

The strong and weak field complexes of several transition metal ions differ in the number of unpaired electrons in the complex. When this number can be ascertained readily from a comparison of the measured magnetic moment and that calculated from the spin paired and spin free complexes. Determination of the number of unpaired electrons can also give information regarding the oxidation state of a metal ion in a complex. It is also useful in establishing a structure of many complexes. The Manganese (II) chloride complex exhibits a moment of 6.05 B.M, Nickel (II) chloride complex exhibits a moment of 2.9 B.M suggesting octahedral geometry Zinc(II)chloride complex is diamagnetic in nature .

3.4 Electronic Spectra:

In the electronic spectra of octahedral Nickel (II) complex should expect three bands corresponding to ${}^3\text{A}_{2g} \rightarrow {}^3\text{T}_{2g}$, ${}^3\text{A}_{2g} \rightarrow {}^3\text{T}_{1g}(\text{F})$, ${}^3\text{A}_{2g} \rightarrow {}^3\text{T}_{1g}(\text{P})$ at $10,000\text{cm}^{-1}$, $14,000\text{cm}^{-1}$

to $18,000\text{cm}^{-1}$ and $25000\text{ to }30000\text{cm}^{-1}$ respectively⁹. Ni (II) chloride complex exhibits the band at $27,382\text{cm}^{-1}$ (365nm) which is assigned to ${}^3\text{A}_{2g} \rightarrow {}^3\text{T}_{1g}(\text{P})$ transition suggesting octahedral geometry.

3.6 Thermal analysis

The TGA and DTA of Manganese (II) complex is stable up to 250°C , and no weight loss is observed before this temperature therefore, the complex has no coordinated water molecule. The first stage degradation was observed at above 250°C with loss of chloride and part of the ligand with experimental weight about 35.3% (calc 33.5%) accompanied by an endothermic peak with 182.3°C and 250.7°C on the DTA curve showed that the complex melts before decomposition. The TGA curve exhibits slow decomposition of ligand with an exothermic peak 534°C on DTA which may be attributed to the decomposition of the ligand. The



mass of the final residue obtained with 33% corresponds to metal with remaining part of the coordinated ligand.

TGA and DTA of Nickel (II) complex shows 79.9 °C on DTA endothermic peak which is not corresponding to any water

molecule in the complex with mass loss of about 1.5% and then the ligand decomposes completely with an exothermic peak at 414.4 °C and 510.2 °C on DTA which may be attributed to the decomposition of the ligand, so it has no final residue.

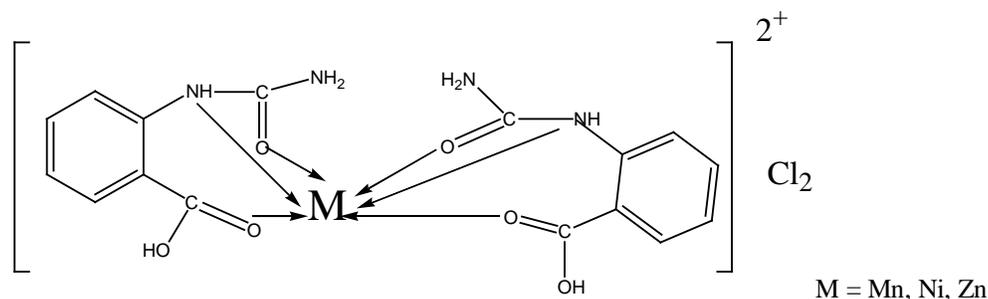


Fig 1. Structure of Uramido Benzoic acid Metal Complex

IV. CONCLUSION

The Uramido Benzoic acid act as a tridentate ligand in which carbonyl oxygen of the acid group, carbonyl oxygen of the amide part and nitrogen of the secondary amine group is coordinated to the metal ion. Conductance studies show that, the complexes are of 1:2 electrolytic nature. Electronic spectra and magnetic moment of the complexes confirmed the octahedral geometry for the complexes. A thermal study revealed that the complexes are thermally stable.

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Synthesis and Characterization of Manganese (II) and Cobalt (II) Complexes of O – Benzoyl Benzoic Acid

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Abstract- The Manganese (II) and Cobalt (II) complexes of o-benzoyl benzoic acid were prepared and characterised by magnetic susceptibility, molar conductivity, thermal analysis and spectroscopic Techniques (FTIR and UV). The IR spectral studies revealed that o-benzoyl benzoic acid behaves as a bidentate ligand and coordinate to the metal ions via; the two carbonyl oxygen. Electronic spectral studies and magnetic studies suggest that Manganese (II) complex is in octahedral geometry except the cobalt complex. The conductance studies show that, cobalt complex is electrolytic in nature. The thermal study explained the stability of the complexes and decomposition.

Index Terms- o-benzoyl benzoic acid, metal salts and Thermal studies.

I. INTRODUCTION

There is a widespread interest in the identification and development of transition metal based compounds for biological applications. Metal ions play enormous important roles in biological chemistry in about one third of enzymes¹. Benzoic acid and some of its salts are used in medicine as urinary antiseptics. A literature survey of the reported mixed ligand containing o-benzoyl benzoic acid with metal ions indicates o-benzoyl benzoic acid exhibits different bonding modes through oxygen of benzoyl group and oxygen of the hydroxyl group of the o-benzoyl benzoic acid ligand^[2-3]. 4 - Nitro benzoic acid with metal ions is also bonding through oxygen of carboxylate anion⁴.

In this paper, we report the synthesis and characterization of Manganese (II) and Cobalt (II) complexes of unionized o-benzoyl benzoic acid. o-benzoyl benzoic acid is involved in coordination through two carbonyl oxygen.

II. EXPERIMENTAL METHOD

The FTIR spectra were recorded as KBr pellets using Fourier transform infrared spectrometer Shimadzu 24 FTIR 8400S. Electronic spectra of the prepared complexes were measured in the region (300 – 1100) nm for 10⁻³ M solution in ethanol and methanol at 25 °C using Shimadzu UV – 160.A – Ultraviolet – visible spectrometer with 1.000 ± 0.001 cm matched quartz cell. The electrical conductivity of the complexes

was recorded at the room temperature for 10⁻³ M solution of the samples in acetonitrile using digital conductivity meter. The magnetic susceptibility measurements were measured using Gouy apparatus using Gouy's method.

2.1 Preparation of the Manganese (II) and Cobalt (II) complexes

Manganese, Cobalt complexes of o- benzoyl benzoic acid were prepared by the refluxion of Manganese (II) chloride, Cobalt (II) chloride and o-benzoyl benzoic acid in ethanol taking 1:3 molar ratio was 6 hours. The solutions were concentrated and cooled, to crystallize out the complexes and complexes were washed with ether to remove the excess ligand. The prepared complexes were characterized by conductance, magnetic behaviour, IR, and Electronic spectral studies.

III. RESULTS AND DISCUSSION

3.1 IR Spectra :

In the spectrum of ligand the sharp peak found at 3324 cm⁻¹ assigned to the OH stretching of Carboxylic acid. The band found at 1710 cm⁻¹ and 1668 cm⁻¹ are assigned to C=O group of Carboxylic acid and C=O of the benzoyl group of the ligand respectively⁵. The band found at 1594 cm⁻¹ is assigned to the C=C group of benzene ring.

In the spectra of the complexes, the C=O stretching of the carboxylic acid group found at 1710 cm⁻¹ in the spectra of the ligand is shifted to the lower wave number by about 40 cm⁻¹ in the spectra of the complexes suggesting that the carbonyl oxygen of carboxylic acid is coordinated to the metal ion. The OH-stretch of the acid group is present in the spectra of complexes are shifted to higher frequency. The presence of anion such as chloride in the complex and absence of symmetric and asymmetric stretches of carboxylate ion, indicating that the acid group is not ionised. Suggest that the carbonyl oxygen of the benzoic acid group is coordinated with metal ion⁶.

The stretch found at 1668 cm⁻¹ is assigned to C=O stretch of benzoyl group which is shifted to the lower wave number by about 40 cm⁻¹ in the spectra of complexes, suggesting that the carbonyl oxygen of benzoyl group is also coordinated to the metal ion. The new peaks at the range of 503-456 cm⁻¹ which is found in the spectra of the complexes and those which are absent in the spectrum of the ligand have been assigned to M-O stretch of the complexes⁷.

Table 1. FTIR spectra of the metal complexes

Compound	ν_{O-H} cm ⁻¹	$\nu_{C=O}$ acid cm ⁻¹	$\nu_{C=O}$ benzoyl cm ⁻¹	ν_{M-O} acid cm ⁻¹	ν_{M-O} II benzoyl cm ⁻¹	ν_{C-C-C} bending mode cm ⁻¹
Ligand	3324	1710	1668	-	-	1278
$[Mn(BBA)_2Cl_2] \cdot 2H_2O$	3369	1670	1622	503	476	1297
$[Co(BBA)_3]^{2+} [CoCl_4]^{2-}$	3393	1671	1624	477	456	1287

3.2 Electronic Spectra of Metal Complexes:

The electronic spectra of Cobalt (II) chloride complex displays the bands at 19,193 cm⁻¹ and 15,068 cm⁻¹. The first band is assigned to ${}^4T_1g(F) \rightarrow {}^4T_1g(P)$ transition of octahedral geometry and the other band is assigned to ${}^4A_2(F) \rightarrow {}^4T_1(F)$

transition of tetrahedral geometry⁸. This suggests that this complex is the mixture of octahedral and tetrahedral geometries with the composition of the type $[Co(BBA)_3]^{2+} [CoCl_4]^{2-}$ which is supported by the conductance data

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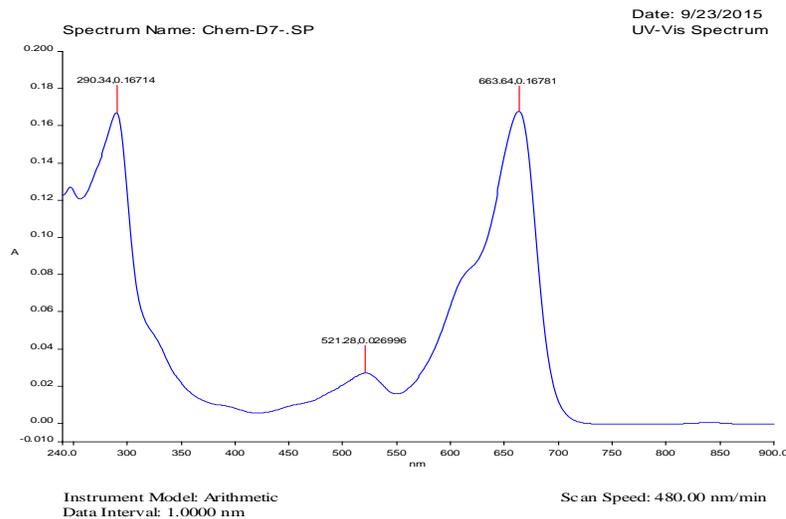


Table 2. Physical properties, conductance and magnetic studies of metal complexes

S.No	Complexes	Colour	Conductance Ohm ⁻¹ cm ² mol ⁻¹	Electrolytic nature	μ_{eff} B.M

1	$[\text{Mn}(\text{BBA})_2\text{Cl}_2] \cdot 2\text{H}_2\text{O}$	White	42.65	1:0	5.96
2	$[\text{Co}(\text{BBA})_3]^{2+} [\text{CoCl}_4]^{2-}$	Pink	145.01	1:1	4.4

1:0 electrolytic nature, in which anions are inside the coordination. The cobalt complex exhibits 1:1 electrolytic nature.

3.5 Thermal Analysis:

The TGA curve of Manganese (II) complex which shows loss of 6.2% (Calc 6.4%) at around 100°C which suggests that the complex is a dihydrate and two water molecules are lost at that range.

On DTA, it shows the melting of complex at about 131.9°C and 204.4°C . The TGA curve $131 - 204^\circ\text{C}$ with release of chloride molecule of 11.1% (calc 12.7%). Above 204.4°C of TGA curve exhibits the slow decomposition of the ligand with

17.8% (calc 18.6%) and further decomposition of another ligand with 19.5% (calc 18.7%). Finally above 550°C of TGA curve, 33% of residue is present.

The TGA and DTA curve of Cobalt (II) complex shows the endothermic peak of DTA at about 176.6°C and 210°C which indicate that the cationic and anionic complex melts. The TGA of the complex at about 200°C , the first degradation occurs with the decomposition of the anionic complex and slow decomposition of ligand of the cationic complex. The experimental weight of the final residue of both the oxides of cobalt is 25% (calc 24.4%)

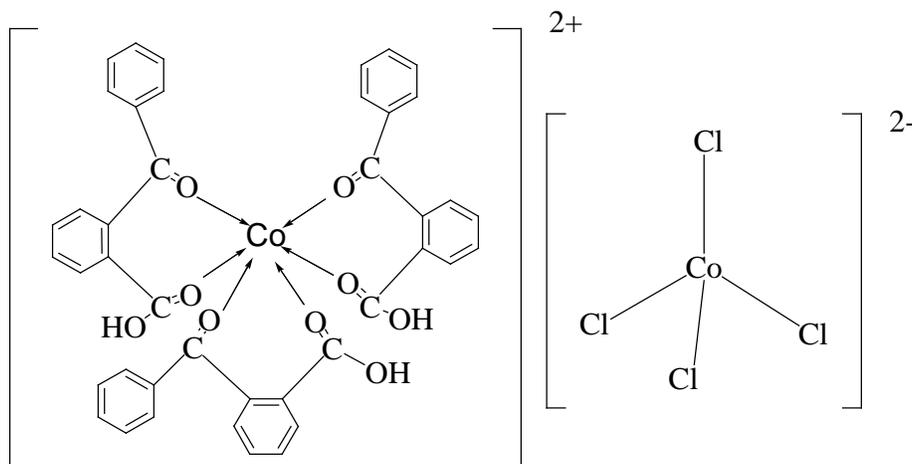


Fig 3. Structure of metal complex $[\text{Co}(\text{BBA})_3]^{2+} [\text{CoCl}_4]^{2-}$

IV. CONCLUSION

The o-benzoyl benzoic acid acts as a bidentate ligand in which the carbonyl of the acid group and carbonyl of the benzoyl group is coordinated to the metal ion. The mode of coordination has been confirmed by the negative shift of the carbonyls of acid group and the benzoyl group by the stretching frequency in the spectra of the complexes. The electronic spectra of the complexes confirmed the geometry of the complex. A thermal study revealed that the complexes are thermally stable.

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Synthesis and Characterization of Manganese (II), Cobalt (II) and Nickel (II) Complexes of Phenyl glycine-o-Carboxylic Acid

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Abstract- The Manganese (II), Cobalt (II) and Nickel (II) complexes of phenyl glycine-o-carboxylic acid were prepared and characterized by magnetic studies, molar conductance studies, thermal analysis and spectroscopic techniques (FTIR and UV). The IR spectral studies revealed that the phenyl glycine-o-carboxylic acid behaves as a bidentate ligand. Electronic spectral studies and magnetic studies suggest that the complexes are in octahedral geometry. The thermal study explained the stability of complexes and their decomposition.

Index Terms- Metal salts, ligand, thermal analysis.

I. INTRODUCTION

Newly synthesized organic ligand phenyl glycine -o-carboxylic acid consisting of a benzene ring with two functional groups at ortho position namely carboxylic acid and NH-CH₂-COOH group is derived from anthranilic acid. There are many reports regarding metal- anthranilate complexes. A literature survey revealed the characterization of complexes of anthranilate ligands in which carboxylate anion and nitrogen or both involved in coordination.^[1-4] and oxygen of carbonyl and nitrogen of amino group of anthranilic acid bonded to the metal atom of the Terpolymer ligand.⁵

The present paper reports the synthesis and characterization of Mn(II), Co(II) and Ni(II) complexes with unionized phenyl glycine -o-carboxylic acid. The phenyl glycine -o-carboxylic acid is also involved in coordination through the acid group and nitrogen of the secondary amine. The TGA and DTA of

Manganese (II), Cobalt (II) and Nickel (II) complexes were characterized.

II. EXPERIMENTAL METHOD

The FTIR spectra were recorded as KBr pellets using Fourier transform infrared spectrometer Shimadzu 24 FTIR 8400S. Electronic spectra of the prepared complexes were taken in the region (300 – 1100) nm for 10⁻³ M solution in ethanol at 25 °C using Shimadzu UV – 160 A Ultra-violet visible spectrometer with 1.000 ± 0.001 cm matched quartz cell. The magnetic susceptibility measurements were measured using Gouy apparatus using Gouy's method.

2.1 Preparation of Metal (II) perchlorate Complexes

Manganese, Cobalt and Nickel complexes of phenyl glycine - o - carboxylic acid was prepared by the refluxion of Manganese (II) perchlorate, Cobalt(II) perchlorate, Nickel (II) perchlorate and phenyl glycine-o-carboxylic acid in ethanol taking 1: 3 molar ratio for six hours. The solutions were concentrated and cooled, to crystallize out the complexes and washed with ether to remove the excess ligand.

III. RESULTS AND DISCUSSION

3.1 Conductance Studies:

The molar conductance of the complexes in Acetonitrile is suggested that the complexes are of 1:2 electrolytic nature, indicating that the perchlorate groups are ionic in nature

Table 1. Characterization of metal complexes

Complex	Conductance Ohm ¹ cm ² mol ⁻¹	Electrolytic nature	μ_{eff} B.M.	Colour
[MnL ₃](ClO ₄) ₂	167.87	1:2	6.01	Light yellow
[CoL ₃](ClO ₄) ₂	170.6	1:2	5.1	Brown
[NiL ₃](ClO ₄) ₂	196.19	1:2	3.05	Light brown

L= Phenyl glycine-o-carboxylic acid

3.2 IR Spectroscopy:

The IR spectrum of ligand phenyl glycine-o-carboxylic acid showed a band at 3373cm^{-1} which is assigned to the hydroxyl group of carboxylic acid groups⁶. The band for NH stretching vibration is merged with the former band. The strong band appeared at 1662cm^{-1} is attributed to the NH bending vibration.⁷ The band at 1398cm^{-1} is assigned to the C-N stretching. The stretch found at 1726cm^{-1} is assigned to the C=O of aliphatic acid group. The stretch found at 1705cm^{-1} is assigned to the C=O of aromatic carboxylic acid group of the ligand.

The comparison of the IR spectra of the ligand and its complexes confirmed the complex formation and it is a tool to find out the mode of coordination. There were expected shifts in the IR spectra of the complexes. The presence of anion in the complex and the absence of symmetric and asymmetric stretch of the carboxylate anion suggest that the acid group of the ligand is not ionized and the shift of C=O stretch found at 1705cm^{-1} in the spectra of the ligand to lower wave number of about 30cm^{-1}

suggest that the carbonyl oxygen of the unionized aromatic carboxylic acid group is coordinated with metal ion⁸. The shift of the band of secondary amine NH group and the C-N stretch to the lower wave number suggest that the nitrogen of secondary amine is coordinated to the metal ion. The stretch found at 1726cm^{-1} assigned to C=O of the aliphatic acid group is also shifted to higher wave number suggesting that the carbonyl oxygen of the aliphatic acid group is not coordinated to the metal ion. The bands found at the range of $569-539\text{cm}^{-1}$ in the spectra of the complexes alone are assigned to M-O stretch and the band at the range of $497 - 490\text{cm}^{-1}$ which is also absent in the spectrum of the ligand is assigned to the M-N stretch of the complexes. The other peaks are not much affected in the complexes including the stretch found at 1573cm^{-1} is assigned to the C=C of the benzene ring. Thus it is concluded that the phenyl glycine-o-carboxylic acid acts as a bidentate ligand from which carbonyl oxygen and secondary amine nitrogen is coordinated to the metal atom.

Table 2. FTIR spectra of metal complexes

Compound	$\nu_{\text{O-H}}$ Stretching for acid cm^{-1}	$\nu_{\text{C=O}}$ Acid Aliphatic cm^{-1}	$\nu_{\text{C=O}}$ Aromatic acid cm^{-1}	$\nu_{\text{C=C}}$ ring cm^{-1}	$\nu_{\text{C-N}}$ stretching cm^{-1}	$\nu_{\text{N-H}}$ bending cm^{-1}	$\nu_{\text{M-O}}$ cm^{-1}	$\nu_{\text{M-N}}$ cm^{-1}
Ligand	3373	1726	1705	1573	1398	1662	-	-
$[\text{MnL}_3](\text{ClO}_4)_2$	3787	1736	1672	1581	1384	1620	539	490
$[\text{CoL}_3](\text{ClO}_4)_2$	3786	1733	1673	1577	1380	1624	567	496
$[\text{NiL}_3](\text{ClO}_4)_2$	3783	1740	1671	1575	1379	1593	569	497

3.3 Magnetic susceptibility measurements:

The strong and weak field complexes of several transition metal ions differ in the number of unpaired electrons in the complex. When this number can be ascertained readily from a comparison of the measured magnetic moment and that calculated from the spin paired and spin free complexes. Determination of the number of unpaired electrons can also give information regarding the oxidation state of a metal ion in a complex. It is also useful in establishing a structure of many complexes. The Manganese (II) perchlorate complex exhibits a moment of 6.05 B.M, Cobalt (II) perchlorate complex exhibits a moment of 5.1 B.M, Nickel (II) perchlorate complex exhibits a moment of 3.05 B.M. suggesting octahedral geometry.

3.4 Electronic Spectra:

The Cobalt (II) perchlorate complex shows the characteristic band of octahedral geometry having a band at $19,445\text{cm}^{-1}$ due to ${}^4\text{T}_{1g}(\text{F}) \rightarrow {}^4\text{T}_{1g}(\text{P})$ Transition. In the electronic

spectra of octahedral Nickel (II) complex should expect three bands corresponding to ${}^3\text{A}_{2g} \rightarrow {}^3\text{T}_{2g}$, ${}^3\text{A}_{2g} \rightarrow {}^3\text{T}_{1g}(\text{F})$, ${}^3\text{A}_{2g} \rightarrow {}^3\text{T}_{1g}(\text{P})$ at $10,000\text{cm}^{-1}$, $14,000\text{cm}^{-1}$ to $18,000\text{cm}^{-1}$ and $25,000$ to $30,000\text{cm}^{-1}$ respectively⁹. Ni(II) perchlorate complex exhibits the band at $27,822\text{cm}^{-1}$ which is assigned to ${}^3\text{A}_{2g} \rightarrow {}^3\text{T}_{1g}(\text{P})$ transition suggesting octahedral geometry.

3.6 Thermal analysis

$[\text{Mn}(\text{PGC})_3](\text{ClO}_4)_2$

TGA and DTA curves of Manganese (II) complex showed that the complex is stable up to 200°C and no weight loss is observed before this temperature. The first stage of degradation occurred at 200°C with the loss of one perchlorate ion with a moisture experimental weight 16.7% (Cal 11.8%). The complex



further decomposes in the second step from 400-600 °C, with weight loss 67.3% (cal 69.7%) corresponds to the decomposition of the coordinated part of the ligand accompanied by an exothermic peak with 443.3 °C on DTA curve was observed. The mass of the final residue corresponds to stable Manganese oxalate (16%) calculated (17%).

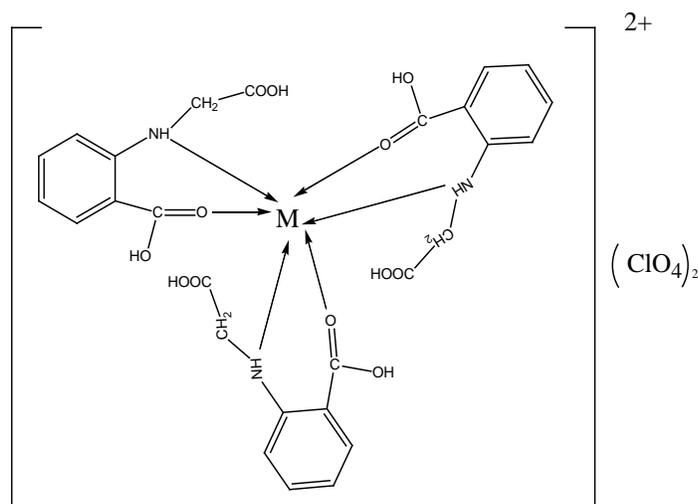
[Co(PGC)₃](ClO₄)₂

TGA and DTA curve of Cobalt (II) perchlorate complex showed that the complex is stable upto 200 °C and no weight loss is observed before this temperature. The first stage of degradation occurred at 200-250 °C decomposition of perchlorate ion with a mass loss 10.2% (Cal 11.8%) accompanied by an exothermic peak with 265 °C on the DTA curve was observed. Slowly decompose the perchlorate and ligand from 320-640 °C with 79.9% (cal 76.3%) mass loss and an exothermic peak with

468.3 °C and 614.5 °C on DTA which may be attributed to the decomposition of the non-coordinated and coordinated part of the ligand. The mass of the final residue corresponds to stable Cobalt oxide 9.9% calculated (8.9%)

[Ni(PGC)₃](ClO₄)₂

TGA and DTA curve of Nickel (II) complex showed that the complex is stable up to 200 °C, no mass loss is observed before the temperature. First step from 200-310 °C decomposition of perchlorate ion with a mass loss of 9.8% (cal 11.8%) accompanied by an exothermic peak with 248.8 °C and 301.1 °C on DTA curve was observed, The second step from 400-650 °C with a mass loss of 47.1% (cal 46.7%) corresponds to removal of the ligand. The mass of the final residue 9.95% (calculated 8.85%) corresponds to stable nickel oxide



Structure of phenylglycine-o-carboxylic acid complex

M = Mn, Co, Ni

IV. CONCLUSION

The phenyl glycine-o-carboxylic acid act as a bidentate ligand in which carbonyl oxygen of the acid group and nitrogen of the secondary amine group is coordinated to the metal ion. Conductance studies show that, the complexes are of 1:2 electrolytic nature. Electronic spectra and magnetic moment of the complexes confirmed the octahedral geometry for the complexes. A thermal study revealed that the complexes are thermally stable.

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Growth, Dielectric studies on pure and CuSO_4 added L(+) - tartaric acid single crystals

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Abstract- Single crystals of pure and CuSO_4 added L(+) - tartaric acid were grown by slow evaporation technique. The molar concentration of CuSO_4 used in the present study were 0.005M, 0.01M and 0.05M. The grown crystals were characterized by energy dispersive spectroscopy, powder x-ray diffraction, Fourier transform infrared spectroscopy and dielectric measurements. The elements presented in the grown crystals were identified by the energy dispersive x-ray analysis. The powder x-ray data were indexed and the lattice constants were determined. Fourier transform infrared spectrum revealed that all the functional groups are presented in the pure and CuSO_4 added L(+) - tartaric acid crystals. The variation of dielectric constant were calculated in the range 20Hz to 20KHz and it was found that the dielectric constant was increasing when the CuSO_4 concentration was increased.

Index Terms - L(+)-tartaric acid crystals, EDAX, PXRD, FTIR, dielectric constant

I. INTRODUCTION

Organic nonlinear optical (NLO) materials have attracted a great deal of attention due to their applications in optical devices, such as optical switches, optical modulators, optical communications, optical data storage etc. [1 – 4]. Due to the increasing need for cheap and easily processable materials for the industrial applications, several studies dealing with organic, inorganic and semiorganic materials for nonlinear optics (NLO) have been reported. Among these, organic nonlinear materials will be the key role industrial technologies. A number of such materials have been reported in literature for their applications as NLO materials [5 – 6].

L(+) - tartaric acid is a good organic nonlinear optical material. L(+) - tartaric acid belongs to the monoclinic system with space group $P2_1$. Growth and optical studies of L(+) - tartaric acid have been reported in the literature [7 – 10]. The effect of dopants on various properties of single crystals are of great interest from both solid state science as well as technological points of view. Additions of dopants have a profound influence on the growth kinetics, morphology, second harmonic efficiency and dielectric properties of grown crystals. In the present work, pure and CuSO_4 added L(+) – tartaric acid single crystals were grown by slow evaporation technique. The grown crystals were subjected to various characterizations to study the structure and dielectric properties. The details are presented herein.

II. EXPERIMENTAL

Analytical reagent grade samples L(+) - tartaric acid, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ and doubly distilled water were used in the present work for the growth of single crystals from aqueous solution by slow evaporation method after recrystallization. The saturated concentration of the L(+) - tartaric acid at room temperature was found to be 3.2 M. The concentrations of CuSO_4 used in present study were 0.005, 0.01 and 0.05M. Copper sulphate was mixed with the pure solution directly. The growth solution was kept in a constant temperature bath in the predetermined temperature. Crystals of maximum size were obtained in about 5-7 days. The maximum size of the grown crystals was $50 \times 15 \times 10 \text{ mm}^3$. Figure 1 shows that the pure and CuSO_4 added L(+) - tartaric acid crystals. It is observed that the transparency of the pure L(+) – tartaric acid crystal decreases with increasing CuSO_4 concentration.

The entry of CuSO_4 into the crystal lattice was confirmed by energy dispersive x-ray analysis (JEOL Model JED - 2300). X-ray diffraction studies were carried out using powder x-ray diffractometer (PANalytical make, Model X'per PRO). The vibrational measurements were carried out at room temperature using FT-IR spectrometer (JASCO – 4100LE with ATR facility) in the region $4000\text{-}400\text{cm}^{-1}$. The dielectric properties of all the samples were carried by measuring capacitance of the samples using HIOKI 3532-50 LCR meter in the frequency range of 200 Hz to 200 kHz

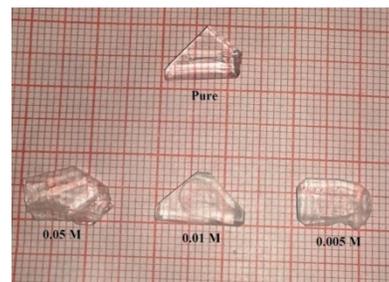


Figure 1: Photograph of the grown pure and CuSO_4 added L(+) – tartaric acid crystals

III. RESULT AND DISCUSSION

A. Energy dispersive spectral analysis

The energy dispersive spectrum of the CuSO₄ added L(+) - tartaric acid crystals are presented in figure 2. The characteristic peaks at the energies 0.277keV, 0.525keV, 2.307keV and 8.040keV shows the presence of carbon, oxygen, sulphur and copper atoms respectively in the grown crystals. The observed and calculated concentration of copper sulphate in the grown crystal is presented in table 1. The concentration of Cu and S in the grown crystal was found to be nearly equal to that of the actually taken for the crystal growth.

Table 1: Calculated and observed concentration of pure and CuSO₄ added L(+) - tartaric acid crystals

Concentration of Copper (in M)		Concentration of Sulphur (in M)	
actually taken	Observed	actually taken	Observed
0.005	0.0043	0.005	0.0039
0.01	0.0095	0.01	0.012
0.05	0.043	0.05	0.046

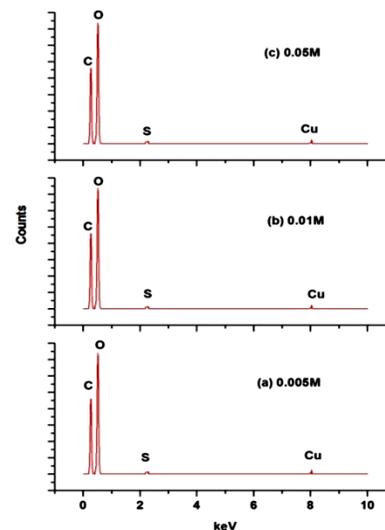
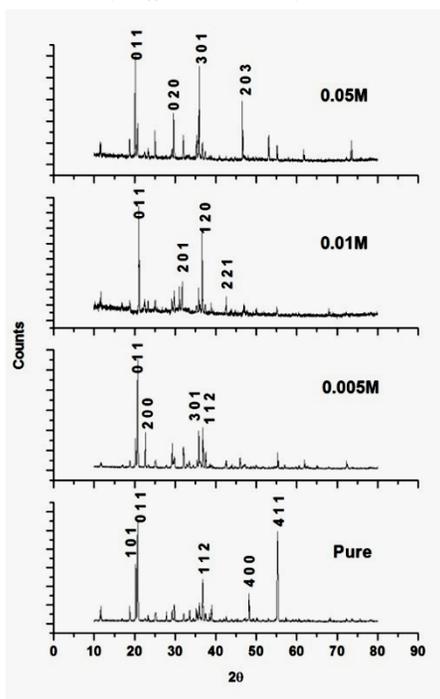


Figure 2: Energy dispersive spectrum of CuSO₄ added L(+) - tartaric acid crystals

B. X-Ray diffraction analysis



The x-ray diffraction pattern for the pure and CuSO₄ added L(+) - tartaric acid is presented in the figure 3. The data were indexed using power x software [11] and the lattice parameters were determined. The indexed data of pure L(+) - tartaric acid was compared and it is in good agreement with JCPDS data [File No. 33 1883]. The x-ray diffraction pattern of the pure and CuSO₄ added L(+) - tartaric acid single crystals differed in their relative intensities and the lattice spacing of the crystals.

Considering high reflection, the lattice parameters of all the grown crystals were calculated using $\alpha = \gamma = 90^\circ$ and $\beta = 100.16^\circ$. The lattice parameters obtained for the crystals grown in the present study are presented in table 2.

Table 2 : Variation of lattice constants and lattice volume of the grown crystals

Crystal	Lattice parameter (Å)		
	a	b	c
Pure L(+) – tartaric acid	7.5421	6.0415	6.0650
0.005M CuSO ₄ added L(+) – tartaric acid	7.8011	6.0319	6.3469
0.01M CuSO ₄ added L(+) – tartaric acid	8.1146	5.6281	6.5981
0.05M CuSO ₄ added L(+) – tartaric acid	7.9380	6.0556	6.5056

Figure 3: XRD pattern of pure and CuSO₄ added L(+) - tartaric acid crystals

Lattice variation was observed in the doped crystals in comparison with the pure crystals. Lattice volume of the pure and CuSO₄ added L(+) – tartaric acid were calculated. The lattice volume of the pure, 0.005M, 0.01M and 0.05M CuSO₄ added L(+) – tartaric acid are 273.06 Å³, 281.88 Å³, 296.61 Å³ and 307.82 Å³ respectively. The increase in the lattice volume of the doped crystals compared with the pure crystals confirms entry of the CuSO₄ in the grown crystals.

C. FT-infrared analysis

The Fourier transform infrared spectra recorded for the grown crystals are presented in figure 4. The two strong peaks at 1719 and 3396 cm⁻¹ are due to C = O and O – H stretching mode respectively. The band at 1190 cm⁻¹ is attributed to the C – O – C asymmetric stretch of carbonyl group. The peak at 1441 cm⁻¹ is due to C–H bending modes. The peaks of various intensities at 1078 and 940 cm⁻¹ are due to out of plane O–H deformation and C–O stretching. The band at 657 cm⁻¹ is absorbed due to O = C = O bending mode. The

FTIR spectra and the corresponding band assignment clearly indicate that the functional groups of pure L(+)-tartaric acid are not altered by the addition of the copper sulphate.

D. Dielectric studies

The grown crystals were powered and made into pellets of 2mm thickness and 13mm diameter. The pellets are placed in a two probe arrangement. In order to ensure good electrical contact between the sample and the electrodes, silver paste was applied on both surfaces of the samples. Dielectric measurements were made in the frequency range 200 Hz – 200 KHz at room temperature (305 K). Figure 5 and 6 shows the plot made between dielectric constant and dielectric loss versus frequency for pure and CuSO₄ added L(+)-tartaric acid crystals respectively.

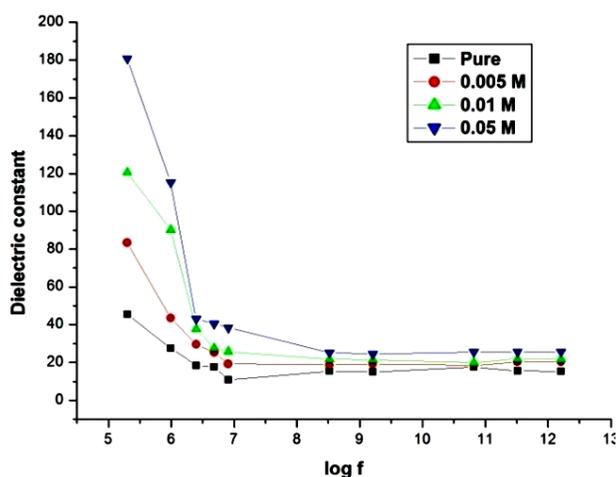


Figure 5: Frequency dependence of dielectric constant at room temperature for pure and CuSO₄ added L(+)-tartaric acid crystals

From the plots it can be seen that the dielectric constant decreases exponentially as the frequency of applied field increases. The electronic exchange of the number of ions in the crystals gives local displacement of electrons in the direction of the applied field, which in turn gives rise to polarization. As the frequency increases, a point will be reached where the space charge cannot be sustained and comply with the variation of external field, hence polarization decreases, which gives rise to diminishing values of dielectric constant [12]. The same trend is observed in the case of dielectric loss versus frequency. At relatively lower frequency, the higher the temperature, the larger is the dielectric constant. The characteristics of low dielectric constant and dielectric loss with high frequency for a given sample suggests that the sample possesses enhanced optical quality with less defects and this parameter is of vital importance for various nonlinear optical materials and their applications [13-14].

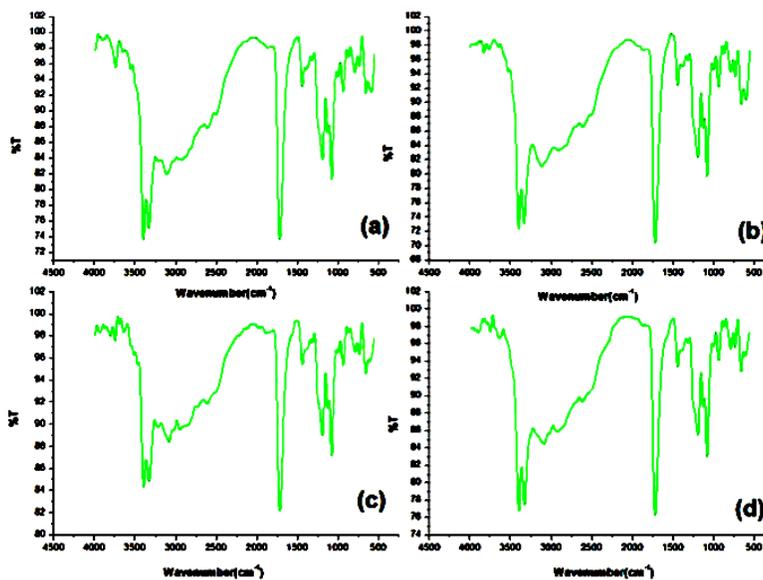


Figure 4: FTIR spectra of (a) pure (b) 0.005 M (c) 0.01 M (d) 0.05M CuSO₄ added L(+)-tartaric acid crystals

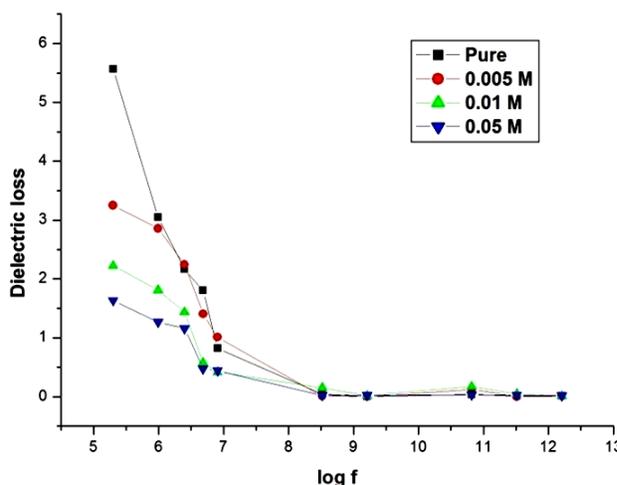


Figure 6: Frequency dependence of dielectric loss at room temperature for pure and CuSO₄ added L(+)-tartaric acid crystals

IV. CONCLUSION

Pure and CuSO₄ added L(+)-tartaric acid crystals were grown by slow evaporation method in a predetermined temperature. The molar concentrations used in the present were 0.005M, 0.01M and 0.05M. All the grown crystals were subjected to energy dispersive x-ray analysis, powder x-ray diffraction analysis, Fourier transform infrared analysis and dielectric measurements. The energy dispersive x-ray spectrum confirmed the presence of CuSO₄ in the grown crystals. The variation of lattice parameter were observed and it was found that the lattice volume increases in increase of CuSO₄ concentrations. Fourier transform infrared spectra revealed

that the presence of all the functional groups in the pure L(+) – tartaric acid crystals and these were not altered by the addition of the CuSO₄. The variation of dielectric constant and dielectric loss with the frequency at room temperature were measured and it was found to decrease as the frequency of applied field increases.

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Phase-Based Binarization of Ancient Document Images

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Abstract- The main defects present in historical documents are darkness, non-uniform clarification, bleed-through and faded characters. To remove these defects binarization method is used. In this paper a phase based binarization method is studied in which phase of ancient document images is preserved. This method is derived in to three steps: preprocessing, main binarization and post processing. In preprocessing phase preserved denoised image is derived. In main binarization two phase feature maps are derived are maximum moment of phase congruency covariance and a locally weighted mean phase angle. At last in post processing Gaussian and median filter is use for enhancement of image. It is also improve the performance of binarization methodologies.

Index Terms- Historical document binarization, phase-derived features, document enhancement.

I. INTRODUCTION

HISTORICAL documents go through different degradations due to getting old, complete use, some attempts of acquisition and ecological situation. The main defects present in historical documents are darkness, non-uniform clarification, smear, strain, bleed-through and faded characters. Those defects are problematic for document image analysis methods which presume even background and consistent quality of writing. In handwritten documents, the writer may use different amount of ink and pressure and make characters of dissimilar intensity or thickness, as well as faint characters. The same writer may write in different ways even within the same document. Similar problems, such as faint characters and non-uniform appearance of characters of the same font, are also encountered in historical machine-printed documents.

Today, there is a strong progress in the direction of digitization of these historical documents to save their content for future generations. The huge quantity of digital data created requires automatic processing, enhancement, and recognition. A key step in all document image processing workflows is binarization, but this is not a very complicated process, which is unfortunate, as its performance has a significant control on the quality of OCR results. lots of research studies includes the problem arising due to binarization of old document images characterized by many types of degradation and they are finding solution, including faded ink, bleed-through, show-through, uneven illumination, variations in image contrast. There are also variations in patterns of hand-written and machine-printed documents, which add to the difficulties related with the binarization of old document images.

A phase-based binarization method is proposed for the binarization and enhancement of historical documents and manuscripts. The three main steps in the proposed method

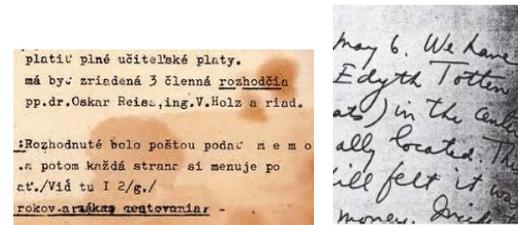


Fig. 1. Sample document images

A phase-based binarization method is proposed for the binarization and enhancement of historical documents and manuscripts. The three main steps in the proposed method are: preprocessing, main binarization, and post-processing. Phase of the image does not corrupt so phase information is mainly preserved. The preprocessing step involves image denoising. In which phase information is mainly preserved, followed by some morphological operations. Then edge map image is obtained by using canny edge operator. These two images are combined to obtained binarization image in rough form.

Then, for the main binarization step we use the phase congruency features. Phase congruency is dimensionless quantity that is invariant to changes in image brightness and contrast. The foreground of ancient documents can be modeled by phase congruency After completing the three binarization steps on the input images using phase congruency features and a denoised image the enhancement processes are applied. A median filter and a phase congruency feature are used to construct an object exclusion map image. This map is then used to remove unwanted lines and interfering patterns. The effect of each step on the binarized output image is discussed in each associated section.

II. LITERATURE REVIEW

In this section, some binarization methods are briefly described. Gatos et al. [4] propose an adaptive binarization method based on low-pass filtering, foreground estimation, background surface computation, and a combination of these. In [5], an initial binary map is obtained using the multi-scale Sauvola's method, and then statistical methods are used to restore the missed strokes and sub-strokes. In [7], Valizadeh et al. map input images into a two-dimensional feature space in which the foreground and background regions can be distinguished. Then, they partition this feature space into several

small regions, which are classified into text and background based on the results of applying Niblack's method.

Lu et al. propose a binarization method based mainly on background estimation and stroke width estimation. First, the background of the document is estimated by means of a one-dimensional iterative Gaussian smoothing procedure. Then, for accurate binarization of strokes and sub-strokes, an L1-norm gradient image is used. This method placed 1st of 43 algorithms submitted to the DIBCO'09 competition. In [1], a local contrast image is combined with a Canny edge map to produce a more robust feature map.

Farrahi Moghaddam et al. [1] propose a multi-scale binarization method in which the input document is binarized several times using different scales. Then, these output images are combined to form the final output image. This method uses different parameters for Sauvola's method to produce output images of the same size, but at different scales. In contrast, Lazzara and Gerard propose a multi-scale Sauvola's method which binarizes different scales of the input image with the same binarization parameters. Then, binary images with different scales are combined in some way to produce the final results.

Combination methods have also attracted a great deal of interest, and provided promising results. The goal of combining existing methods is to improve the output based on assumption that different methods complement one another. In [10], several of these methods are combined based on a vote on the outputs of each. In [6], a combination of global and local adaptive binarization methods applied on an inpainted image is used to binarize handwritten document images. The results show that this method performs extremely well; however, it is limited to binarizing handwritten document images only.

Learning-based methods have also been proposed in recent years. These methods are an attempt to improve the outputs of other binarization methods based on a feature map [8]–[9], or by determining the optimal parameters of binarization methods for each image. In [8] and [9], a self-training document binarization method is proposed. The input pixels, depending on the binarization method(s) used are divided into three categories: foreground, background, and uncertain, based on a priori knowledge about the behavior of every method used. Then, foreground and background pixels are clustered into different classes using the k-means algorithm or the random Markov field [8], [9]. Finally, uncertain pixels are classified with the label of their nearest neighboring cluster. The features used for the final decision are pixel intensity and local image contrast.

Another combined method based on a modified contrast feature is proposed. Lore and Bouchara also classify pixels into three categories using a coarse thresholding method, where uncertain pixels are classified based on super resolution of likelihood of foreground. Howe proposes a method to optimize the global energy function based on a Laplacian image. In this method, a set of training images is used for optimization. Howe improved this method by tuning two key parameters for each image. In [10], a learning framework is proposed to automatically determine the optimal parameters of any binarization method for each document image. After extracting the features and determining the optimal parameters, the relation between the features and the optimal parameters is learned. As we show in the Experimental Results and Discussion section, a

problem associated with all these algorithms is that they are not reliable for all types of degradation and with different datasets.

III. METHODOLOGY

The final binarized output image is obtained by processing the input image in three steps: preprocessing, main binarization, and postprocessing.

1. Preprocessing

In the preprocessing step, denoised image instead of the original image is used to obtain a binarized image in rough form. A number of parameters impact the quality of the denoised output image (ID), the key ones being the noise standard deviation threshold to be rejected (k), and the number of filter scales ($N\rho$) and the number of orientations (Nr) to be used. The $N\rho$ parameter controls the extent to which low frequencies are covered. The higher $N\rho$ is, the lower the frequencies, which means that the recall value remains optimal or near optimal. Based on our experiments, $N\rho = 5$ is the appropriate choice in this case. Therefore, to preserve all the foreground pixels, we set the parameters in the experiments as follows: $k = 1$, $N\rho = 5$ and $Nr = 3$.

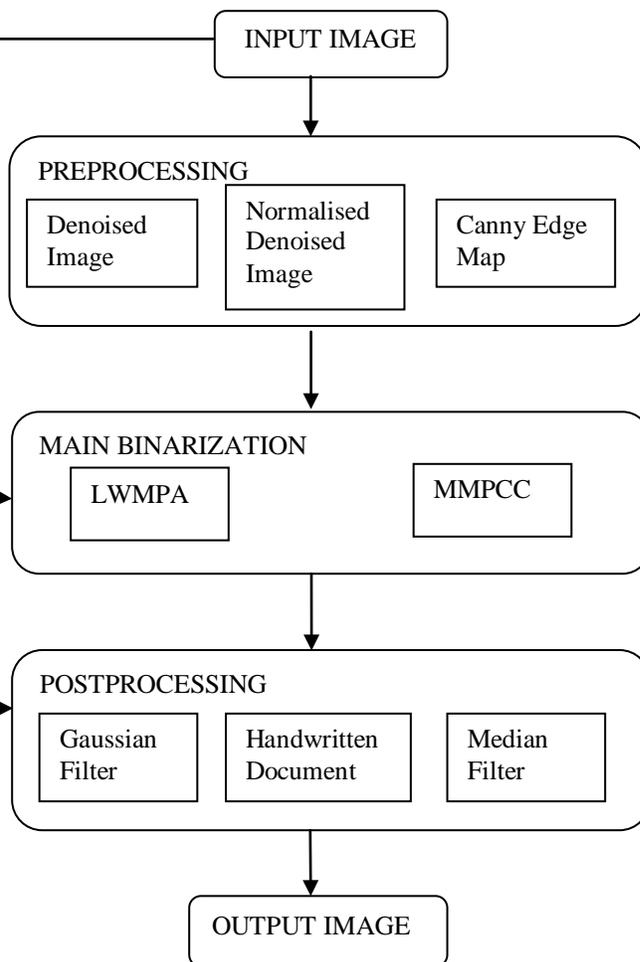


Fig.2. Flowchart of the proposed binarization method.

We used Otsu’s method on the normalized denoised image, where normalized denoised image is obtained by applying a linear image transform on the denoised image. This approach can also remove noisy and degraded parts of images, because the denoising method attempts to shrink the amplitude information of the noise component. The problem with this approach is that it misses weak strokes and sub-strokes, which means that we cannot rely on its output. To solve this problem, we combine this binarized image with an edge map obtained using the Canny operator. Canny operator is applied on the original document image and for combination those edges without any reference in the aforementioned binarized image are removed. We then compute a convex hull image of the combined image.



Fig.3. Example of *IM*, *IL*, and *ID* maps.

2. Main Binarization:

The next step is the main binarization, which is based on phase congruency features: i) the maximum moment of phase congruency covariance (*IM*); and ii) the locally weighted mean phase angle (*IL*).

a) *IM*:

In this paper, *IM* is used to separate the background from potential foreground parts. This step performs very well, even in badly degraded documents, where it can reject a majority of badly degraded background pixels by means of a noise modeling method. Two-dimensional phase congruency is calculated by

$$PC_{2D,r}(x) = \frac{\sum_p W_r(x) [A_{pr}(x) \Delta \Phi_{pr}(x) - T_r]}{\sum_p A_{pr}(x)}$$

Two-dimensional phase congruency is calculated by:

$$I_M = \max_r PC_{2D,r}(x)$$

To achieve this, we set the number of two-dimensional log-Gabor filter scales ρ to 2, and use 10 orientations of two-dimensional log-Gabor filters r . In addition, the number of standard deviations k used to reject noises is estimated as follows:

$$k = 2 + \left[\alpha \times \left(\frac{\sum_{n,m} I_{Otsu,bw}(n,m)}{\sum_{n,m} I_{pre}(n,m)} \right) \right] \tag{20}$$

where α is a constant (we are using $\alpha = 0.5$); *I*_{Otsu,bw} is the binarization result of Otsu’s method on the input image; and *I*_{pre} is the output of the preprocessing step. Here, the minimum possible value for k is 2.

5.2.2 *IL*:

The two-dimensional locally weighted mean phase angle (*IL*) is obtained using the summation of all filter responses over all possible orientations and scales:

$$I_L(x) = \arctan \left[\frac{\sum_{p,r} e_{pr}(x)}{\sum_{p,r} o_{pr}(x)} \right]$$

We consider the following assumption in classifying foreground and background pixels using *IL* :

$$p(x) = \begin{cases} 1, & I_L(x) \leq 0 \\ 0, & I_L(x) > 0 \text{ and } I_{Otsu,bw}(x) = 0 \end{cases} \tag{21}$$

where $P(x)$ denotes one image pixel; and *I*_{Otsu,bw} denotes the binarized image using Otsu’s method. Because of the parameters used to obtain the *IM* and *IL* maps, *IL* produces some classification errors on the inner pixels of large foreground objects. Using more filter scales would solve this problem, but reduce the performance of *IL* on the strokes. Also, *IL* impacts the quality of the *IM* edge map, and of course requires more computational time. Nevertheless, the results of using Otsu’s method to binarize the large foreground objects are of interest. Consequently, we used the *I*_{Otsu,bw} image to overcome the problem.

3. Postprocessing:

In this step, we apply enhancement processes. First, a bleedthrough removal process is applied. Then, a Gaussian filter is used to further enhance the binarization output and to separate background from foreground, and an exclusion process is applied, based on a median filter and *IM* maps, to remove background noise and objects. Finally, a further enhancement process is applied to the denoised image. The individual steps are as follows.

IV. CONCLUSION

The information of phase for input image using the image binarization method and extraction of robust phase-based features from that image are needed to build a model for the binarization of ancient documents. Depends the morphological operations preprocess the input image. Then, main binarization is performing the phase congruency features. In post-processing, a proposed gaussian and trimmed median filter has been needed for eliminate noise, unwanted lines, and interfering patterns. A Gaussian filter was helpful for separating the both foreground, background objects, and also improving the final binary output. The manual correction is deduced based on this tool which is involved in ground truth generation. The application of phase-derived features, the stable behavior of document images, to other cultural heritage fields, can be maintained for long time. So, they are very useful to our future generation to follow the ancient culture and their traditions. And also our historical documents can be saved.

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Role of Bone Morphogenetic Proteins in Periodontics

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Abstract- Bone Morphogenetic Proteins which are part of extracellular matrix are capable of inducing de novo bone formation. De novo bone formation is essential in treating non-union of fractures, periodontal defects or in patients with tissue irradiation, those in whom there is a necessity to augment alveolar ridge or maxillary sinus for implant placement. BMPs are essential components of tissue engineering. This article focuses on history of isolation and purification of BMPs, mechanism of action, carriers and various clinical applications of BMPs.

Index Terms- Bone Morphogenetic Proteins, Periodontal Regeneration, Tissue engineering.

I. INTRODUCTION

Extracellular matrix (ECM) contains 'morphogenetic factors' apart from growth factors which are capable of inducing de novo bone formation. (Urist, 1965,Reddi)¹ 'Inductive interactions' between these morphogenetic proteins and target cell leads to sequential biochemical and morphogenetic events resulting in differentiation of endochondral bone.

BMPs were acknowledged to the world when Marshall Urist implanted demineralized bone matrix intra-muscularly into the rodents and observed new bone formation. Urist² named them "bone morphogenetic protein" believing that they are capable of determining morphogenesis of structures such as bone. Subsequently he was able to isolate the protein responsible for inducing new bone formation. However isolation and purification of BMPs were laborious tasks [Wang et al., 1988]^{3,4} until bovine bone sequencing was done by Wozney et al and highly purified form was extracted by Sampath et al in 1980s.⁷

II. BONE MORPHOGENETIC PROTEINS IN PERIODONTICS

INTRODUCTION:

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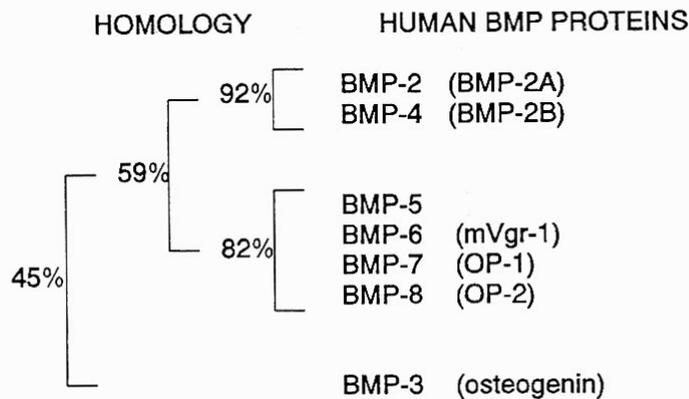
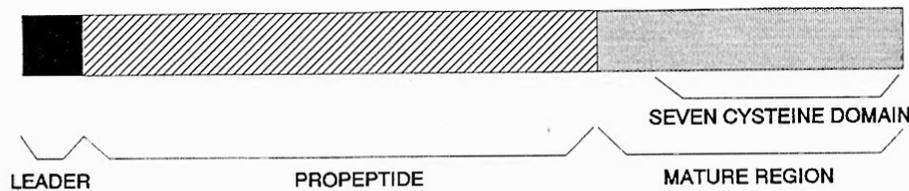
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III. STRUCTURE OF BMPS

There are about 20 BMPs identified till now. They belong to Transforming Growth Factor β superfamily except BMP1 which is a metalloproteinase.⁴

The basic structure of a BMP protein has :

- hydrophobic secretory leader sequence,
- large propeptide region, and
- mature domain.



Courtesy: wozney 1995

BMPs are divided into 3 groups:

- BMP- 2 and BMP-4 –has similar seven-cysteine domains but varies in amino-terminal regions- share 92% of homology.
- BMP-5, BMP-6, BMP-7,BMP-8 share sequence homology

BMP-7 is OP-1osteoprotegrin 1 and BMP-8 is OP-1osteoprotegrin 2

- BMP-3 (osteogenin), differs from these two subgroups, form a different entity.

Recombinant human BMP-2 (rhBMP-2) has been produced using a Chinese hamster ovary (CHO) cell expression system.

- rhBMP-2 causes bone formation by intramembranous as well as the endochondral method. Other BMPs, including BMP-4, BMP-5, BMP-6, and BMP-7, also induce bone in a similar manner although there could be variation in the amount and rate of bone and cartilage formation.

IV. ROLE OF BMPS IN EMBRYO DEVELOPMENT

The bone inducing property of BMPs in extra-skeletal tissues gives clue regarding their involvement in embryonic development and also in post-natal bone differentiation (RIPOMANTI 1992)⁸. BMP2 was localised in mouse embryo at condensing precartilagenous mesenchyme, and in developing bones thus indicating it could also regulate cartilage and bone formation. Similarly, Osteogenin was also observed in rat

embryo. BMP-2A was found localized in developing mouse hair follicles, limb buds, tooth buds – including the dental papilla and the odontoblastic layer, and in the mesenchyme of craniofacial region including Meckel's and nasal cartilage and that of the palatal shelves. Thus BMPs are believed to regulate embryogenesis.

V. BONE INDUCING PROPERTY OF BMPS

Subcutaneous implantation of demineralized bone matrix leads to endochondral bone formation similar to embryonic bone development. The sequential developmental cascade includes

1. Activation and migration of undifferentiated mesenchymal cells by chemotaxis;
2. anchorage-dependent cell attachment to the matrix via fibronectin;
3. mitosis and proliferation of mesenchymal cells;
4. differentiation of cartilage;
5. mineralization of the cartilage;
6. vascular invasion and chondrolysis;
7. differentiation of osteoblasts and deposition of bone matrix;
8. Mineralization of bone
9. Differentiation of hemopoietic marrow in the newly developed ossicle.

VI. MECHANISM OF ACTION OF BMPS

The ability of rhBMPs to induce intramembranous bone formation without endochondral formation has created interest in role of BMPs in periodontal regeneration. Since periodontal

regeneration also involves regeneration of periodontal ligament and bone, the ability of BMPs to stimulate cementum formation is believed to be similar to that of its bone-forming ability⁸ Cementoblast and osteoblast share similar progenitor cells and rhBMP2 is expressed just before the initiation of tooth development during cementogenesis has opened way for research for the possibility of regeneration of periodontium with BMPs.

BMPs can stimulate the following cells to regenerate periodontium

- Residual cells in periodontal ligament
- Blood clot in the wound of periodontal wound
- Adjacent endosteal spaces and beyond the defect.

Two pathways may be hypothesized to reestablish tissue relationship in the periodontium following periodontal reconstructive surgery:⁹

- 1) growth and migration of already differentiated cells into the wound site from existing tissue resources (i.e., alveolar bone and periodontal ligament),
- 2) growth and subsequent differentiation of pluripotent progenitor cells (mesenchymal stem cells).

rhBMP-2 has been demonstrated to induce endochondral ossification through differentiation of mesenchymal cells into cartilage and bone cells. This, however, may only in part explain periodontal regeneration following surgical implantation of rhBMP-2. Possibly, when the healing sequence is initiated by rhBMP-2, other tissue specific cytokines and growth factors may in turn support differentiation of mesenchymal stem cells into additional periodontal phenotypes.

Due to high osteogenic potential rhBMP-2/ACS (Absorbable Collagen Sponge) was tried by many authors for better bone regeneration.

VII. CARRIERS

Carriers play an important part in bone induction by contributing to the following functions:¹⁰

- Localisation and retention of BMPs at the site of application (reduces the dosage)
- Providing a matrix for mesenchymal cell infiltration
- Providing substrate for cell growth and differentiation
- Shapes the new bone formation
- Degradation rate that does not inhibit bone growth and remodelling⁴

The ideal scaffold should not only deliver BMP-2, but also have the following characteristics:¹¹ It should be

- non-immunogenic,
- biocompatible,
- be biodegradable,
- present adhesion for cell ligands;
- contain affinity sites for growth factor (GF) binding;
- permit the integration of the newly formed bone with native surrounding tissue; and
- to fill the defect;

Components of ECM may act as carrier for collagenous matrix but due to potential problems of antigenicity and viral contamination, there is a constant search for carrier materials.

Carriers can be

- ✓ Solid xenogenic (HA)
- ✓ Solid alloplastic (polyethylene polymers)
- ✓ Gels of
 - autogenous/
 - allogenic
 - alloplastic origin
- ✓ Combinations of the above.

VIII. RELEASE KINETICS OF BMPS

Release kinetics is important for example, a study by Talwar et al have shown that rapid release of BMPs resulted in bone formation and slow release promotes cementum formation¹².

By affecting the degradation rate of carrier, its release kinetics could be altered. Resorbable carrier matrices have an unpredictable degradation rate. Regeneration may be limited since earlier resorption leads to premature obliteration of space. In case of non-resorbable carriers such as methacrylate/tetrahydrofurfuryl methacrylate (PEM/THFM), amount and duration of release can be altered by adjusting the preparation method. They have been observed to have an initial rapid relief followed by a slow release and resiliency in maintaining the space necessary for proliferation and differentiation of osteogenic cells. However they necessitate a second surgery for removal.¹³

Release kinetics could be altered through

1. Chemical method- for example gelatin carrier is altered by cross-linking with glutaraldehyde.
2. Magnetic field,
3. Ultrasound
4. Emission of photons.

IX. CLINICAL APPLICATIONS

BMPs are of tremendous interest as therapeutic agents for healing bone fractures, including non-union and in open tibial fracture⁽⁴⁾ Also used in spinal fusion and reported to prevent osteoporosis.

In dentistry, it is used for augmentation of maxillary sinus floor and alveolar ridge. BMPs may provide a promising alternative to traditional grafting procedures. Its scope further extends in treating periodontal bone defects and in implant placement along with alloplastic materials, root coverage procedures and in periodontal regeneration.

The combination of BMP2/ACS is commercially available as INFUSEVR bone graft (Medtronic, Minneapolis, MN), is useful for sinus lifting and implant dentistry.

Potential of BMP-2 helps in regenerating bone in irradiated tissues seems promising in rehabilitating patients who have undergone radiation therapy and need bone reconstruction.

X. BMPS IN TISSUE ENGINEERING

Tissue engineering aims to reconstruct lost tissues or organs and is considered as the ultimate regenerative technique. Using tissue engineering, unwanted reaction which arise due to grafts such as tissue biocompatibility or rejection could be avoided.

With the help of tissue engineering, therapies such as the production of skin to treat burns, bone grafts, arteries to treat atherosclerotic vascular disease and cartilage for plastic and reconstructive surgeries have been achieved. Tissue engineering is being applied in dentistry for the regeneration of temporomandibular joint, periodontal ligament, dentin, enamel, pulp and integrated tooth tissues.

mandibular joint, periodontal ligament, dentin, enamel, pulp and integrated tooth tissues.

Tissue engineering has three key features namely

- Cells
- Scaffolds
- Signaling molecules such as growth factors

Cells synthesize the matrix essential for the new tissue. Scaffolds provide the environment for the cells to synthesize matrix. Growth factors facilitate and promote this action.¹³

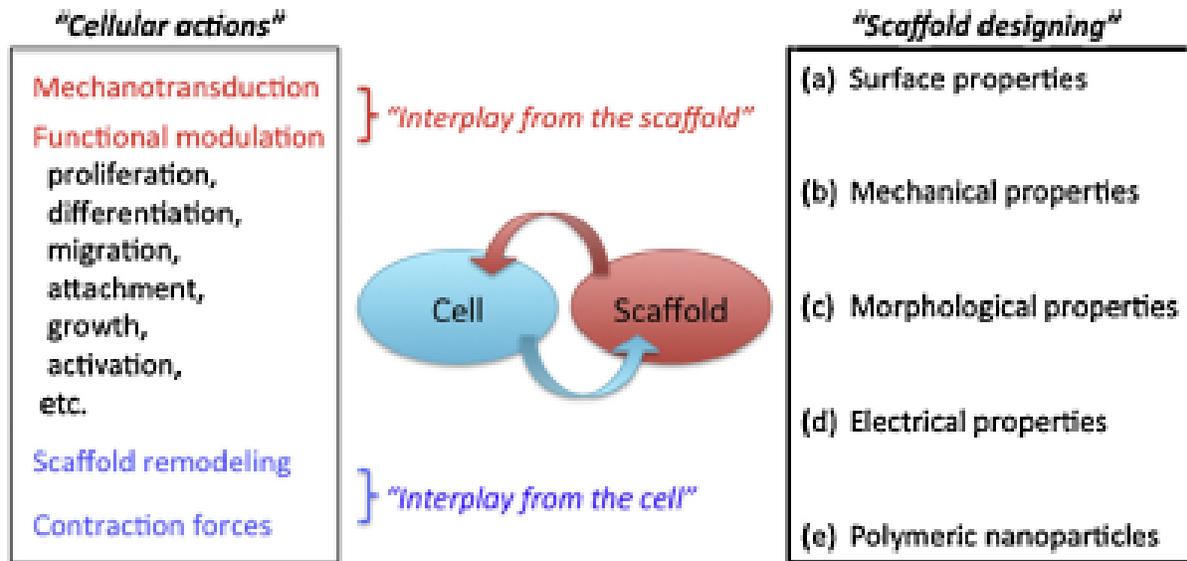


Figure 3 Cell-scaffold interplay and the components of scaffold designing.

Courtesy: Eiji Nemoto Japanese Dental Science Review

The growth factors that have frequently been applied to tissue engineering include bone morphogenetic proteins (BMPs), basic fibroblast growth factor (bFGF or FGF-2), vascular epithelial growth factor and transforming growth factor- β (TGF- β).

The BMP/TGF- β signaling pathway mediates osteoblastic differentiation and in vivo bone formation; BMP-2 and -7 were reported to play a role in the differentiation of periodontal ligament stem cells (PDLSC) and dental follicle stem cells. Reparative dentin formation was promoted by BMP-2 and -7. Other members of the BMP family, such as BMP-7/OP-1 have observed periodontal regeneration in animal model.⁸

XI. BMPS IN SOCKET AUGMENTATION

Bmps when used in augmentation of socket and maxillary sinus wall¹⁸ were found to promote soft-tissue healing, minimize surgery time, reduce potential postsurgical infection, accelerate cell migration and promotes early bone formation.

XII. BMPS IN IMPLANTOLOGY

Application of BMPs for the osseointegration of Endosseous implant has been evaluated by some authors¹⁵. Osseointegration is critical for endosseous implant in which there is complete union of implant with bone. Sometimes there would be insufficiency in quality or amount of bone, which is addressed by using grafts or growth factors.

In human trial studies conducted by Howell in 1997 and Cochran et al in 2000 using Recombinant human BMP-2 in collagen sponge carrier, bone formation at the extracted site was observed, which helped in endosseous implant placement.^{15,16}

Boyne et al in 1997, observed bone formation in sinus lift procedure using the same combination and this aided in implant placement (Boyne PJ). A feasibility study evaluating rhBMP-2/absorbable collagen sponge for maxillary sinus floor augmentation¹⁷

XIII. BMPS USED ALONG WITH DISTRACTION OSTEOGENESIS (DO)

Rachmiel et al I 2006, evaluated the effect of rhBMP in distraction osteogenesis in sheep model. 1.5 mm distraction devices were placed following alveolar segmental osteotomy in sheep. ¹⁹ 5 days later rhBMP was injected. Radiographic analysis showed lifting of the transported segment and union of the distracted segment, newly formed bone and the native bone. Thus BMPs when used in the process of distraction osteogenesis seemed to minimise the consolidation period, allowing early placement of implants.

BMP implanted at the distraction site, may induce the noncommitted mesenchymal cells to form cells of osteoblastic or chondroblastic lineage. Thus to reduce the consolidation phase and improve quality of bone, BMPs can be used in DO procedure.

XIV. LIMITATIONS

Though BMPs are potential candidates for promotion of regeneration of periodontium, ²⁰ limitations do exist. Ankylosis of varying degrees has been observed in some studies. Still there are difficulties in the method of delivering BMPs to the target site to achieve a constant supply of BMPs. Thus gene therapy and other modes of targeted delivery are being developed. BMPs are also associated with some systemic toxicity

XV. CONCLUSION

BMPs apart from inducing new bone also seem applicable in multiple modes of regeneration like being used along with implants and distraction osteogenesis procedures .

Though the discovery and usage of BMPs are like the 'light at the end of tunnel' towards periodontal regeneration, more experimental studies and research are needed to fully tap their potential for regeneration.

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Isolation and Molecular Characterization of acne causing *Propionibacterium acnes*

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Abstract- *Propionibacterium acnes* is the most common member of the Anaerobic or microaerophilic coryneform organisms found on the skin. The present study focused on the isolation of *Propionibacterium acnes*, the causative organism of acne and its characterization based on the cultural characteristics, biochemical tests, GC FAME (Gas Chromatography- Fatty acid methyl esters) analysis and 16 S r RNA sequencing. The results were compared with the standard organisms procured from IMTECH, Chandigarh, India. The FAME analysis report of the organism correlates with that of the genotyping of the isolate and the organism is identified as *Propionibacterium acnes*.

Index Terms- *Propionibacterium acnes*, Biochemical tests, FAME analysis, 16 S r RNA gene sequencing

I. INTRODUCTION

Acne is a chronic inflammatory disease of the pilosebaceous unit resulting from androgen induced increased sebum production, altered keratinization, inflammation and bacterial colonization of hair follicles on the face, neck, chest and back by *Propionibacterium acnes*. Facial scarring due to acne affects up to 20% of the teenagers. Acne can persist into adulthood, with detrimental effects on self-esteem.¹

Propionibacterium acnes is relatively slow growing, aero tolerant anaerobic, Gram-positive skin microbe that colonizes sebaceous glands and pilosebaceous follicles.² This organism is considered to play a principal role in the development of acne vulgaris.² Acne has many different symptoms including comedones, papules, pustules, nodules, cysts and pilosebaceous inflammation. Among these, inflammatory lesions of acne are of the greatest concern to patients because they may lead to acne scarring, thereby inducing adverse psychological effects.³ It can also cause chronic blepharitis and endophthalmitis, the latter particularly following intraocular surgery.⁴ The bacterium is largely commensal and part of skin flora present on most healthy adult human skin⁵. It lives primarily on, among other things, fatty acids in sebum secreted by sebaceous glands in the follicles. It may also be found throughout the gastrointestinal tract in humans.⁶ It accounts for approximately half of the total skin microbiota⁷, with an estimated density of 10² to 10⁵ or 10⁶ organisms per cm².^{8,9}

P. acnes bacteria live deep within follicles and pores, away from the surface of the skin. In these follicles, *P. acnes* bacteria use sebum, cellular debris and metabolic byproducts from the surrounding skin tissue as their primary sources of energy and nutrients. Elevated production of sebum by hyperactive

sebaceous glands or blockage of the follicle can cause *P. acnes* bacteria to grow and multiply.¹⁰

P. acnes bacteria secrete many proteins, including several digestive enzymes.¹¹ These enzymes are involved in the digestion of sebum and the acquisition of other nutrients. They can also destabilize the layers of cells that form the walls of the follicle. The cellular damage, metabolic byproducts and bacterial debris produced by the rapid growth of *P. acnes* in follicles can trigger inflammation.¹² This inflammation can lead to the symptoms associated with some common skin disorders, such as folliculitis and acne vulgaris.^{13,14} The aim of this study is to isolate *P. acnes* and identify it based on its characteristics. There are many different ways of identifying bacteria. Rapid and accurate identification of bacterial pathogens is a fundamental goal of clinical microbiology, but one that is difficult or impossible for many slow-growing and fastidious organisms.¹⁵ New and exciting molecular methods, using the 16S small sub-unit ribosomal nucleic acid molecules have added much to our knowledge of microbial diversity¹⁶. For many years, sequencing of the 16S ribosomal RNA (r RNA) gene has shown that sequence identification is useful for slow-growing, unusual, and fastidious bacteria as well as for bacteria that are poorly differentiated by conventional methods. The technical resources necessary for sequence identification are significant. Despite the availability of resources, sequence-based identification is still relatively expensive.¹⁷ Although it is generally regarded that routine identification of very common species using conventional methodologies are highly accurate, we now have a more convenient and precise mechanism for checking these identifications on a molecular basis. Such studies need to be performed and published¹⁸.

Recent advances in the biochemistry of microorganisms revealed that analysis of cell components, such as proteins and fatty acids, can be effectively applied to bacterial identification, providing the basis for chemotaxonomy¹⁹. Fatty acids are one of the most important building blocks of cellular materials. In bacterial cells, fatty acids occur mainly in the cell membranes as the acyl constituents of phospholipids. These fatty acids are synthesized in certain bacteria from iso, anteiso, or cyclic primer and Malonyl-CoA with or without a subsequent modification²⁰. The occurrence of branched-chain fatty acids as major constituents in bacteria was first reported for *Bacillus subtilis*²¹. These days, fatty acids in bacterial lipids are routinely analyzed by gas-liquid chromatography. The unique pattern of fatty acids in bacteria is the basis of identification in FAME analysis. The MIDI (Microbial Identification Incorporation) Sherlock FAME analysis is a laboratory-based system that can be used on a routine basis to identify commonly isolated bacteria from clinical

and environmental source²². More than 300 fatty acids and related compounds have been found in bacteria are analyzed in the MIDI Research and Development Laboratory. Whole cell fatty acids are converted to methyl esters and analyzed by gas chromatography. The fatty acid composition of the unknown is compared to a library of known organisms in order to find the closest match. The peaks are automatically named and quantitated by the system. Branched chain acids predominate in some Gram positive bacteria, while short chain hydroxy acids often characterize the lipopolysaccharides of the Gram negative bacteria²³. The MIS, as the first automated CFA (Cellular fatty acid) identification system, is an accurate, efficient, and relatively rapid method for the identification of microorganisms²⁴

The present study focuses on the isolation, characterization of *P. acnes* based on its cultural characteristics, biochemical tests, FAME and 16S r RNA typing.

II. MATERIALS AND METHODS

2.1 Isolation of *Propionibacterium acnes*

P. acnes is isolated from acne. About 50 samples were collected from students aged between 18-21 years. The samples were collected using sterile swabs and then were inoculated into Brain Heart Infusion broth and Thioglycollate broth. A 1 cm² area of the facial skin of about 50 volunteers aged between 17-21 years was cleansed with a sterile swab, and the swab was placed in a test tube containing 10ml of Thioglycollate broth. The broth was incubated for 4days in Anaero Gas Pak. After incubation, the culture was then streaked onto BHI and Clostridia agar and incubated for 4 days at 37 ° C. The colony morphology was observed and stained by gram staining. The isolated colonies were sub cultured anaerobically into BHI broth and were preserved on BHI agar slants and also inoculated by stab culture onto BHI agar tubes.

2.2 Characterization of the organisms:

2.2.3. Biochemical Characterization

The Biochemical characteristics of the strains of anaerobes isolated from the persons suffering with acnes were analyzed by looking for production of Indole, sugar fermentation tests, nitrate reduction and Gelatin hydrolysis²⁵

Hemolysis:

The organisms were plated onto the Blood Agar plates containing 10% defibrinolyzed sheep blood to test for Hemolysis. The plates were incubated anaerobically for 4 days.

2.2.4 .FAME Analysis:

FAME analysis was carried out using Agilent 6850 Series II. To perform this analysis, a bacterial culture was taken and the fatty acids were extracted and used to form methyl esters. The volatile derivatives are then introduced into a gas chromatograph and the patterns of the peaks helped identify the organism. Anaerobic library BHI was referred for the analysis. This is widely used in characterizing new species of bacteria and is useful for identifying the pathogenic strains.

2.2.5. 16S r RNA typing:

The 16S r RNA gene is used as the standard for classification and identification of microbes, because it is present in most microbes and shows proper changes. Type strains of 16S r RNA gene sequences for most bacteria and archaea are available on public databases. In the present study, the Ez Taxon database (a web-based tool for the identification of [prokaryotes](#) based on [16S ribosomal RNA](#) gene sequences) was used. Ez Taxon is an [open access](#) database that is produced and maintained by Chun Lab, Inc. The Ez Taxon database contains sequences of type strains of prokaryotic species with validly published names, mainly used for the routine identification of prokaryotic isolates.

III. RESULTS AND DISCUSSION

Isolation and Characterization of *P. acnes*

1.	Pa1	Round, slimy, opaque, small colonies	Gram positive cocci
2.	Pa2	Small, circular, raised, creamy mucoid colonies.	Gram positive bacilli
3.	Pa3	Circular, opaque, irregular and creamy colonies.	Gram positive bacilli
4.	Pa4	Small, Round, cream coloured pin head colonies	Gram positive bacilli
5.	Pa5	Slimy, round, cream colored colonies.	Gram positive bacilli
6.	Pa6	Small, round, opaque, mucoid colonies	Gram positive cocci
7.	Pa7	Big, round, elevated, creamy colonies	Gram positive bacilli
8.	1951	Round, opaque, raised, creamy pinhead colonies	Gram positive bacilli
9.	3297	Small, round, opaque, regular, creamy colonies.	Gram positive bacilli

Table: 1 Colony characteristics and gram stain results

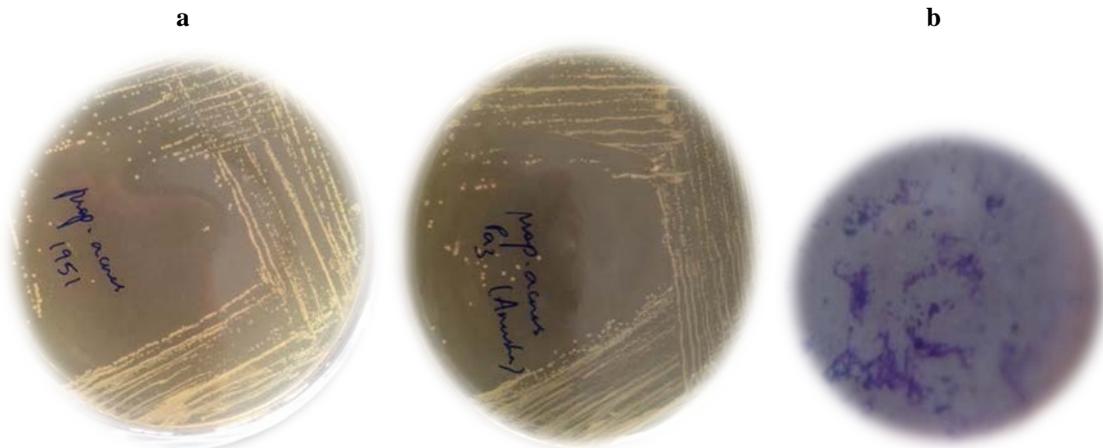


Figure 1: a) Colony morphology of 1951, Pa3 b) Microscopic observation of Pa 3



Figure 2: P.acnes showing Hemolysis on Blood Agar plate

Identification	Glucose	Maltose	Sucrose	Esculin*	Adonitole	Indole	NO ₃ [^]	Gelatin	Catalase
Pa2	-	-	-	-	-	+	+	+	+
Pa3	+	-	-	-	+	+	+	+	+
Pa4	+	-	-	-	+	+	+	-	+
Pa5	-	-	-	-	-	+	-	-	+
Pa7	+	+	+	-	-	-	+	+	-
MTCC1951	+	-	-	-	+	+	+	+	+
MTCC3297	+	-	-	-	+	+	+	+	+

Table 2: Typical reaction patterns of the isolates

*in the case of Esculin + indicates a positive ferric citrate test. The pH in these tubes did not change significantly
 Fermentation of Carbohydrates in question is indicated by +
 + indicates production of Indole, reduction of nitrate to nitrite and liquefaction of Gelatin respectively in the last three columns

Out of the samples analyzed 5 samples showed colony morphology and Microscopic observation similar to that of the standard culture. These cultures were subjected to further analysis. The colonies were round, opaque, raised, creamy colonies and on gram staining, gram positive bacilli were observed (Table 1, Fig.1). Cultures Pa1, Pa6 were Gram positive cocci in clusters, hence could be *Staphylococcus aureus*. Pa3, Pa4 showed hemolysis on the blood agar plates as shown in Fig.2. From Table 2 we can infer that Pa3 and Pa4 showed sugar fermentation, Nitrate reductase, catalase test results similar to

that of the standard cultures – *P. acnes* MTCC 1951, *P. acnes* MTCC 3297. Pa3 and Pa4 fermented glucose, adonitole. Were positive for indole, catalase and nitrate reductase. Gelatin was hydrolysed by Pa3 and not by Pa4. Similar results were reported by Cummins 1975²⁶. The cultures Pa3 and Pa4 which showed most of the biochemical analysis similar to that of the standard culture were subjected to FAME Analysis and 16 S r RNA typing.

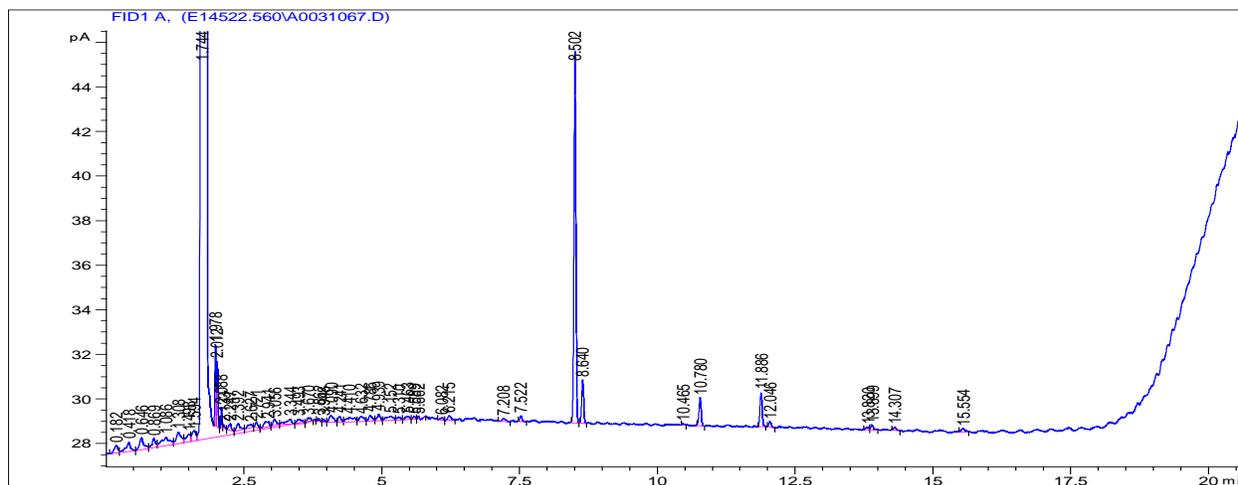
FAME Analysis and 16S r RNA:

The microbial culture Pa3 and Pa4 obtained from acne was analyzed using FAME and sequencing approaches. On comparing FAME results of Pa3 with that of sequencing, it was found that both the methods correlate to each other in confirmation of identity. Fig. 3. shows results corresponding to the fatty acids identified through FAME analysis of bacterial sample. The MIDI Sherlock microbial identification system using ANAER6 method identified the organism to be *Propionibacterium acnes* with 0.446 Similarity Index (SI). The SI is a numerical value, which expresses how closely the fatty acid composition of an unknown compares with the mean fatty acid composition of the strains used to create the library entry listed as its match. The SI is not a “probability” or percentage, but an expression of the relative distance of the unknown sample from the population mean. Samples with an SI of 0.500 or higher and with a separation of 0.100 between the first and second choice are considered good library comparisons. If the SI is between 0.300 and 0.500 and well separated from the second choice (>0.100 separation), it may be a good match, but an atypical strain (it would fall very far away from the mean on the normal distribution curve).²⁷ The sequence analysis also showed similar results (Table 3). After the completion of BLAST analysis the organism was identified to be *Propionibacterium acnes* with 100% identity match with *Propionibacterium acnes* strain: DSM 1897(T) , Accession number AWZZ01000008 (EZ TAXON database). Pa4 did not find any matching chromatogram pattern in Anaerobic (BHIBLA) library.

The present study focused on the isolation, culturing and characterization of *Propionibacterium acnes* from acne. Identification was done based on the colony morphology, gram staining, biochemical tests, FAME analysis and sequencing. Identification of bacteria by conventional methods usually requires ≥ 48 h after a colony has been isolated. The identification of slow-growing fastidious microbes to the species level is difficult and time-consuming by conventional methods. 16S r RNA gene sequences frequently provide phylogenetically useful information. Signature nucleotides allow classification even if a particular sequence has no match in the database, since otherwise-unrecognizable isolates can be assigned to a phylogenetic branch at the class, family, genus, or subgenus level. Cost is a critical issue in the evaluation of 16S rDNA sequence analysis as a diagnostic tool. However, sequencing costs will probably continue their rapid trend downward, bringing this technology within the reach of many microbiology laboratories^{15,28}.

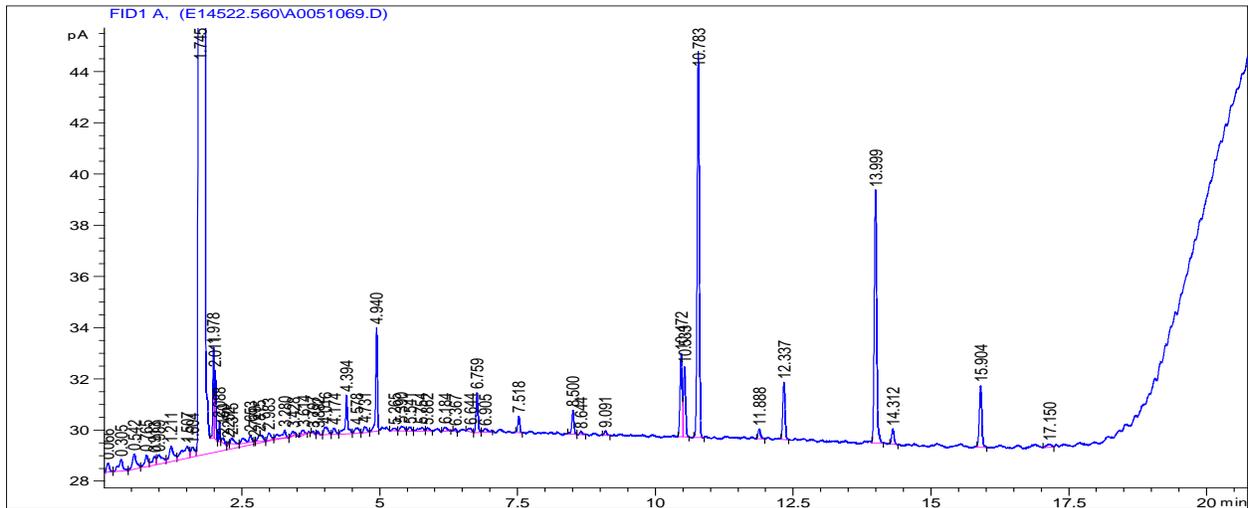
IV. CONCLUSION

Propionibacterium acnes was isolated from acne and the characterization and confirmation of the same was carried out by conventional methods (Cultural characteristics and biochemical tests), FAME analysis and 16 S r RNA gene sequencing. FAME analysis and sequencing were useful in characterizing the organism up to species level.



S.No	Sample Id	Analysis	Method Used	Result
1	Pa-3	FAME	ANAER6	<i>Propionibacterium acnes</i>

Figure 3: Chromatogram of bacterial sample Pa3 showing the fatty acid peaks through Agilent GC 6850



Sample Id	Analysis	Method Used	Result
Pa-4	FAME	ANAER6	No Match

Figure 4: Chromatogram of bacterial sample Pa4 showing the fatty acid peaks through Agilent GC 6850

Accession	Description	Pairwise similarity (%)	Different/ Total	Completeness (%)
AWZZ01000008	Propionibacterium acnes strain: DSM 1897(T)	100	0/1398	100
AFAM01000003	Propionibacterium humerusii strain: P08(T)	98.26	24/1397	100
AGBA01000019	Propionibacterium avidum strain: ATCC 25577(T)	96.44	49/1385	100
JQ283460	Propionibacterium olivae strain: IGBL1 (T)	94.4	76/1358	94.73
JQ283461	Propionibacterium damnosum strain: IGBL13(T)	94.36	77/1365	95.7
AOSS01000369	Propionibacterium granulosum strain: DSM 20700(T)	94.32	78/1374	100
AJ704569	Propionibacterium acidopropionici strain: NCFB 563 (T)	94.24	79/1372	98.85
AF234623	Propionibacterium microaerophilum strain: M5(T)	93.74	86/1373	100
AUDD01000055	Propionibacterium jensenii strain: DSM 20535(T)	93.74	86/1373	100
AJ704572	Propionibacterium thoenii strain : NCFB 568 (T)	92.79	99/1373	99.46

Table. 3: Blast Similarity Search Results for Pa3 by 16S r RNA sequencing

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Working Capital Management and Its Impact on Profitability Evidence from Food Complex Manufacturing Firms in Addis Ababa

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Abstract- Working capital refers to the funds required to undertake the day-to-day operations of a firm. To achieve business objectives, an investment of the firm's capital in current assets and the use of current liabilities to fund part of the investment are required. Therefore, sound working capital management is required in order for the firm to remain competitive in this information age. This study explores the impact of working capital management on the profitability of food complex manufacturing firms operating in and around Addis Ababa. The efficiency of working capital management has been measured by Inventory Turnover Period, Account Receivable Collection Period, Days Payables Outstanding, Cash Conversion Cycle, Current Ratio and Quick assets ratio; and Return on Assets was considered as proxy for profitability. Relevant data for this study has been collected from 10 food complex manufacturing firms' annual financial statements for the period 2009-2013 and analyzed through descriptive statistics, Pearson correlation and multiple regression analysis. Accordingly, the findings revealed that Return on Assets was found to be significantly and negatively related to average days in inventory, average days payable and cash conversion cycle, which would suggest that by shortening of cash conversion cycle food complex manufacturing firms can increase their profitability. The findings of the regression analysis show that average days in inventory, average day's receivable, and average days payable have a significant impact on Return on Assets. However, current ratio and quick asset ratio have insignificant and positive relation with Return on Assets. Therefore, managers of food complex business can increase the profitability of their firms by shortening the cash conversion cycle, inventory conversion period, and receivables collection period. However, they cannot increase profitability by lengthening the payables deferral period.

and the appropriate level of working capital so as to minimize risk, effectively prepare for uncertainty and improve the overall performance of their businesses (Lamberson, 1995). Sound working capital management involves diligent planning and controlling. A balance should be struck between current assets and current liabilities in order to avoid the risk of failure to meet maturing obligations on one hand and avoid excessive investment in these assets on the other hand (Eljelly, 2004). The presence of sound working capital management practices can make significant difference between the success and failure of a firm. In today's business, the skill to exploit every opportunity and to look for practical business tools and techniques to improve the financial performance are of paramount importance for success.

Working capital management is essential for the survival of business organization because of its effect on a firm's profitability, risk and value. Cognizant of this fact, various studies have analyzed the relationship of working capital management (WCM) and firm profitability in developed markets and economic situation. However, the results are quite mixed, contradicting and confusing. The various studies reviewed have used various variables to analyze the relationship, with different methodology such as linear regression, panel data regression, correlation and others. The investigator of the current study noted that there are inconclusive and inconsistent results with regard to the impact of working capital management on firms' financial performance. Further examination of these studies reveals that evidence-based result that investigated the relationship between working capital management and profitability of Food Complex Manufacturing Companies operated in Ethiopia, Addis Ababa are not found. Therefore, this study attempted to fill the research gap by examining and analyzing the relationship between the most important working capital management variables.

I. INTRODUCTION

1.1 Justification of the Study

The very purpose of working capital management is to preserve an ideal balance between each of the working capital components, that is, cash, receivables, inventory and payables is a fundamental part of the overall corporate strategy to create value and is an important source of competitive advantage in businesses (Deloof, 2003). In practice, it has become one of the most important issues in organizations with many financial executives struggling to identify the basic working capital drivers

1.2 Statement of the Problem

"Have working capital management a visible impact on profitability of Food Complex Manufacturing Companies operated in Addis Ababa?" The financial managers of firms spend most of their time and effort on day-to-day working capital management. Due to the inability of financial managers to properly plan and control the current assets and current liabilities of their companies, the failure of a large number of businesses can be attributed to the inefficient working capital management (Smith, 1973). For instance, Egbide (2009) found that large number of business failures in the past has been attributable to the inability of the financial managers to plan and control the

working capital of their respective firms. These reported inadequacies among financial managers are still practiced today in many firms in the form of high bad debts; high inventory costs etc., which poorly affect their operating performance (Egbide, 2009, p. 45). Moreover, some managers do neglect the firm's operating cycle thereby having longer debtors' collection period and shorter creditors' payment period.

Inadequate working capital leads the firm to bankruptcy. Inversely, unnecessary investment in working capital results in wasting cash and ultimately leads to lower profitability or even loss (Chakraborty, 2008). Management strategy aimed at maintaining a balance between liquidity and profitability has far-reaching consequences on the growth and survival of the firm. Thus, the manager of a business entity is in a dilemma of achieving desired tradeoff between liquidity and profitability in order to maximize the value of a firm. Therefore, the issues raised above vindicates the need to thoroughly investigate the problem; and hence, the need to study the relationship between measures of working capital management and firm performance in selected food complex manufacturing industries in Addis Ababa.

1.3 Objectives of the Study

The objective of the study is to examine and analyze the impact of working capital management on the profitability of Food Complex Manufacturing Companies operating around Addis Ababa. Specifically, the study assumes the following specific objectives:

- To evaluate the impact of account receivable collection days on the profitability of Food Complex Manufacturing firms.
- To examine the effect of inventory turnover days on Food Complex Manufacturing Companies profitability position.
- To examine the impact of account payable turnover days on Food Complex Manufacturing Companies profitability position
- To investigate the impact of cash conversion cycle on Food Complex Manufacturing Companies profitability position.
- To measure the effect of current ratio on Food Complex Manufacturing Companies profitability position.
- To examine the effect of quick asset ratio on Food Complex Manufacturing Companies profitability position.

1.4 Hypotheses

One of the purposes of cash and liquidity management is to sustain a minimum amount of idle cash holding in the firm, so as management of accounts receivable (AR) and inventories, too, assist keeping level of the invested funds in these assets as low as possible. Conversely, management of accounts payable (AP) tries to elongate the time of payment and to make the most of the short-term funds which actually belong to others. The period from the time of payment for the purchased materials or goods until collection of sales cash proceeds is called Cycle of Operation (Bozorgasl, 2005). Operating cycle has two parts: the first part is the *Inventory Sale Period*, the period extending from Asset Acquisition Period until Inventory Sale Period; and the

second part is from Inventory Sale Period to the period of receiving the sale proceeds known as "*Accounts Receivable Collection Period*". The Cycle of Operation in fact represents a process which shows how a products moves through different accounts of current assets; it is initiated in the inventory account, then when it is sold, it turns into accounts receivable, and at last when its cash proceeds are received, it is converted into cash or liquid asset. In this process, the asset step by step gets closer to cash (Ross, 2008).

The period from inventory acquisition until payment of the price thereof is called payment period. Cash Conversion Cycle refers to the process starting from cash payment for purchase of inventory and ending up to collection of sale cash proceeds. Note that cash conversion cycle (CCC) is the difference between cycle of operation and payment period (Ross et al., 2008). In other words, cash conversion cycle is the time period in which cash is spent by the company operation on production of a product item. Shortening this period means that for certain volume of production, less amount of cash is spent. CCC can be shortened by cutting down on either the average period in which cash is in the form of inventory, or the average accounts receivable collection period, or by lengthening the payment period (Jahankhani, 2008). The change in CCC leads to alteration of asset turnover and eventually affects profitability of the business unit. Consequently, the following hypotheses are drawn:-

H1. The Food Complex Manufacturing Companies profitability position is significantly negatively related to cash conversion cycle.

H2. The Food Complex Manufacturing Companies profitability position is significantly negatively related to the account receivable turnover days.

H3. The Food Complex Manufacturing Companies profitability position is significantly negatively related to the inventory turnover days

H4. The Food Complex Manufacturing Companies profitability position is significantly positively related to the account payable turnover days.

Moreover, according to the economic theory, risk and profitability are positively related (the more risky the investment, the higher the profits it should offer), thus since higher liquidity means less risk, it would also earn lower profits. According to Assaf Neto (2003, p.22), the greater the amount of funds invested in current assets, the lower the profitability, and by the same time the less risky is the working capital strategy. In this situation, the returns are lower in the case of a greater financial slack, in comparison to a less liquid working capital structure. Conversely, a smaller amount of net working capital, while sacrificing the safety margin of the company, by raising its insolvency's risk, positively contributes to the achievement of larger return rates, since it restricts the volume of funds tied up in assets of lower profitability. This risk-return ratio behaves in a way that no change in liquidity occurs without the consequence of an opposite move in profitability. This way each company should choose an amount of net working capital that better fits its risk accessibility and profit margins. Considering the above concepts **H5.** The Food Complex Manufacturing Companies profitability position is significantly negatively related to current ratio figure

H6. The Food Complex Manufacturing Companies profitability position is significantly negatively related to quick asset ratio figure.

The study has significance importance for corporate managers, researchers and students. First, managers of companies, especially food complex manufacturing companies will have insight on how best to optimize balance between liquidity and profitability in their companies. The study will equip managers with desirable working capital strategy that maximizes shareholders interest and directs them in challenges that the entity faces. Secondly, other researchers who are interested in the working capital management of firms and its impact on performance will find this work as beneficial.

II. LITERATURE REVIEW

2.1 Theoretical Literature

2.1.1 Components of Working Capital

Working capital management concern companies management of their short-term capital. The short-term capital refers to the capital that companies use in their daily operations and it consists of companies' current assets and current liabilities. A well-managed working capital promotes a company's wellbeing on the market in terms of liquidity and it also acts in favor for the growth of shareholders value (Jeng-Ren, et al., 2006).

Current assets consist of capital tied up in cash, short-term financial investments, inventories, account receivables and other current assets (Brealey, Myers & Allen, 2006, p. 813). Current liabilities include short-term loans, the debts to suppliers as account payables, accrued income taxes, and interest payments on long-term debts, dividend and other current liabilities. Consistent and systematic examination of a firm's current assets and liabilities is important to maintain sound and effective working capital management strategy.

2.1.2 Working Capital Management and Its Importance

Working capital management involves regulating the various types of short-term assets and short-term liabilities. Working capital management also requires decisions with regard to how short-term assets should be financed. The firm can finance its current assets through various means like short-term debt, long-term debt, or equity. All else constant, working capital of the firm increased when it finances short-term assets through noncurrent sources. Review of literature discloses four greatly interrelated objectives of working capital management, viz., liquidity, profitability, risk reduction and value maximization. The very purpose of any business organization is to increase the market value. Sound management of working capital is an integral component of the overall corporate strategy in creating the shareholders' value.

The main objective of working capital management is to maintain an optimal balance between each of the working capital components. Business success heavily depends on the financial executives' ability to effectively manage receivables, inventory, and payables (Filbeck and Krueger, 2005). Firms can minimize the cost of financing and/or increase the funds available for expansion projects by minimizing the amount of investment tied up in current assets. Most of the financial managers' time and

efforts are allocated towards bringing on-optimal levels of current assets and liabilities back to optimal levels (Lamberson, 1995).

The major benefits of holding adequate working capital include among others, keeping of the affluence of the firm or averting of its commercial indebtedness through continuing production, maintenance of credit by early payment to supplies of raw materials and others. Favorable opportunities can also be exploited, e.g., a firm may make off seasonal purchases resulting in significant savings or it can fetch big supply orders, availability of emergency capital on soft terms is ensured, regular payment of dividend can also be assured due to the availability of sufficient liquidity, productivity is enhanced by making expenditures on research, innovation and technical development and by maintaining incessant flow of materials, etc.

Also, Working capital management is essential because of its effects on the firms' risk and return, and consequently its value. Usually, the larger the firm's investment in liquid assets, the lower will be its risk and return alike. Referring to theory of risk and return, high-risk investment will result in high return. Therefore, firms with high liquidity of working capital may have low risk then low profitability. Inversely, a firm that has low liquidity of working capital, facing high risk results to high profitability. The central point here is that when managing working capital, the firm should carefully consider all the items in both accounts and try to balance the risk and return (Moradi *et al.*, 2012).

2.1.3 Working Capital Policy

Deciding on the firm's basic policy decisions regarding the target levels for each category of current assets, how current assets will be financed, and is formulated by the finance management in order to manage and handle the firm's working capital efficiently refers to working capital policy (Brigham & Houston, 2003; Paramasivan & Subramanian, 2009). Working capital policy refers to the level of investment in current assets for safeguarding the targeted sales and growth. Ideally, a firm can implement different working capital management policies as *Aggressive* or *restricted* working capital policy, *Conservative* or *relaxed* working capital policy, and/or *Moderate* working capital policy based on its investment and financing strategies. These different practices affect the profitability, liquidity, risk, and finally the value of the firm in different ways. A firm may adopt an aggressive working capital management policy with a low level of current assets as a percentage of total assets, or it may also be used for the financing decisions of the firm in the form of high level of current liabilities as a percentage of total liabilities. Excessive investment in short-term assets may have adverse effect on the firm's profitability, whereas paucity of current assets may lead to a lower level of liquidity and stock outs, resulting in difficulties in maintaining smooth operations (Van Horne & Wachowicz, 2004). More aggressive working capital policies are related to higher risk and return while conservative working capital policies are associated with lower risk and return (Gardner et al., 1986; Weinraub & Visscher, 1998). In restricted policy, the estimation of current assets for achieving targeted revenue is done very aggressively without considering for any contingencies and provisions for any unforeseen event. On the other hand, relaxed policy is just the reverse of restricted policy

in that assessment of liquid assets for realizing the targeted revenue is prepared after careful consideration of uncertain events such as seasonal fluctuations, sudden change in level of activities or sales etc.

2.1.4 Measures of Working Capital

There are two terms called gross working capital and net working capital that are also used commonly for measuring working capital level of a company. Working capital refers to its financial health and is computed by deducting current liabilities from current assets. If it is positive, it indicates that the company is in good financial health and can pay its short term debts by selling its current assets. If it is negative, the company cannot meet its debt liabilities even if it sells its current assets such as cash, accounts receivables and inventory. When working capital is in red, it is a signal that company's operational efficiency is going down or it is not generating enough sales and in the worst case scenario, negative working capital may result in bankruptcy for a company. As such, working capital is a good indicator for investors to invest or shy away from a company.

The two commonly known measures of working capital are net working capital and the gross working capital. The gross working capital is referred as working capital and it includes the total current assets of the firms, whereas net working capital is the excess of current assets over current liabilities. On the other hand, net working capital being the difference of current assets and current liabilities reflects operational efficiency and ability to generate more sales (Zubair and Mohamed (2013)

2.1.5 Profitability and Liquidity Measures

Profitability is the net result of a number of policies and decisions (Brigham & Daves, 2007). Profitability can be measured in many ways. Often these measures permit financial analysts to appraise the firm's profits with respect to a given level of sales, a certain level of assets, or the owners' investment. A firm could not attract outside capital without realizing adequate level of profit from its operation. Creditors, shareholders, and management give due consideration in increasing the earnings of the firm because of the great importance the market places on earnings (Gitman & Zutter, 2012). Among the measures, profitability ratio helps to measure the profitability position of the firm (Paramasivan & Subramanian, 2009) and go on to show the overall effects of liquidity, asset management, and debt on operating results. They also enable the investor measure how well a firm is managing its expenses. Profit margin ratios compare components of income with sales. They give the investor an idea of which factors make up a firm's income and are usually expressed as a portion of each dollar of sales (Fabozzi & Drake, 2009). Some of the measures of profitability include Return on Assets, Profit margin before income tax, Total asset turnover, Profit margin after income tax, Return on equity after income taxes, Return on equity before income taxes, etc. While measures of liquidity include Current ratio, Quick ratio, Net sales to working capital, Receivables turnover and Inventory turnover.

2.2 Empirical Evidence

The previous section presented the theories of Working Capital Management and other related topics. This section is devoted to review the empirical studies on Working Capital Management and its effect on Profitability. Daniel and Ambrose

(2013) analyzed the effect of working capital management on firm's profitability in Kenya for the period 2003 to 2012. They used, balanced panel data of five manufacturing and construction firms each of which were listed on the Nairobi Securities Exchange (NSE). Pearson's correlation and Ordinary Least Squares regression models were used to establish the relationship between working capital management and firm's profitability. They found a negative relationship between profitability and number of day's accounts receivable and cash conversion cycle, while a positive association between profitability and number of days of inventory and number of day's payable. Moreover, the financial leverage, sales growth, current ratio and firm size also have significant effect on the firm's profitability. Similarly, using a sample of 88 American firms listed on New York Stock Exchange for a period of 3 years from 2005 to 2007, Amarjit Gill, et al. (2010) examined the relationship between working capital management and profitability. They found statistically significant relationship between the cash conversion cycle and profitability, measured through GOP. They concluded that managers can create profits for their firms by properly managing the cash conversion cycle and by keeping accounts receivables at an optimal level.

Using panel data methodology, Richard Kofi Akoto, et al. (2013) studied the relationship between working capital management practices and profitability of listed manufacturing firms in Ghana. They used secondary data collected from 13 listed manufacturing firms in Ghana covering the period from 2005-2009. They revealed a significantly negative relationship between profitability and accounts receivable days. However, the firms' cash conversion cycle, current asset ratio, size, and current asset turnover significantly and positively influence profitability. Hence, the authors suggested that managers can create value for their shareholders by creating incentives to reduce their accounts receivable to 30 days. It is further recommended that, enactments of local laws that protect indigenous firms and restrict the activities of importers are eminent to promote increase demand for locally manufactured goods both in the short and long runs in Ghana.

Abbasali P, et al. (2012) empirically tested the impact of working capital management on profitability and Market evaluation of the companies listed in Tehran Stock Exchange. They collected data from a sample of companies listed in Tehran Stock Exchange during the years 2006 to 2010. To measure firm's profitability, they used return on assets and return on invested capital ratios. To measure the market value of companies Tobin Q ratio was used; and variables of cash conversion cycle, current ratio, current assets to total assets ratio, current liabilities to total assets ratio and total debt to total assets ratio as working capital management Criteria. The results indicated that there is a significant relationship between the working capital management and profitability criteria of company but there is no significant relationship with the criterion of market value of company. The authors concluded that management can increase the profitability of firms by reducing the cash conversion cycle and total debts to total assets ratio.

On the other hand, Lyroudi and Lazaridis (2000) conducted a study on the cash conversion cycle and liquidity analysis of food industry in Greek using data from the major companies in the food and beverage industry of Greece, by

adopting regression and correlation analysis, as well as t-tests of two independent sample means, indicated that there is a significant positive relationship between the cash conversion cycle and the traditional liquidity measures of current and quick ratios. The cash conversion cycle was positively related to the return on assets and the net profit margin but had no linear relationship with the leverage ratios. On the other hand, the current and quick ratios had negative relationship with the debt to equity ratio, and a positive one with the times interest earned ratio. Finally, there was no difference between the liquidity ratios of large and small firms.

Sharma and Kumar (2011) examined the effect of working capital on profitability of Indian firms. They collected data about a sample of 263 non-financial BSE 500 firms listed at the Bombay Stock (BSE) from 2000 to 2008 and evaluated the data using OLS multiple regression. Hence, their findings were significantly departed from the various international studies conducted in different markets. The results revealed that working capital management and profitability is positively correlated in Indian companies. The study further revealed that inventory of number of days and number of days accounts payable is negatively correlated with a firm's profitability, whereas number of days accounts receivables and cash conversion period exhibited a positive relationship with corporate profitability.

Also, Adolphus J. Toby (2010) examined the association between working capital management policy and corporate profitability in Nigerian quoted companies. Based on the data of 107 quoted companies spread across 23 sectors for the 2003-2007 period, averages and product-moment correlation coefficients were computed based on measures of return on assets (ROA), net profit margin (NPM) and net current assets ratio (NCAR). The Love day Likelihood Test was adopted to establish the minimum value for the correlation to be most likely using sectoral data points. On the average all the sectors adopted an aggressive working capital management strategy by relying heavily on current liabilities for financing their working capital needs. Accordingly, the study identified that the adoption of this strategy produced negative profitability in most of the sectors. Also, the result showed strong positive correlation between NCAR and selected measures of profitability. Finally, the author suggested that companies would maximize profitability and add value by adopting the conservative working capital management strategy (i.e. investing more in current assets) as long as the operating environment and money markets are vigorous.

Kesseven Padachi (2006) examined the trends in working capital management and its impact on firms performance for a sample of 58 Mauritian Small Manufacturing Firms operating in five major industry groups (food and beverages, leather garments, paper products, prefabricated metal products and wood furniture) which were both registered and organized as proprietary/private companies. Using panel data analysis for the period 1998 – 2003, the association between working capital management and corporate profitability was examined. The trend in working capital needs and profitability of firms are examined to identify the causes for any significant differences between the industries. The return on total assets defined as profit before interest and tax divided by total assets was used as a measure of profitability. The efficiency ratios, namely inventory period, accounts payable period and accounts receivable period, were

used as measures of working capital. The Cash Conversion Cycle (CCC) was used as a comprehensive measure of working capital. To measure the extent of aggressive financing policy, the regressions were also included the ratio of current liabilities to total assets with a high ratio being relatively more aggressive. Sales a proxy for size (the natural logarithm of sales), the gearing ratio (financial debt/total assets), the gross working capital turnover ratio (sales/current assets) and the ratio of current assets to total assets were included as control variables in the regressions. Accordingly, the regressions result indicated that high investment in inventories and receivables is associated with lower profitability. An analysis of the liquidity, profitability and operational efficiency of the five industries showed significant changes and how best practices in the paper industry have contributed to performance. Also, the results discovered an increasing trend in the short-term component of working capital financing.

On the other hand, using a sample of Japanese and Taiwanese firms Wang (2002) found that a shorter cash conversion cycle would lead to a better firm's operating performance. Similarly, Teruel and Solano (2007) using samples of small to medium sized Spanish firms for the 1996-2002 periods revealed that firms can create value by reducing the days in inventory period and the debtors' collection period, thus leading to the reduction in the cash conversion cycle. Deloof (2003), Samiloglu & Demirgunes (2008) and Uyar (2009), in their respective Belgium, Japan and Turkey found that there exist inverse relationship between working capital management measured by the CCC and firms financial performance. The implication is that by adopting a working capital policy which results in low investment in inventories and account receivables and the highest value of account payables, management could maximize the firms' earnings. This has been reported earlier by Blinder and Maccini, 1991, that investing more in cash conversion cycle (conservative policy) could lead to improved profitability since retaining high inventory levels is expected to increase sales, reduce supply costs, reduce cost of possible interruption in production and protect against price fluctuations caused by macro and micro economic factors. A longer receivable collection period could reinforce the relationship with customers and hence may lead to an increase in sales revenue (Ng et al., 1999). Likewise, Gill et al. (2010), in their study of US firms identified a positive relation between CCC and firm profitability; however, they did find a highly significant negative relation between account receivables and firm profitability. They suggested that management can improve the earnings of the firm by maintaining the investment in working capital to a minimum level.

As can be observed from the foregoing empirical evidence, a lot of studies have been made on the subject of working capital management and its effect on firm profitability. However, majority of the studies were case study driven which results in contradicting and inconclusive outcomes regarding the effect of working capital management on firms' financial performance. Hence, the investigator s of the current study is highly motivated to extend the studies in Ethiopia, Addis Ababa market with reference to food complex manufacturing companies as there are no adequate studies on the subject.

III. RESEARCH METHODOLOGY

3.1 Research Design

The aim of this research is to investigate and analyze the relationship between working capital management & profitability of food complex manufacturing firms currently operating in around Addis Ababa, Ethiopia. The impact of working capital components, which are the days sales outstanding (DSO), Days inventory outstanding (DIO), Days payment outstanding (DPO) and cash conversion cycle (CCC), current ratio (CR) and quick asset ratio (QAR) on profitability of Food Complex Manufacturing Companies in Ethiopia, Addis Ababa, was analyzed. The research design, used is a pooled panel data analysis of cross-sectional and time series data. Moreover, explanatory research designs with quantitative approach through which cause and effect relationship of one dependent and one or more independent variables were employed.

3.2 Sample Design and Sample Size Determination

The target population for this study was all Food Complex Manufacturing Companies currently operating in Addis Ababa. Thus, the sample comprises of Food Complex Manufacturing Companies operating in around Addis Ababa only. Specifically, the authors selected those firms meeting the following basic criteria (a) in the line of business for more than five years; (b) maintain book of records using Accepted Accounting Standards, and developed the habit of preparing financial statements annually and whose book of accounts are examined by independent Auditors. These criteria make the data more reliable and dependable. To obtain the required data, purposive sampling was applied to make the sample best fitted for the designed model. The study consist of ten (10) purposively selected food complex manufacturing firms from a population of fifty (50) companies operating at around Addis Ababa. List of manufacturing companies included in the sample were Kojj food complex manufacturing Co., Sarem food complex manufacturing Co., Helina enrich food Complex manufacturing Co., Astco food complex manufacturing Co., Simachew food complex manufacturing Co., Ahfa food complex manufacturing Co., Health care food Plc., Universal food complex manufacturing Co., Meshobia food complex manufacturing Co., and NAS Foods Plc.

3.3 Data Source and Collection Methods

Data refers to known facts or things used as a basic for inferring. Data can be described either qualitative or

quantitative. In this study the authors used quantitative data to perform quantitative research so as to examine the phenomena by analyzing the numerical data, using mathematical based methods, particularly statistics. The quantitative data was secondary data collected from Annual Financial Statements of the sample firms for consecutive five years period from 2009 to 2013. The researchers considered five years as a study period, because of limited number of firms having an operating life of more than five years that can placate the basic criteria established above.

3.4 Data Analysis Techniques

The authors applied three main data analysis techniques. Firstly, descriptive statistics was used to describe the sample data collected. This statistical technique helps to overview the sample characteristics. Secondly, Pearson correlation analysis was used to define whether working capital management is associated with firm profitability. Thirdly, regression analysis was employed to test the research hypotheses. Finally, the analysis is presented by using figures and tables.

3.5 Variables Identification

3.5.1 Independent Variables

To measure the working capital management efficiency of a company, the study used Account Receivable Collection period (ARCP/DSO), Inventory turnover day (ITD/DIO), and Account payable day (APD/DPO), Cash Conversion Cycle (CCC), current ratio (CR), quick asset ratio (QAR) as independent variables. These variables are considered as ratios that measures working capital management efficiency of firms.

3.5.2 Dependent Variable

To measure the selected firms financial performance position ROA was selected as dependent variable. Return on Assets measures how efficiently the company uses its assets to realize profits. Return on assets = Net income before taxes ÷ Total assets

3.5.3 Control Variables

Firm size, firm sales growth and the leverage ratio considered in this study as control variables because they all are inherent firms' characteristics which may also affect company operational profitability in addition to the effect of independent variables. Hence, firm Size is measured by natural logarithm of sales; Firm Sales Growth rate is measured by change in sales while debt ratio is computed by dividing total debt by total Assets.

Table 1: Variables, Their Types, Abbreviations and Measurements

Variable	Abbreviation	Type	Measurement
Return on Assets	RoA	Dependent	Net income before taxes ÷ Total assets
Inventory Conversion Period (Days Inventory Outstanding)	DIO	Independent	Average Inventory X 365 / COGS
Receivables Collection Period (Days Sales Outstanding)	DSO	Independent	Accounts Receivables X 365/ Sales
Payables Deferral Period (Days Payment outstanding)	DPO	Independent	Total Purchases/Average Accounts Payable
Current Ratio	CR	Independent	Current Assets/Current Liabilities
Quick Asset Ratio	QAR	Independent	Current Assets – Inventories/Current

			Liabilities
Cash Conversion Cycle	CCC	Independent	DIO + DSO - DPO
Firm Size	LnSales	Control	Natural Logarithm of Sales
Debt Ratio	DtR	Control	Total Debt / Total Assets
Growth in Sales	GiS	Control	This Year's Sales – Previous Year's Sales / Previous Year's Sales

3.5.4 Model Planning

In the foregoing section, the authors described that ROA depend upon days sales outstanding (DSO), Days inventory outstanding (DIO), Days payables outstanding (DPO), cash conversion cycle (CCC), current ratio (CR) and quick asset ratio (QAR). After reviewing theoretical literature, the following best fitted multiple regression models were developed to measure the effect of working capital management on financial performance (profitability); this model was employed by most of the previous researchers.

$$ROA = f(DSO, DIO, DPO, CCC, CR, QAR) \dots \dots \dots \text{Equation}$$

When the least square model has been converted into specified variables as follows;

$$ROA = \beta_0 + \beta_1(ITD) + \beta_2(ARCP) + \beta_3(DPO) + \beta_4(CCC) + \beta_5(CR) + \beta_5(QAR) + \beta_5(FS) + \beta_5(FGR) + \beta_5(DR) + \epsilon$$

Where;

- | | | | |
|----------|---|------------|---------------------|
| ROA | = Return on Assets | CR | = Current ratio |
| ARCP/DSO | = Account receivable collection period (Days sales outstanding) | QAR | = Quick Asset ratio |
| ITD/DIO | = Inventory turnover day (Days inventory outstanding) | FS | = Firm Size |
| DPO | = Days payables outstanding | FGR | = Firm growth rate |
| CCC | = Cash conversion cycle | DR | = Debt ratio |
| | | ϵ | = the error term |
| | | β | = Coefficients |

Specifically, when the above general model is converted into the specified Variables of this study the following multiple regression model equations were run to estimate the effect of working capital policies on the profitability of selected companies:

- Inventory turnover day and Profitability Measure (ROA):
 $ROA_i = \beta_0 + \beta_1 ITDi + \beta_2(FSi) + \beta_3(FGRi) + \beta_4(DRi) + \epsilon \dots \dots \dots (1)$
- Accounts Receivable Collection period and Profitability Measure (ROA):
 $ROA_i = \beta_0 + \beta_1(ARPi) + \beta_2(FSi) + \beta_3(FGRi) + \beta_4(DRi) + \epsilon \dots \dots \dots (2)$
- Days payable Outstanding and Profitability Measure (ROA):
 $ROA_i = \beta_0 + \beta_1(DPOi) + \beta_2(FSi) + \beta_3(FGRi) + \beta_4(DRi) + \epsilon \dots \dots \dots (3)$
- Cash Conversion Cycle and Profitability Measure (ROA):
 $ROA_i = \beta_0 + \beta_1(CCCi) + \beta_2(FSi) + \beta_3(FGRi) + \beta_4(DR) + \epsilon \dots \dots \dots (4)$
- Current ratio and Profitability Measure (ROA):
 $ROA_i = \beta_0 + \beta_1(CRi) + \beta_2(FSi) + \beta_3(FGRi) + \beta_4(DRi) + \epsilon \dots \dots \dots (5)$
- Quick Asset ratio and Profitability Measure (ROA):
 $ROA_i = \beta_0 + \beta_1(ARPi) + \beta_2(FSi) + \beta_3(FGRi) + \beta_4(FLi) + \epsilon \dots \dots \dots (6)$

IV. DATA ANALYSIS AND FINDINGS

In this part of the study, the panel data, which is prepared from the financial statements of sample firms, are analyzed using descriptive statistics, correlation analysis and linear regression analysis.

4.1 Descriptive Statistics

Table 2: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ITD	50	12.84	664.29	129.8	114.15
ARCP	50	8.91	330.65	74.57	74.32
APD	50	25.16	892.05	172	177.24
CCC	50	-224.11	271.45	32.34	94.94
CR	50	0.54	7.34	1.89	1.37
QAR	50	0.06	5.64	0.86	0.88
DR	50	0.10	0.92	0.54	0.20
FGR	50	-0.68	3.98	0.34	0.92
FS	50	3.32	5.39	4.71	0.43
ROA	50	-0.13	0.40	0.17	0.12

Source: SPSS Output from Financial Statements of Sample Firms, 2009-2013

Table 2 above shows some of selected descriptive statistics of the sample firms including the mean, standard deviations, minimum and maximum values of study variables for the study period. The research has used a total of 10 variables for the analysis purpose and the total 10 variables were broadly classified in to three categories, that is, 6 independent variables, 1 dependent variable and 3 control variables. Out of the 6 independent variables, 4 are proxies for working capital management measures of the sample firms, while the rest two independent variables are used to measure liquidity. Three variables are considered as control variables, which are firm size as measured by the natural logarithm of sales, firm growth rate measured by the relative change in sales as compared to previous year and leverage of the firms.

The mean value of return on asset is 0.17 percent and it deviates 0.13 percent to the left and right side of the mean value. This indicates that the data points are very close to the mean. Its minimum value is -0.13 percent while its maximum value is 0.4 percent. This suggests that the profitability position of the food complex manufacturing business in Addis Ababa is not found satisfactory.

The average current ratio for the sampled food Manufacturing Private Limited Companies is 1.89, which is almost approached to the preferred current ratio (as a rule of thumb it is good for the firm to have current ratio of 2). The standard deviation is 1.37. The standard deviation shows little variability in current ratio among the sampled companies. The minimum and the maximum values of current ratio is 0.54 and 7.34 respectively. The table further depicts, the mean value of Quick asset ratio is 0.87, which is slightly less than the standard quick ratio of 1 (as a rule of thumb the preferred quick ratio is 1). The value of quick asset ratio can vary to both sides of the mean value by 0.89. The minimum and the maximum value of quick ratio is 0.06 and 5.64 respectively.

Similarly, descriptive statistics for the three measures of efficiency of working capital management, namely, accounts receivable collection period, inventory turnover period and accounts payable period was computed. Accounts receivable collection period, a measurement for collection policy of the

firm, is averaged to 75 days for the sampled firms. This indicates that, firms in the sample wait 75 days on average to collect cash from credit sales. The Account receivable period shows the sampled firms wait a minimum of 8 days and a maximum of 330 days to collect credit sales and deviates by 73.81 days to both sides of the mean value. The variance shows the existence of large difference in accounts receivable period among the sampled firms.

The average value of Inventory turnover period as a proxy for inventory policy is 130 days. This means, firms in the sample needs on average 130 days to sell inventory. As it is shown in the above table, the standard deviation of inventory holding period is 114 days. To the sampled firms the inventory holding period ranges between 12 and 664 days as minimum and maximum values respectively. The maximum value of 664 days to convert inventory into sales is a very long period. The average value of Accounts payable period as a proxy for payment policy is 172 days. The standard deviation of account payable period for the sample firms is 177 days. The period ranges between 25 days and 892 days. The minimum value of account payable period, 25 days, indicates that the firm needs 25 days to effect payment of credit purchases.

Average cash conversion cycle, one of the comprehensive measures of working capital, days for the sampled firm is 30 days and the standard deviation is 96 days. The minimum value of -224 days shows that a firm records a large inventory turnover and/or cash collections from credit sales before making a single payment for credit purchases. It means that the accounts receivable period and/or the inventory holding period are very short and/or the accounts payable period of the firm is very long. On the other hand, the maximum time for cash conversion period of 271 days is considered a very long period.

In addition, the above table includes the descriptive statistics of control variables that was used in the study. The first control variable, firm size, as measured by the natural logarithm of annual sales, is averaged to 4.72 for the sampled firms and it can deviate to both sides of the mean value by 0.43. The minimum and maximum values of the firm size measured by the natural logarithm of the firm's annual seals are 3.32 and 5.79

respectively. The second control variable, firm growth rate average value is 34 percent, as measured by changes in annual sales. This indicates that there was moderate sales growth rate among the sampled firms. However, there is a deviation of 92 percent, from mean value of sales growth to both directions. The minimum and maximum sales growth among the sampled firms is -68 percent and 398 percent respectively. The third control variable, financial leverage is 54 percent on average and vary by 20 percent to both sides of the mean value. The minimum and maximum values of financial leverage are 10 percent and 92 percent respectively.

4.2 Correlation Analysis on Working Capital Management and Profitability

Pearson correlation coefficient is the most common tool to measure the relationship between two variables. It measures the linear dependence between two variables. The coefficient is a value between +1 and -1 inclusive. A value of 1 implies that a linear equation describes the relationship between the two variables perfectly, i.e. the first variable increases in the same

proportion as the second one. A value of -1 implies that all data points lies on a line for which if the first variables increases the second have a perfectly proportional decrease. A value of 0 implies that there is no linear correlation between the variables. The other values are a mean term between these results. E.g. a coefficient of 0.4 means that there is a positive but not perfect relationship between the variables, a coefficient of 0.8 means the same thing however a 0.8 means a stronger relationship than a 0.4 coefficient. The interpretation of the correlation result is subjective. An important aspect to be considered is that the Pearson correlation coefficient presupposes that the variables are normally distributed. So in order to verify if this is valid for the studied sample test for normality was made for each of the variables.

4.2.1 Correlation Analysis of ARCP/DSO and ROA

Correlation Analysis has been performed to examine the relationship between Account receivable collection period and profitability and the result is shown in the following table.

Table 3: Correlation Analysis of ARCP/DSO and ROA

		ROA	ARCP	APD	CCC
ROA	Pearson Correlation	1	-.311*	-.274	-.566**
	Sig. (2-tailed)		.028	.054	.000
	N	50	50	50	50
ARCP	Pearson Correlation	-.311*	1	.664**	.669**
	Sig. (2-tailed)	.028		.000	.000
	N	50	50	50	50
APD	Pearson Correlation	-.274	.664**	1	.691**
	Sig. (2-tailed)	.054	.000		.000
	N	50	50	50	50
CCC	Pearson Correlation	-.566**	.669**	.691**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	50	50	50	50

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS Output from Financial Statements of Sample Firms, 2009 - 2013

Results from the Pearson correlation analysis reveal that ROA has a significant negative relationship with receivable collection day. This would suggest that better returns may be associated with fast collection of receivables and undue length of receivable days negatively affect ROA. However, such an assumption further investigated in this study by using linear regression analysis to confirm any economic impact of Account Receivables collection days on return on assets.

In the previous chapter of this study, it was hypostasized that, there is strong negative correlation between accounts receivable period and profitability as measured by return on asset. In line with the research hypothesis, the above correlation Table showed strong negative correlation coefficient between accounts receivable period and profitability measured by return on asset. From the table, the correlation coefficient of accounts receivable period with return on assets is -0.311 and significant

at the 0.05 level. It indicates that the shorter account receivable period is strongly linked with high profitability and/or longer accounts receivable period is associated with lower profitability.

4.2.2. Correlation Analysis of APD/DPO and ROA

Table 3 also shows the correlation between Account payable days and profitability measured by return on asset. The result showed that ROA has a negative correlation with Account payable days. In the first chapter of this study, it was hypothesized that there is a strong positive relationship between accounts payable period and profitability as measured by return on assets. In contrary with the research hypothesis, the above correlation matrix indicates negative relationship between account payable period and profitability measure. Account payable period has correlation coefficients of -0.27 with return on assets and the relationship is not found significant. However, the prevailed negative relationship between accounts payable period and profitability goes with the view that less profitable firms wait longer to pay their bills.

4.2.3. Correlation Analysis of CCC and ROA

Pearson correlation analysis between CCC and ROA is also processed in the above table. The result suggested that ROA

has a significant negative correlation with CCC. This means that better returns may be associated with shortest CCC and lengthy CCC negatively affects ROA. However, such a conclusion further investigated in this study by using linear regression analysis to confirm any economic impact of CCC on return on assets.

In the previous chapter of this study, it was hypostasized that, there is strong negative correlation between CCC and profitability as measured by return on asset. In line with the research hypothesis, the above correlation Table showed strong negative correlation coefficient between CCC and profitability measured by return on asset. From the table, the correlation coefficient of CCC with return on assets is -0.566 and significant at the 0.01 level. It indicates that the shorter the CCC is highly associated with higher profitability and/or longer the CCC is highly associated with lower profitability.

1.2.4. Correlation Analysis of ITD/DIO and ROA

Pearson correlation analysis between inventory conversion period and profitability as measured by ROA has been computed and the result is summarized in the following table:-

Table 4: Correlation Analysis of ITD/DIO and ROA

		ROA	ITD	DR	FGR	FS
ROA	Pearson Correlation	1	-.530**	.322*	.127	.274
	Sig. (2-tailed)		.000	.023	.380	.054
	N	50	50	50	50	50
ITD	Pearson Correlation	-.530**	1	.098	-.122	-.490**
	Sig. (2-tailed)	.000		.497	.397	.000
	N	50	50	50	50	50
DR	Pearson Correlation	.322*	.098	1	-.136	.142
	Sig. (2-tailed)	.023	.497		.347	.324
	N	50	50	50	50	50
FGR	Pearson Correlation	.127	-.122	-.136	1	-.135
	Sig. (2-tailed)	.380	.397	.347		.349
	N	50	50	50	50	50
FS	Pearson Correlation	.274	-.490**	.142	-.135	1
	Sig. (2-tailed)	.054	.000	.324	.349	
	N	50	50	50	50	50
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

Source: SPSS Output from Financial Statements of Sample Firms, 2009-2013

Results from the correlation analysis revealed that ROA has a significant negative correlation with inventory turnover day. This would suggest that better returns may be associated with fast production and selling activities. However, the result further investigated in this study by using linear regression analysis to confirm any economic impact of inventory turnover days on return on assets.

In the first chapter of this study, it was hypothesized that there is strong negative correlation between inventory turnover days and profitability as measured by return on asset. In line with the research hypothesis, the above correlation Table shows strong negative correlation coefficient between inventory turnover day and return on asset. From the table, the correlation coefficient of inventory turnover days with return on assets is -

0.53 percent and significant at the 0.01 level. It indicates that the shorter the inventory turnover day is strongly associated with high profitability and/or longer inventory turnover days is associated with lower profitability.

4.2.5. Correlation of Control Variables with ROA

In addition, as it can be clearly reflected in Table 4 there is a positive correlation coefficient between firm size and profitability as measured by return on assets. The Pearson coefficient of 0.27 means firm size has weak positive relationship with return on assets. Moreover, the above correlation table

showed that firm growth rate is also weakly and positively related with Return on asset with a correlation coefficient of 0.12. On the other hand, financial leverage has strongly and positively correlations with return on assets with a correlation coefficient of 0.322.

4.2.6. Correlation Analysis of CA, QAR and ROA

Pearson between liquidity measures (Current assets ratio and quick asset ratio) and profitability as measured by ROA has been performed and the result is summarized in the following table

Table 5: Correlation analysis of CA, QAR and ROA

		ROA	CR	QAR
ROA	Pearson Correlation	1	-.237	-.071
	Sig. (2-tailed)		.097	.624
	N	50	50	50
CR	Pearson Correlation	-.237	1	.820**
	Sig. (2-tailed)	.097		.000
	N	50	50	50
QAR	Pearson Correlation	-.071	.820**	1
	Sig. (2-tailed)	.624	.000	
	N	50	50	50

** . Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS Output from Financial Statements of Sample Firms, 2009-2013

In finance theories there is a trade-off between profitability and liquidity. In line with this theoretical framework, it was hypothesized that there is a strong negative relationship between profitability measures and the traditional measures of liquidity. However, the above table showed that, there is negative relationship between liquidity, as measured by both current ratio and quick assets ratio, and the profitability measures but the correlation is not found significant. As indicated in the above table the correlation coefficients for current ratio and quick asset ratio with return on assets are -0.237 and -0.071 respectively.

Although, the pair wise correlations give evidence for relationship between two variables; it says nothing about cause and effect relationships between the variables. So that, from the results of correlation analysis, it is difficult to say that shorter accounts receivable period leads to higher profitability or shorter inventory turnover period is a result of the higher profitability. Likewise, it is difficult to interpret the CCC and profitability variables by stating that a higher profit is the result of shorter CCC or lower profit is the result of longer CCC.

The limitation of correlation analysis is it shows the coefficient and the direction of relationship (weather it is positive or negative) between two variables. Another additional shortcoming of correlation analysis is that, it does not provide reliable indicators or coefficients of association in a manner which control for additional explanatory variables. This means care must be exercised when interpreting the pair wise correlation coefficients. In examining effect of some variables on the other variables, additional analysis will be carried out using

linear regression analysis so as to overcome the problems of correlation analysis.

4.3. Regression Analysis of WCM and ROA

To further investigate the relationship between working capital management and firm’s profitability and also to analyze the impact of independent variables on firms profitability measured by return on assets multiple regression model were carried out. Moreover, two additional regressions analysis were done to examine the relationship between firm’s profitability measure (return on asset) and the traditional measures of liquidity (current asset and quick asset).

Before running each of the following regression models, the basic eight assumptions of multiple Regression Models (MRM) has been tested. The first assumption says dependent variable should be measured on a continuous scale. The second assumption says there must be two or more independent variables which can be either continuous and/or categorized. The third assumption is about the independence of observation and independence of residuals. The forth assumption says there need to be a linear relationship between the dependent variable and each of the independent variables and the dependent variable and the independent variable collectively. The fifth assumption says the data need to show homoscedestically. The sixth assumption says the data must not be multi co-linearity. The seventh assumption says there should be no significant outlier. Finally, the last assumption said that the residual error appropriately normally distributed.

4.3.1. Regression Analysis of ITD and ROA

Regression analysis has been performed to analyze the effect of inventory turnover day on return on assets and the result

is shown in the following table. The data were tested for all the MRM assumptions and the result is shown in the appendix.

Table 6: Regression analysis of ITD and ROA

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.661 ^a	.437	.387	.10008

a. Predictors: (Constant), FS, FGR, DR, ITD

ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	.350	4	.088	8.738	.000 ^a
Residual	.451	45	.010		
Total	.801	49			

a. Predictors: (Constant), FS, FGR, DR, ITD

b. Dependent Variable: ROA

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	.535	.322		1.663	.103
ITD	-.123	.028	-.585	-4.380	.000
DR	.251	.072	.402	3.474	.001
FGR	.014	.016	.102	.882	.382
FS	-.167	.401	-.056	-.417	.678

a. dependent variable ROA

From the model summary table, we have seen that the coefficient of determination value is 0.437, which indicates 43.7% of the variability in the return on assets is well explained by the changes in the independent variables used in the model. However, the remaining 56.3 percent change in the return on asset is caused by other factors that are not included in the models. Moreover, the overall significance of the model, when measured by F statistics of 8.738 with P-values of 0.000 on the ANOVA table, indicate that the model is well fitted at 1 percent significance level. The result of the regression analysis in the above table indicates that inventory turnover day has a significant negative impact on profitability. The t-significant value of -4 and 0.000 indicates that the impact of inventory turnover days on ROA is very strong and significant. This finding is in line with the hypothesis that there is strong negative relationship between inventory turnover day and profitability of firms. This means that inventory turnover period significantly and negatively affect return on asset. That is, as the inventory

turnover period increases, profitability will decrease in the food complex manufacturing firms operated in around Addis Ababa and vice versa. This does make economic sense; the longer the inventory is held, the more working capital is tied up, and firms thus have less opportunity to invest this capital in profitable projects. Therefore, the firm's profitability can be enhanced by speeding up the inventory conversion period. This result is similar with the previous study of Tiringo Dinku (2013), Sharma and Kumar (2011), Ponsian N.et.al. (2014) Shin and Soenen (1998), Lazaridis & Tryfonidis (2006), Raheman and Nasr (2007), Teruel and Solano (2007) while, it is contrary to the prior study findings of Daniel M. and Ambrose J. (2013), Shahid Ali (2011) and Mathuva (2010).

4.3.2. Regression Analysis of ARCP and ROA

Regression analysis has been done to analyze the effect of receivable collection day on return on assets and the result is shown in the following table. The data is tested for all assumption of multiple regression models.

Table 7: Regression analysis of ARCP and ROA

Model Summary

Model R	R Square	Adjusted R Square	Std. Error of the Estimate
.469 ^a	.220	.151	.11781

a. Predictors: (Constant), FS, FGR, DR, ARCP

ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	.176	4	.044	3.174	.022 ^a
Residual	.625	45	.014		
Total	.801	49			

a. Predictors: (Constant), FS, FGR, DR, ARCP

b. Dependent Variable: ROA

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	-.082	.425		-.193	.848
ARCP	-.126	.110	-.182	-1.148	.257
DR	.192	.084	.307	2.288	.027
FGR	.018	.020	.133	.901	.373
FS	.520	.453	.174	1.147	.257

a. Dependent Variable: ROA

The coefficient of determination in the model summary is 0.22. This suggests that 22 percent of variability in the return on assets is explained by the changes in the independent variable used in the model. Moreover, the overall significance of the model in the ANOVA table, when measured by their respective F statistics of 3.08 with P-values of 0.022, indicate that the model is well fitted at 5 percent significance level. The result of the regression analysis in the above table indicates that receivable collection day negatively related to profitability but it is not significant as the t-significant value is less than 2. This result is not 100% in line with the hypothesis that there is strong negative relationship between receivable collection day and profitability of firms. However, receivable collection day negatively affects return on asset but not significantly. This implies that managers to some extent can increase return on assets by reducing receivable collection day. As Mathuva (2010) explained that the sooner customers make payment, the more cash the companies get to reinvest in inventory, consequently they get higher sales

which leads to higher profit. This result is consistent with the prior study findings of Gamze V. et.al (2012), Daniel M. and Ambrose J. PhD (2013), Tirngo Dinku (2013), Shahid Ali (2011), Sharma and Kumar (2011), Ponsian N.et.al. (2014), Shin & Soenen (1998), Lazaridis & Tryfonidis (2006), Raheman & Nasr (2007). However, positive relationship between account receivable collection period and earnings before interest tax did found by Ramachandran, A & Janakiraman, M (2009) as explained in the literature review of the study of N.Venkata Ramanan (2013). In addition, contradicting evidence found by Sharma and Kumar (2011), who found positive relation between ROA and accounts receivables.

4.3.3. Regression Analysis of DPO and ROA

In the same fashion, regression analysis has been computed to investigate the effect of account payable period on returns on assets. The data is tested for all the assumption of multiple regression models.

Table 8: Regression Analysis of DPO and ROA

Model Summary

Model	R	R Squared	Adjusted R Square	Std. Error of the Estimate
1	.570 ^a	.324	.264	.10964

a. Predictors: (Constant), FS, FGR, DR, APD

ANOVA^b

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	.260	4	.065	5.403	.001 ^a
Residual	.541	45	.012		
Total	.801	49			

a. Predictors: (Constant), FS, FGR, DR, APD

b. Dependent Variable: ROA

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.488	.410		1.190	.240
	APD	-.311	.107	.473	-2.911	.006
	DR	.336	.092	.537	3.666	.001
	FGR	.014	.018	.103	.800	.428
	FS	.095	.438	.032	.216	.830

a. Dependent Variable: ROA

The value of R squared, which is the coefficient of determination, in the model summary table is 0.324. This indicates that 32.4 percent of the changes in return on asset are explained by the variables used in the model. On the other hand, the remaining 67.6 percent change in return on assets is caused by other factors that are not included in the model. The overall significance of the model in the ANOVA table when measured by F statistics of 5.403 with P-values of 0.0000 suggests that the model is well fitted at the 1 percent significance level. The above table further manifest that Accounts payable period has a significant negative impact on firm's profitability as measured by return on assets at the 1 percent significance level. A negative relationship of ROA and the accounts payables deferral period, contradicts the notion that the longer a firm delays its payments, the higher the level of working capital it stores and uses with the intent of increasing profitability. This difference may exist because less profitable firms take longer to pay their obligations. To the contrary of the hypothesis, the regression analysis showed that there is strong negative relationship between accounts payable and profitability of firms. A negative significant

relationship between accounts payable period and profitability can be explained by the benefits of early payment discounts. Such findings were also supported by Tenda i Zawaira; Shahid Ali (2011), Shin and Soenen (1998), Lazaridis and Tryfonidis (2006), Raheman and Nasr (2007). Nevertheless, some studies have found that firm profitability is significantly and positively related to days payable outstanding. Such studies include Daniel M. and Ambrose J. PhD (2013) Tirngo Dinku (2013) Sharma and Kumar (2011) Ponsian N .et al. (2014), Mathuva (2010).

4.3.4. Regression Analysis of CCC and ROA

Regression analysis has been run to analyze the effect of CCC, the comprehensive measures of working capital management, on the return on assets. Tests for the assumptions of MRM have been done. Table 7 below; present the result of the regressions analysis of cash conversion cycle and firms profitability. As it is clearly shown in the table cash conversion cycle has significant negative relationship with return on assets at the 1 percent significance level.

Table 9: Regression Analysis of CCC and ROA

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.642 ^a	.412	.360	.10225

a. Predictors: (Constant), FS, FGR, DR, CCC

ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	.330	4	.083	7.898	.000 ^a
Residual	.471	45	.010		
Total	.801	49			

a. Predictors: (Constant), FS, FGR, DR, CCC

b. Dependent Variable: ROA

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.543	.339		1.601	.116
	CCC	-.125	.031	-.564	-4.060	.000
	DR	.192	.073	.307	2.639	.011
	FGR	.010	.017	.071	.587	.560
	FS	-.155	.414	-.052	-.375	.710

a. Dependent Variable: ROA

The value of R squared in the model summary table is 0.412. This indicates that 41.2 percent of the changes in return on asset are explained by the variables used in the model. On the other hand, the remaining 58.8 percent change in return on assets is caused by other factors that are not included in the model. The overall significance of the model when measured by F statistics of 7.898 with P-values of 0.0000 in the ANOVA table, suggests that the model is well fitted at the 1 percent significance level. The value of standardized and un-standardized coefficient in the table indicates that CCC has significant negative impact on the profitability of the firm as measured by ROA. This means as the CCC increase, profitability will decrease and vice versa. This result is in agreement with the hypothesis which was explained in the previous chapter, that there is a significant negative relationship between cash conversion cycle and profitability of firms. This confirms the notion that a decrease in the cash conversion cycle will produce more profits for a firm. This relationship has been confirmed in a number of studies, including Daniel M. and Ambrose J. (2013); Gamze V. et al. (2012) Tirngo Dinku (2013) Raheman and Nasr (2007) Shin and Soenen (1998), Lazaridis and Tryfonidis (2006); Raheman and Nasr (2007), Deloof (2003), Uyar (2009), Samiloglu and Demirgunes (2008). Contrary to this finding Richard K. et al. (2013); Lyroudi and Lazaridis (2000); Shahid Ali, Sharma and Kumar (2011) Ponsian N. et al. (2014); Ng et al. (1999); Gill et al. (2010) found positive relationship between CCC and profitable.

4.3.5. Regression Analysis of CR and ROA

To analyze effect of current ratio on return on assets, regressions analysis has been performed. The model was tested for the assumptions of MRM. While testing the assumptions, multi co linearity problem were identified as the two independent variables (current ratio and quick asset ratio) are perfectly correlated with each other. However, variable inflation factor in excess of 5 is considered as an indication of harmful multi co linearity for a sample of 50 or less observation (Zikmund et al., 2010). In this particular study, all the VIF are much less than 5 and treated as the multi co linearity effect is not harmful. See Table 9.

The result of the regression analysis can therefore be interpreted with a greater degree of confidence. The Durbin Watson statistics was also used to test for the auto correlation. The Durbin Watson value of 1.4 indicates that the data has no serial correlation or auto correlation.

The value of R square in the model summary is 0.20, which means that 20% of the variation in dependent variables (ROA) is explained by variation in the independent value. Table 9 shows that current ratio has no significant impact on the profitability of the firm as measured by ROA. Current ratio coefficient is positive but very small and it means that if the current assets are growing or current liabilities are decreasing than the ratio is growing and then ROA is slightly growing, too.

This result is consistent with the previous study of Hina Agha (2014); Amit et al. (2005), as explained in the literature review of the study of Ehiedu, Victor Chukwunweike (2014); Richard K. et al (2013); Lyroudi and Lazaridis (2000) and J. Aloy Niresh (2012). Conversely, strong negative relationship between ROA

and liquidity ratio did found by Qasim Saleem and Ramiz Ur Rehman (2011). In another hand significant positive correlation between current ratio and profitability did found by Ehiedu, Victor Chukwunweike (2014).

Table 10:Regression Analysis of CR and ROA

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.447 ^a	.200	.129	.11933	1.428

a. Predictors: (Constant), FS, FGR, CR, DR

b. Dependent Variable: ROA

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients		Sig.	Collinearity Statistics	
	B	Std. Error	Beta	T		Tolerance	VIF
1 (Constant)	-.498	.289		-1.727	.091		
CR	.037	.097	.081	.384	.702	.398	2.510
DR	.235	.133	.376	1.774	.083	.396	2.524
FGR	.029	.019	.208	1.529	.133	.963	1.038
FS	.781	.406	.262	1.921	.061	.958	1.044

a. Dependent Variable: ROA

ANOVA^b

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.160	4	.040	2.809	.036 ^a
	Residual	.641	45	.014		
	Total	.801	49			

a. Predictors: (Constant), FS, FGR, CR, DR

b. Dependent Variable: ROA

4.3.6. Regression Analysis of QAR and ROA

To analyze the effect of quick assets ratio on return on assets, regression analysis has been carried out. In the same fashion, the fulfillment of all the assumption of LRM was checked and found multi co linearity problem as the two independent variables (current ratio and quick asset ratio) are perfectly correlated with each other. However, in this particular study, all the VIF are less than 5 and it is assumed that the multi co linearity effect is not harmful. The result of the regression analysis can therefore be interpreted with a greater degree of confidence. The Durbin Watson statistics was also used to test for the auto correlation. The Durbin Watson value of 1.3

indicates that the data has no serial correlation or auto correlation.

The value of R square in this model is 0.19, which indicates that 19 percent of the variation in the value of the return on asset is explained by the model. This figure is also confirmed by the analysis of variance table. The results of the regression table suggest that quick asset ratio has no significant impact on return on asset as the t significant value is less than 2. This result is similar with the previous study of, Ehiedu, Victor Chukwunweike (2014), Ehieu, Victor Chukwunweike (2014) and Amit et al. (2005). Conversely, strong negative relationship between ROA and liquidity ratio did found by Qasim Saleem and Ramiz Ur Rehman (2011).

Table 11: Regression Analysis of QAR and ROA

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.506 ^a	.256	.190	.11503	1.383

a. Predictors: (Constant), FS, QAR, FGR, DR

b. Dependent Variable: ROA

ANOVA^b

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	.205	4	.051	3.881	.009 ^a
Residual	.595	45	.013		
Total	.801	49			

a. Predictors: (Constant), FS, QAR, FGR, DR

b. Dependent Variable: ROA

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	-.546	.265		-2.058	.045		
QAR	.112	.059	.341	1.894	.065	.509	1.965
DR	.346	.114	.552	3.039	.004	.501	1.997
FGR	.031	.018	.225	1.716	.093	.961	1.041
FS	.810	.391	.272	2.073	.044	.963	1.039

a. Dependent Variable: ROA

V. CONCLUSIONS AND RECCOMENDATIONS

5.1. Conclusions

This paper examined the impact of working capital management on profitability of 10 food complex manufacturing companies operating in and around Addis Ababa from 2009 to 2013. The results provided evidence that the Cash Conversion Cycle, as a measure of working capital management, negatively affects Return on Assets. A negative relationship between the Receivables Collection Period, strong negative relation of Inventory Conversion Period, Payment Deferral Period and profitability was also found. This indicates that companies can increase their profitability by shortening receivables, inventory and payables periods. This finding is in line with many previous studies, namely with those of Raheman and Nasr (2007) and Deloof (2003).

In general, the results from the analysis suggest that food complex manufacturing companies can rethink their corporate financial management in order to boost their growth and subsequently the creation of value for shareholders. Such companies can direct their efforts towards their own resources and circumvent certain financial problems. By optimizing the

time span during which working capital is tied up the company can improve profitability. Moreover, working capital management facilitates other forms of financing because those financiers who focus on balance sheet structures are interested to invest on companies with solid financial positions. Concerning the relationship between company current asset ratio and quick asset ratio on profitability as measured by return on assets, there is no significant effect of increasing or decreasing the current ratio and quick asset ratio on profitability. Therefore, the results of the research indicate that through proper working capital management, the company can increase its profitability.

5.2 Recommendations

- Managers of food complex manufacturing companies in Addis Ababa should continuously monitor their inventory levels with a view to reducing the number of days inventory are held in store before they are sold. This will not only enhance their profitability positions but also maximize returns to shareholders and firm value in general.
- Before struggling to secure funds from the traditional sources of finance such as banks and other lending institutions, companies should consider effective

working capital management as an inward option for source of financing

- Effective working capital management can attract financing channels because creditors, who look at and appraise the structure of balance sheet to make financing decision, will further invest in financially healthy companies.
- The policy implications of this finding is that financial managers of food complex manufacturing companies can improve the company's performance by reducing cash conversion cycle. Moreover, reducing inventory period, payable period and receivable period will enhance company's profitability and consequently bring positive effect on the firm financial position. Hence, they should develop and implement effective, interrelated and coordinated CCC management strategy, Inventory management strategy, Account receivable management strategy and Account payable management strategy.
- In addition, the inventory management strategy of the company should focus on avoidance of over stocking of inventory resulting efficient outcome of investment. It has to make sure certain standards and levels which will stop pilling up of inventory. Moreover, the companies should engage in developing dependable and strong relationship with suppliers through quick settlement of outstanding liabilities

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