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Table of Contents

Discovery of Highly Conserved Evolutionary Regions in Polyhydroxyalkanoate Synthase (PhaC) From Pseudomonas sp. Using Bioinformatics and In-silico Approaches.....	1
Ubaid Mehmood, Faizan Muneer, Xiao Junhua, Habibullah Nadeem.....	1
Thyroid Ultrasound Report Generation Based On Urdu Speech Recognition.....	19
Naeem Haider, Wenzhong Yang.....	19
Factors Affecting Community Anxiety In Facing Covid-19 In Traditional Markets, Sumbermanjing Wetan District, Malang Regency.....	31
Faizatur Rohmi.....	31
Geometry Application: 3D Batik Design Development using jBatik Software.....	36
Ari Sriantini, Dwi Juniati.....	36
Aggregate Properties Of Fluvial Deposits Of Malir, Lyari And Hub Rivers Of Karachi Embayment, Southern Indus Basin, Pakistan	42
Malik Humza, Muhammad Waris, Muhammad Haris.....	42
Assessment Of Landscape Design In Hospital Environments In Ota, Ogun State, Nigeria.....	58
ADEBAYO Oluwatoyin, OYENUGA Ayomide, AKANBI Marvellous, AREWA Dickson, OLAJIDE Paul.	58
Ayurvedic efficacy of the medicinal plants utilized by Rabari tribes in Kachchh, Gujarat: An Ethno-botanical Study.....	65
Amit Pandey.....	65
Determinants of Saving in Rural Saving and credit cooperatives in Sodo Zuria Woreda , Wolaita Zone , Southern Ethiopia.....	86
Derese Balcha, Mathewos Chafa.....	86
Agromorphological Study Of Jute Mallow (Corchorus Olitorius L.) Accessions In Nigeria.....	92
Mikail, L.I.M and Mustapha, O.T.....	92
Implementation of Minimum Service Standards (SPM) in the Field of Tuberculosis Health Services in Demak District.....	149
Luthfiyatul Mustafidah, Ida Herwati, Jennyla Puspitaning Ayu, Muhasim.....	149

The Influence Of The Role Of Leaders, Work Safety, Work Experience, Organizational Climate, Work Ability And Perception On Work Commitment.....	154
Ida Herwati, Rindu, Jennyla Puspitaning Ayu, Luthfiyatul Mustafidah, Listiyawati Ratna Ningrum.....	154
How is Telemedicine in Health Services in Indonesia during the Covid-19 Pandemic?: Literature Review.....	100
Jennyla Puspitaning Ayu, Ida Herwati , Luthfiatul Mustafidah, Listiyawati.....	100
Activities in The Certificate of Occupancy Process That Often Experience Delays In Jakarta City, Indonesia.....	106
Guruh Sakti Maruli.....	106
Nature Of Religious Groups' Engagement In Preventing Youth Radicalization In Mombasa County, Kenya.....	111
Roselyne Anyango Onunga, Kennedy Onkware, and Crispinous Iteyo.	111
Arabidopsis phytochelatin synthase gene overexpression and accumulation of cadmium, arsenic in tobacco.....	120
Swathi bai Moodavath, Srinivas Naik K, Vijay Kumar G And Nirmala Babu Rao.....	120
Learner Perspectives of Synchronous and Asynchronous Online Education: A Comparative Study.....	126
S.Nagodavithana and P.B.T.K Premarathne.....	126
Effectiveness Of Independent Policing Oversight Authority In Enhancing Police Performance In Starehe, Nairobi County, Kenya.....	133
Benjamin Muthytuku Kimwele and Gabruel Nyabuto.....	133
Research Trend in Personality-based Recommender System.....	139
Iman Paryudi.....	139
Comparative Analysis of Cryptographic Algorithms in Context of Communication: A Systematic Review.....	161
Shahzad Ahmed, Tauseef Ahmed.....	161
Social Demographic Characteristics and Teachers' Performance in Government Aided Secondary Schools: Evidence from Uganda.....	174
Maali Chrispo, Herbert Elvis Ainamani, and Adrian Mwesigye Rwekaza	174
Visualization Teaching Methodology For Assimilation Of Knowledge: An Adult Educator's Approach.....	180
NWAKAIRE, Onuzuruike Nwagwu, KOBANI, Doreen.....	180

The World disenchantment, re-enchantment, neo-tribalism and the Free Masonry.....	186
Francesco Paolo Pinello.....	186
In The Covid-19 Pandemic, Implementation Of Learning To Write Non-Literary Text Using Technology-Based Learning Media On Class Viii Smp Students.....	196
Deni Fourin Achiriarsi, Prihadi.....	196
Analysis of the factors affecting the adoption of farmer led irrigation initiatives in the model a1 schemes of Zimbabwe: A case of Mazowe district.....	203
Fortune Chimbishi	203
The Impact Of Farmer-Led Irrigation On Zimbabwe’s Model A1 Land Reform: A Review.....	213
Chimbishi Fortune	213
Job Related Stress and Organizational Commitment among Bank Employees in India: An Empirical Analysis.....	221
Dr. Vandana Singh, Deepika Ahuja.....	221
Maturity Indices Color Chart and Quality Assessment of Mango (Mangifera indica cv. Mallika).....	230
Jaman, M. J., Hasan, M. F., Robbani, M., Masumbillah, T. R., Ferdous, K., and Rajib, M. M. R.....	230
Teacher Related Factors Affecting Afghan EFL Undergraduates’ Speaking Skill.....	239
Siti Maftuhah Damio, Hazrat Usman Mashwani.....	239
Unveiled Patriarchate Egoism In Current Literature: A Study Of Indonesias Short Story Writers.....	251
Nadia Sutra Lismi, Wiyatmi.....	251
The Nascence of Social Work Education in Somalia: Challenges, Opportunities, and the Way Forward.....	256
Mohamed A. Eno, Mohamed Aweys, Amina M. Abdi, Mohamud Abukar, Asha M. Abdi.....	256
Extraction of Virgin Coconut Oil from Dehydrated Coconut Meat using Mechanical Screw Press	263
Pwint Hay Marn Aung, Myat Lin, Saw Hto Lwe Htoo, Kyi Moe.....	263
Technical Analysis to Determine Signal Lines in Sharia Stock Trading: Case in Indonesia Sharia Stock Market.....	275
Yoga Surahman Priatmojo, Shinta Permata Sari.....	275
Fattening Mangrove Crab (Scylla olivacea) With Silvofishery Systems in Different Types Mangrove and Trash Fish Vegetation.....	283
Sukirman, Zainuddin, Muhammad Yusri Karim.....	283

Role of Manufacturing Sector in Development of Eastern Region of Uttar Pradesh.....	290
Prof. Rajesh Pal, Suman Kumar Preme	290
The Language of Command in Various English Quran Translation.....	302
Muhsinin	302
Comparison Analysis and Data Retrieval to identify the associated people of Instagram by Image Processing.....	306
JKSL Jayakody, NT Jayatilake, Thushara Weerawardane	306
Analysis Of Policy Implementation On Electronification Application Of Notification Of Tax Payable On Rural And Urban Land And Building Tax In The Special Region Capital Of Jakarta - Indonesia	311
Rohani and Ning Rahayu	311
Estimating HbA1c External Quality Assurance Scheme (EQAS) Findings in Princess Iman Center; a Stepwise in Quality Improvement Plan.....	322
Eng. Iman Abdullah Alkhreisha, Eng. Eman Nasser Al-Frehat, Yazan Fuad Jarrah	322
Factors Affecting Egyptians Adoption of E-government Using Extension of the UTAUT Model after COVID-19 Pandemic.....	327
Rasha Hassan	327
Development And Validation Of Mathematics Test (MT) For Senior Secondary Schools	342
Otuoku Karl	342
Industrial Impact On Selected Heavy Metals In Soils Of Nnewi-North Local Government Area, Anambra State, Southeast Nigeria	357
Akannam, P.O* and Kakulu, S.E	357
Comparative Analysis Of Systems Of Vocational Education In Ukraine, The United States Of America And Great Britain	369
Victor Parzhnytsky, Olexander Savenko, Olga Kaitanovska	369
Digital transformation in healthcare.....	379
Rudwan Masoud	379
Digital Television Migration In Zambia: Who Are The Real Beneficiaries?	383
Elijah Mutambanshiku Mwewa Bwalya; MacPherson Mutale; Lt Col. Emmanuel Kunda	383

A Critical Analysis Of The Introduction Of Comprehensive Sexuality Education In The School Curriculum In Zambia.....	397
Elijah Mutambanshiku Mwewa Bwalya and Gladys Mwansa Matandiko.....	397
Effect Of Emotional Intelligence On Employee Performance In Banking Sector In Bangalore.....	409
Dr. Irshad Nazeer, Isani Gazala Abdul Gafar.....	409
The Performance of Biometric Attendance System (BAS): CTU-Tuburan Campus as case study	419
Alden Q. Gabuya Jr, Leo T. Zosa, and Joemar T. Minoza.....	419
Polytechnic Library Personnel Competency Framework In Ict Environment: A Study Of Some Selected Polytechnic Libraries In The North West.....	427
Murtala Hashimu, Muhammad Garba, Abubakar Ibrahim.....	427
Understanding the Effect of University Service Quality on Student Loyalty to Online Learning Adoption in the Light of COVID-19 Pandemic.....	445
Ado Ismail Sabo	445
Factors Affecting The Performance Of The Java-Bali Province Government In The 2016-2018 Period.....	452
Nanda Aditya Putra, Heppy Purbasari.....	452
Pattern Of Electrocardiography Findings And Correlates Among Pregnant Women At The Three Trimesters Of Pregnancy In Southwest Nigeria	461
Lookman Olalekan Kareem, Adeseye Abiodun Akintunde, Oladimeji George Opadijo, Oluranti Babatope FAMILONI.....	461
Determinants of Financial Statement Accountability.....	468
Faiz Naufal Alphen, Heppy Purbasari	468
Evaluation of the Implementation of Hospital Management Information Systems: Literature Review.....	474
Ida Herwati, Jennyla Puspitaning Ayu, Luthfiyatul Mustafidah, Listiyawati Ratna Ningrum, Indah Nur Aini, Muhasim, Lailatul Kodriyah.....	474
Migration of Batch Processing Systems in Financial Sectors to Near Real-Time Processing.....	483
Vigneshwaran Kennady, Priya Mayilsamy.....	483
Social Assistance Expenditure as Mediating in Regional Original Income, General Allocation Funds, Against the Number of Poor People.....	494
Jingga Galuh Lumintang, Heppy Purbasari.....	494
Analysis of the Influence of Auditor Characteristics and Company Characteristics Towards Audit Delay in Companies on the IDX.....	506
Santi Yopie, Riandi.....	506

The Impact Of Interior Layout On Human Behavior; A Study Of Co-Working Spaces.....	520
THILAKARATHNE.S.K.& HETTIARACHCHI.A.A.....	520
Moderating effect of age in the relationship between debt literacy and indebtedness of formal sector employees in Kenya.	532
Morris Irungu Kariuki, John Muturi Mwangi & Peter Githae Muturi.....	532
Analysis Of Tax Implementation On Income In Tax Harmonization Law.	545
Ratih Ayu Yuniarti	545
Convolutional neural network-based Face Mask Detection.....	562
Olafuyi Basiru Alani (Ph.D.), Rashmi Jha (Professor), Adekoya Oluwaseun (Ph.D.), Tashawa Perrin, Medina Rahman.....	562
Taxation of Income Tax on Instagram Celebrities Endorsement Service in Indonesia.....	570
Ita Kristiana.....	570
Analysis Of Factors Affecting Risk Management Disclosure.....	575
Pipiet Kurniasari, Fatchan Achyani.....	575
Farmer Led Irrigation Initiatives And Its Impact On The Livelihoods Of Smallholder Farmers Under Redistributed Lands: A Case Study Of Mazowe District A1 Resettled Farmers, Zimbabwe.....	586
Fortune Chimbishi.....	586
Diseases of Circulatory System as the Cause of Deaths in North East India.....	598
Dr. Kishor S. Rajput.....	598
Relationship Between Marketing Strategies And Firm Performance Of Food And Beverage Processing Companies In Kenya	603
Dr. Mulinge Daniel	603
Understanding the Effect of University Service Quality on Student Loyalty to Online Learning Adoption in the Light of COVID-19 Pandemic.....	608
Ado Ismail Sabo	608
A Comparative Study Between Plating And Titanium Elastic Nailing In Fracture Midshaft Clavicle	615
Dr Rahul Verma, Dr Vivek Prakash, Dr Sanjay Gupta, Dr Apser Khan.....	615
Polymer-reinforced hybrid composites: Review.....	642
Akram Kharir Saleh Edkheil, Zaynab Aboulqasim Faraj Albireek, Khaled Elgergeni.....	642

Employee motivation and performance of the agricultural sector in Trans Nzoia County,
Kenya.....654
MSC : Wafula Daniel Chebukati and Dr. Anthony Osoro.....654

Prevalence Of Psychoactive Substance Use And Drug Problem Among Medical Students Of Ladoke Akintola
University Of Technology, Ogbomosho Nigeria663
**Samson Ojedokun, 1Nicholas Aderinto, 1Ayodeji Ilelaboye, 1Samson Afolabi, 1James Adebayo,
1Oluwatosin Ayantoyinbo, 1Aderonke Afolabi, 1Yetunde Akande, 1Abayomi Olaitan 2Taiwo Alatishe
.....663**

Discovery of Highly Conserved Evolutionary Regions in Polyhydroxyalkanoate Synthase (PhaC) From *Pseudomonas* sp. Using Bioinformatics and *In-silico* Approaches

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Abstract- Microbial polyesters such as polyhydroxyalkanoates (PHAs) are biopolymers with unique physicochemical and thermal properties that can replace synthetic polymers from the environment. The ability of these polymers to aid multiple processes in pharmaceuticals, drug delivery systems, and bioplastic materials has increased their worth in the polymer industry. Polyhydroxyalkanoate synthase (PhaC) has a crucial role in the biosynthesis of PHA and is produced by various microbes. *Pseudomonas* strains have a high potential to produce PhaC. Due to limited structural, functional, and phylogenetic studies of the PhaC, its important evolutionary and underlying molecular functional characteristics remain unknown. This study envisaged finding out the phylogenetic relation, conserved motifs, and 3D structural coherence in PhaC for various species of the *Pseudomonas*. Three highly conserved evolutionary regions named R1, R2, and R3 were identified in forty strains of *Pseudomonas* including five conserved regions in each phylogenetic group formed. R1 with amino acid sequence of (Arg-263)-(Glu-264)-(Trp-265)-(Gly-266)-(Leu-267), R2 with (Phe-367)-(Ala-368)-(Trp-369)-(Met-370)-(Arg-371)-(Pro-372)-(Asn-373)-(Asp-374)-(Leu-375)-(Ile-376) and R3 having (Asp-452)-(His-453)-(Ile-454)-(Thr-455)-(Pro-456)-(Trp-457) amino acid sequence were determined. Ramachandran plot analysis for the PhaC of *P. fluorescens*, *P. stutzeri*, *P. putida*, *P. aeruginosa*, and *P. syringae* suggested that nearly 87% of the residues of PhaC are in favored regions with 11-12% in additionally allowed and 1-2% in allowed regions. This study has confirmed for the first time the presence of three highly conserved in the PhaC protein of the *Pseudomonas* genus additionally with conserved sites in each phylogenetic group that can help in understanding and improving the function of this protein in the future.

Keywords - Bioplastics; Carbonosomes; Evolution; Polyesters; Phylogenetic; Ramachandran plot

I. INTRODUCTION

Polyhydroxyalkanoates (PHAs) are polyesters produced by a wide range of microbes under nutrient stress and unfavorable environmental conditions [1]. These polyesters are also termed Carbonosomes by the researchers working in the polymeric fields because they are produced in the presence of excess carbon sources. Prokaryotes such as bacteria and some microalgae and fungi produce PHA as cytoplasmic inclusions of 0.2-0.5 μm [2]. Studies have confirmed that these microbial inclusions are energy reserves and protect the bacterial cells from osmotic stress and environmental imbalances [3]. PHAs are diverse and versatile due to the difference in monomeric compositions and the number of carbon atoms in the monomer unit of the polyesters [4]. Maurice Lemoigne, a French chemist, first isolated these polyesters from *Bacillus megaterium* in the

1920s and showed that these bacterial polymers can be used to form transparent films [5]. Depending upon the number of monomers in the polyester chain, PHAs are usually divided into three major groups namely, short-chain length PHA (scl-PHA), medium-chain length PHA (MCL-PHA), and long-chain length PHA (LCL-PHA) [6]. Scl-PHA have 3-4 carbon atoms and are the most common forms. Poly-3-hydroxybutyrate (P3HB) and poly-4-hydroxybutyrate (P4HB) are common examples of scl-PHA. Mcl-PHA such as poly-3-hydroxyhexanoate (P3HHx), and poly-3-hydroxyoctanoate (P3HO) have 6-14 carbon atoms. Mcl-PHA can be either homopolymer such as (P3HHx) and (P3HO) or copolymers like poly-3-hydroxybutyrate-co-3-hydroxyvalerate (P(3HB-co-3HV)) [2]. Long-chain PHAs (lcl-PHA) are highly complex and have not been considered good polymers for bioplastic production [2].

PHA is biopolymers that are not only ecofriendly and sustainable but important bio-based raw material, used in bioplastic production [7]. Various bacterial species such as *Bacillus megaterium*, *Cupriavidus nector*, *Ralstonia eutropha*, and *Pseudomonas* sp. have a high potential to produce PHA. *Pseudomonas* species usually produce mcl-PHA and were studied for the first time in 1983 [2]. Since the discovery of the first PHA in the polymeric form of P3HB between 1923 and 1927 by Lemoigne, more than 300 microbial species including bacteria, algae, and fungi have been identified to produce these eco-friendly and sustainable polyesters [2]. PHA shows interesting polymeric properties such as glass transition temperature (T_g), melting temperature (T_m), crystallinity, tensile strength, extension to break ratios, and Young's modulus [8]. Excellent physicochemical and mechanical properties make PHA a natural, eco-friendly, and sustainable replacement for synthetic or petrochemical-based polymers (plastics) such as polyethylene (PE), polypropylene (PP), and polyethylene terephthalate (PET), and polyvinyl chloride (PVC) [2]. Synthetic plastics since their first prominent discovery back in 1907 have ruled the world's polymeric industry and research [9]. Plastics got much focus on the development of industrial and domestic products that their presence is undeniable today. From small-scale electronic appliances to large-scale heavy machinery, all employ some sort of plastic materials in their production [10].

Daily life products, pharmaceuticals, packaging materials, and cosmetics are dependent on synthetic plastics one way or the other during their production line due to the lack of natural, bio-based polymers that might be an efficient replacement [11]. Polyhydroxyalkanoates as biopolymers have thermo-mechanical properties similar to synthetic plastics therefore, these are the potential candidates for the development of bioplastics. The sharp and continuously growing production curve of synthetic plastics is alarming for the global environment, health, and economy [8]. Climate change, environmental pollution, destruction of ecosystems, biosphere, and public health are currently in their worse scenarios due to the severe impacts of plastics [12]. Today, almost 340-350 million tons of synthetic plastics are produced globally [2]. Limited recycling processes, production, and release of toxic gases during the incineration of plastics, less resource for plastic waste management are the major factors that have proved to a stimulus towards the need for bio-based plastics referred to as bioplastics [13].

Bioplastics are made using various biomass sources including agro-polymers (starch, cellulose), animal proteins (keratin, chitin, chitosan), and microbial polyesters (PHA) [14][15]. Although a huge amount of biomass can be obtained from agro-polymers and animal proteins for the production of biomaterials, microbial polyesters are considered more versatile, sustainable, and ecofriendly [16]. Polyhydroxyalkanoates (PHAs) are, therefore, potential candidates for the development of bioplastics that can help in achieving the sustainable development goals (SDGs) of the United Nations by countering and replacing petroleum-based synthetic plastics [17]. One thing that makes PHA a more crucial candidate for bioplastic and biomaterial development is the variety in its polymeric forms obtained under varying synthesis environments coupled with a wide range of nutrients and bacterial strains. Researchers can, therefore, use specific microorganisms and provide them controlled environment to obtain polymers of their own choice and physicochemical characteristics [18]. *Azotobacter vinelandii*, *Bacillus megaterium*, and *Bacillus licheniformis* produce scl-PHA or more specifically P3HB under glucose, lactose as carbon sources, and incubation temperature between 37–40 °C. *Pseudomonas putida* KT2440, *P. chlororaphis*, and *P. mendocina* biosynthesized mcl-PHA when providing various carbon sources and an incubation temperature of 37–45 °C for 72 hours [2]. A study of the PhaC concerning its structure, functions, catalytic sites, and evolution is highly desirable to design and produce PhaC with highly improved and efficient properties for hyper-production of PHA [19].

This study focused on the structural and functional analysis of PHA synthase protein (PhaC) using different bioinformatics and *in silico* approaches. Structural analysis using bioinformatics tools and computational methods can help in the indirect evidence of PhaC and its varying response to different carbon substrates during PHA synthesis and its catalytic activity [20]. The study of catalytic residues in the active site of PhaC for different bacterial species and their phylogenetic analysis on the same bases can help biotechnologists to create recombinant microbes and PHA synthases for the hyper-production of PHA making the process not only highly efficient but also economically feasible.

II. MATERIAL AND METHODS

PROTEIN SEQUENCE RETRIEVAL FOR PHA-PRODUCING *PSEUDOMONAS* STRAINS

Forty different strains of *Pseudomonas* were selected from the available literature based on their ability to produce PHA. Polyhydroxyalkanoate synthase (PhaC) protein sequences for the selected forty strains were retrieved from uniprot (<https://www.uniprot.org/>) and NCBI (www.ncbi.nlm.nih.gov) in FASTA format and saved in word file for further analysis [21].

CONSTRUCTION OF PHYLOGENETIC TREE

Based on the PHA synthase (PhaC) protein sequence retrieved from the NCBI database a phylogenetic tree was constructed using MEGA7 software. ClustalW was used for aligning the amino acid sequence of the protein and BLASTp the sequence to search for the similarity and common residue in the sequences [22]. Results were used to construct a maximum likelihood phylogenetic tree. The tree was further divided into different groups (A, B, and C, based on the similarity and conserved motifs of the proteins among different strains of *Pseudomonas*. One strain from each group was designated as the representative for the whole group by hypothesizing that each group has identical and conserved residues. *P. fluorescens*, *P. stutzeri*, *P. putida*, *P. aeruginosa* PA01, and *P. syringae* were used as representatives from group A respectively.

PREDICTION OF SECONDARY AND 3D STRUCTURES OF SELECTED PhaC PROTEIN

Chou and Fasman's secondary structure prediction server (CFSSP) (<http://www.biogem.org/tool/chou-fasman/index.php>) [23] was used to predict the unknown secondary structure of the PhaC proteins from the selected *Pseudomonas* strains. The possible 3D structures were predicted using Modeller 9.20 software. PyMOL software was used for analyzing the 3D ribbon structure of PhaC using PDB files of the amino acid sequences for the selected strains. The strains and their protein IDs were *P. fluorescens* (ACK57562.1), *P. stutzeri* (AAO59384.1), *P. putida* (AAP37050.1), *P. aeruginosa* PA01 (NP_253745.1) and *P. syringae* (WP_024673311.1).

PHYSIOCHEMICAL CHARACTERIZATION OF PHAC FOR THE SELECTED STRAINS OF *PSEUDOMONAS*

Physiochemical characterization of PhaC from various *Pseudomonas* strains was accomplished by using Protparam (<https://web.expasy.org/protparam/>) [24].

RETRIEVAL AND 3D STRUCTURAL ANALYSIS OF PHAC OF *CHROMOBACTERIUM* SP. AND *RALSTONIA EUTROPHA* FOR COMPARISON WITH THE PREDICTED STRUCTURES OF PhaC

The already predicted and confirmed structures of PhaC protein for *Chromobacterium* sp. USM2, (PDB ID 5XAV and 6K3C) and *Ralstonia eutropha* (PDB ID 5HZ2) were retrieved from the protein data bank (www.rcsb.org). Retrieved PDB files were analyzed using PyMOL [25]. Active site and residues actively participating in binding at the site were determined. The results were compared to that of the predicted structures of *Pseudomonas* strains PhaC protein to find the evolutionarily conserved motifs of PhaC proteins in different bacterial strains and to determine the residual chains of active sites of the protein [2].

III. RESULTS AND DISCUSSION

PROTEIN SEQUENCE RETRIEVAL FOR PHA-PRODUCING *PSEUDOMONAS* STRAINS

Sequence retrieval for PhaC protein of various *Pseudomonas* strains from NCBI showed that almost all the strains have PhaC protein consisting of 560 amino acids and a mass of 62544 (62.544 kDa) to 62809 Da (62.809 kDa). Due to the equal number of amino acids and molecular mass, the enzyme is almost similar in its properties dependent on mass such as the isoelectric point of the protein [24].

PHYLOGENETIC ANALYSIS

Retrieved PhaC protein sequences from the Uniprot database were used to construct a maximum likelihood tree using Mega7 (Fig. 1). The tree is divided into 5 groups depending upon the sequence identity in the conserved motifs. Group-A is shown in blue color and has 17 strains of *Pseudomonas* with *P. synxantha* at the top and *P. cichorii* at the bottom of the group. The yellow color represented group B which has three strains and is the second smallest group of the phylogenetic tree with *P. stutzeri* being at the top and *P. mendocina* at the bottom. Group-C has six bacterial strains and is shown in green. *P.*

parafulva and *P. monteilii* occupy the top and bottom of the group respectively. The smallest group of the phylogenetic tree is group-D and has only two strains namely *P. aeruginosa* PA01 and *P. denitrificans*, which are colored purple. Group-E indicated with red color and has 12 strains. *P. fulva* and *P. avellanae* are present at the top and bottom of this group respectively. For each group, the PhaC sequence was aligned separately to find out the conserved residues or more specifically the conserved motifs. Alignment results for each group can be seen in Fig 2a, 2b, 2c, 2d, and 2e.

Group-A has a conserved motif sequence of 28 amino acids for the PhaC protein that is composed of *Val-Asn-Leu-Gly-Ala-Cys-Ala-Gly-Gly-Thr-Ile-Ala-Ala-Leu-Gln-Gly-His-Leu-Gln-Ala-Lys-Arg-Gln-Arg-Arg*. The asterisk mark in the chain showed a variable amino acid. In the *P. chlororaphis* PhaC motif, the sequence has a methionine (Met) replaced with leucine (Leu) at the first variable site. At the second variable amino acid site in the motif sequence, *P. synxantha*, *P. aurantiaca*, and *P. corrugata* have threonine (Thr), methionine (Met), and threonine (Thr) respectively, while all other strains have leucine (Leu) at this position. The third and last variable site in the conserved motif of group-1 is for *P. breunneri*, which has glutamine (Gln) instead of leucine (Leu) at this position, unlike other strains. Group-B has a conserved motif of 28 amino acids for PhaC that account for the amino acid chain of *Arg-Pro-Leu-Leu-Ile-Val-Pro-Pro-Gln-Ile-Asn-Lys-Tyr-Tyr-Ile-Phe-Asp-Ser-Leu-Asn-Asp-Lys-Ser-Phe-Val-Gln-Tyr-Ala*. The motif sequence for group-B is almost identical with no variable amino acid site in the sequence.

Group-C has 27 amino acids in the conserved region with one variable position of amino acid in the group. The amino acid sequence with high similarity is composed of *Asp-Ser-Phe-Thr-Val-Ala-Gly-Ser-Asn-Asp-His-Ile-Thr-Pro-Trp-Asp-Ala-Val-Tyr-Arg-Ser-Ala-Leu-Leu-Gly-Gly*. In *P. parafulva* the variable amino acid site has a threonine (Thr) unlike all other members of this group that have leucine (Leu). *P. aeruginosa* PA01 and *P. denitrificans* are the only members of group D and have a conserved motif of 49 amino acids namely *Met-Arg-Glu-Lys-Gln-Glu-Ser-Gly-Ser-Val-Pro-Val-Pro-Ala-Glu-Phe-Met-Ser-Ala-Gln-Ser-Ala-Ile-Val-Gly-Leu-Arg-Gly-Lys-Asp-Leu-Leu-Thr-Thr-Val-Arg-Ser-Leu-Ala-Val-His-Gly-Leu-Arg-Gln-Pro-Leu-His-Ser*. PhaC sequence of group-D is identical for both strains with no variable site. Group-E of the *Pseudomonas* strain has 12 members with a conserved motif of 45 amino acids that include *Ser-Tyr-Gln-Ala-Gly-Val-Leu-Gly-Gly-Asp-Met-Ala-Lys-Val-Phe-Ala-Trp-Met-Arg-Pro-Asn-Asp-Leu-Ile-Trp-Asn-Tyr-Trp-Val-Asn-Asn-Tyr-Leu-Leu-Gly-Asn-Glu-Pro-Pro-Phe-Asp-Ile-Leu*. The sequence has two variable sites with the first variation in *P. fulva* and *P. viridiflava* where arginine (Arg) is replaced with lysine (Lys) and serine (Ser) respectively.

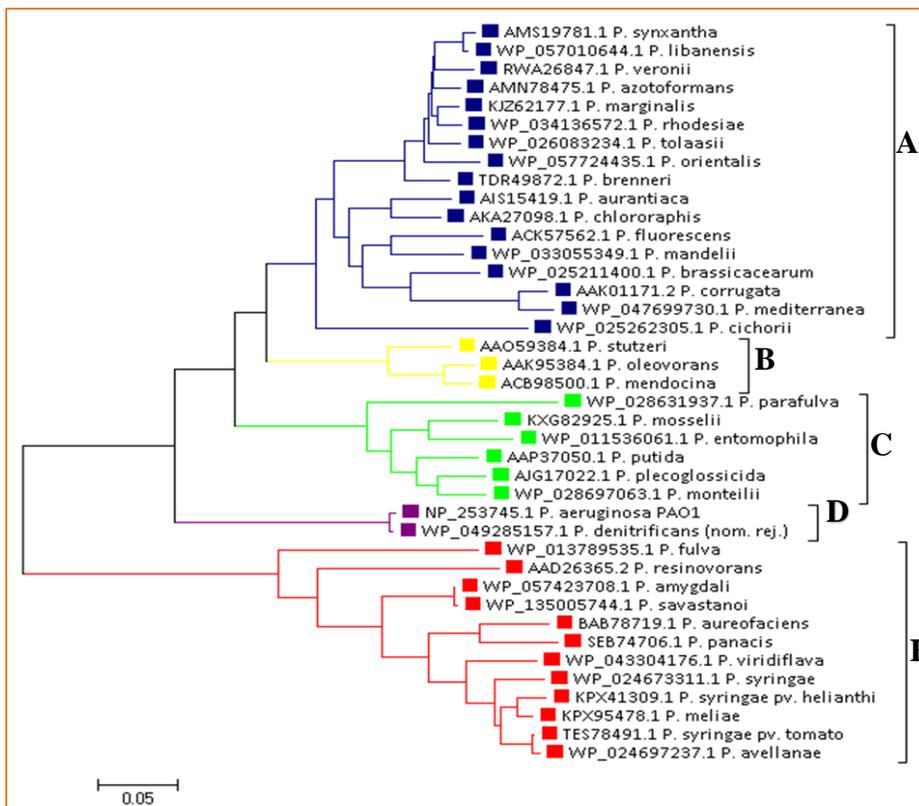


Fig. 1. Maximum likelihood tree constructed for forty different strains of *Pseudomonas*. PhaC protein sequence was used to infer the tree in MEGA7 software. The tree has five groups that are named Group-A to E depending on the evolutionarily conserved motif sequences in the PhaC protein. Members of each group are evolutionary more conserved and similar in terms of their PhaC protein as compared to members of any other group. A total of forty *Pseudomonas* strains are present in the tree with each group having a variable number of *Pseudomonas* strains in it. Group-A has 17 members and is highlighted as a blue taxon. Group B is shown yellow and has three members. Green taxon represented the six members of Group-C. Group D is the smallest group of the tree and is shown with purple color. Group-E has 12 members and is shown in red.

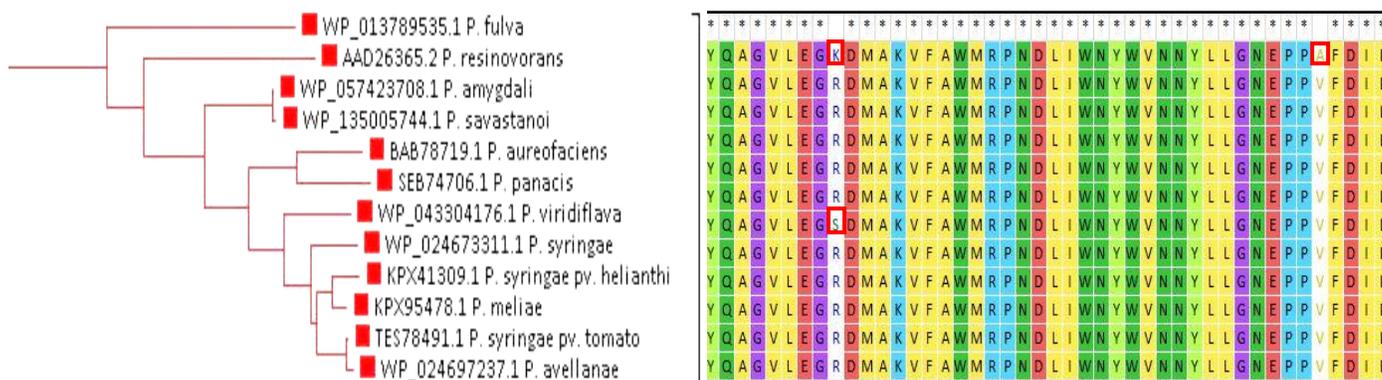
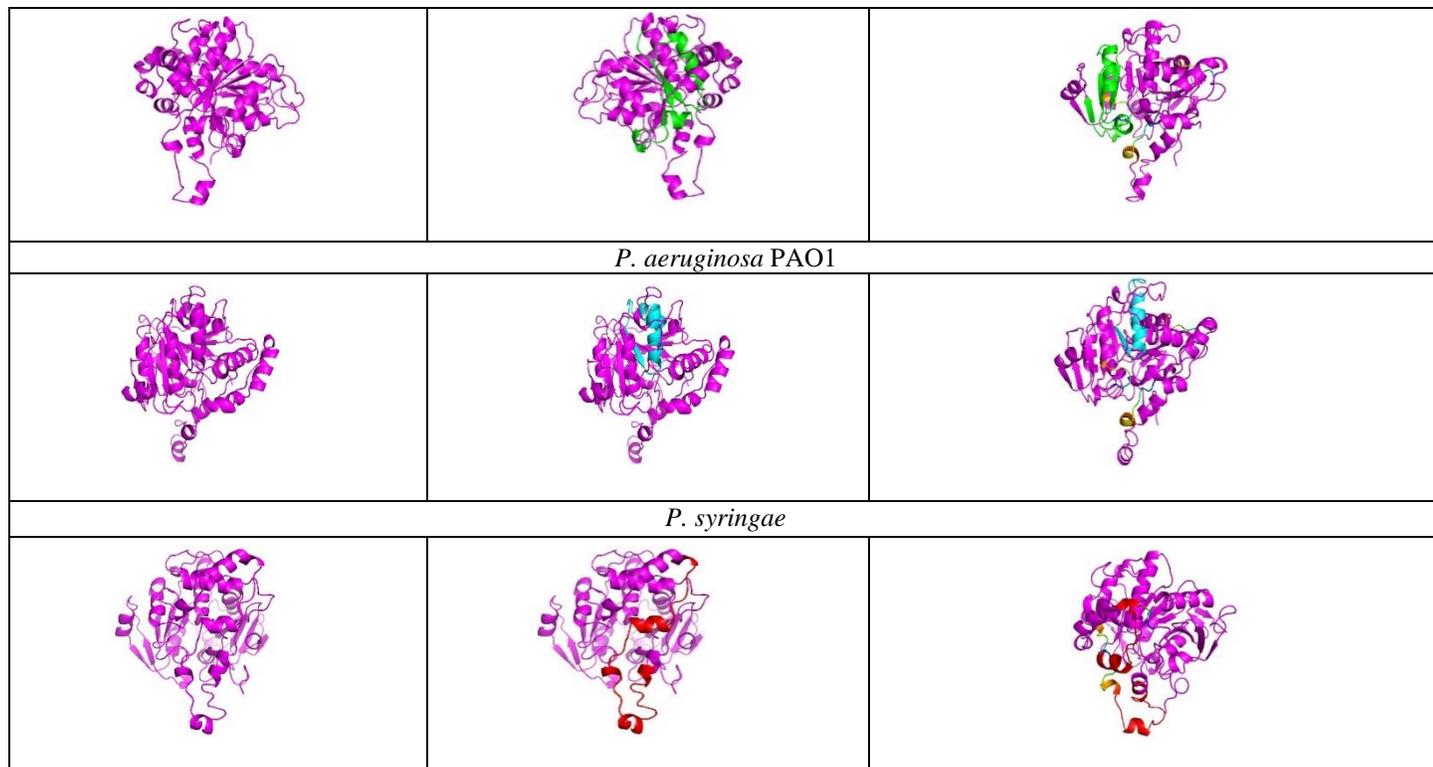


Fig. 2e. Bacterial strains in group-E have 45 amino acids in the conserved PhaC motif sequence with three variable sites. *P. fulva* has two variable amino acid sites. Lysine (Lys) and alanine (Ala) replace arginine (Arg) and valine (Val) respectively unlike other strains except for *P. viridiflava* where arginine (Arg) is replaced with serine (Ser).

Based on identical residues of each group 3D protein structures were drawn in PyMOL that help us to understand how evolution has conserved specific residual chains in these groups. A comparison of the predicted 3D structure along with conserved sites in groups and the selected strains of *Pseudomonas* from each group are represented in Table 1.

Table 1. A comparison of common residual chains of the PhaC protein of *Pseudomonas*.

3D-structure of PhaC	Common residual chains among the phylogenetic group	Common residual chains in selected <i>Pseudomonas</i> species
<i>P. fluorescens</i>		
<i>P. stutzeri</i>		
<i>P. putida</i>		



SECONDARY AND 3-D STRUCTURES OF PhaC PROTEIN

Simple secondary structures, as well as 3D structures of PhaC protein for five different strains of *Pseudomonas*, were obtained. Each strain was selected to represent the whole group because all other *Pseudomonas* sp. in a group has identical sequence and conserved motifs. Chou and Fasman's secondary structure prediction server (CFSSP) (<http://www.biogem.org/tool/chou-fasman/index.php>) [23] was used to predict the unknown secondary structure of the selected *Pseudomonas* strains. Fig. 3a – e. secondary structure prediction showed that all the selected strains have almost identical secondary structures for PhaC protein with minor differences in the percentage of α -helices, β - sheets, and turns. *P. fluorescens* PhaC has 63.4 % α -helices, 65.2 % β -sheets and 15.2 % turns. In the secondary structure of PhaC of *Pseudomonas stutzeri* 67.9 % α -helices, 63 % β - sheets, and 15.5 % turns were present. In *Pseudomonas putida* secondary structure was composed of 57.3 % α -helices, 59.1 % β - sheets, and 15 % turns. 69.8 % α -helices, 64.5 % β - sheets, and 15.7% turns were predicted in the secondary structure of *Pseudomonas aeruginosa* PAO1 PhaC. *Pseudomonas syringae* had 73.9% α -helices, 61.5% β - sheets and 14.1 % turns in the secondary structure of PhaC protein. The data showed that PhaC of *P. syringae* has the highest percentage of α -helices i.e. 73.9 % . *P. fluorescens* had 65.2% β - sheets, which was the highest among the selected strains. *Pseudomonas aeruginosa* PAO1 had the maximum percentage i.e. 15.7 % of turns in the secondary structure of PhaC. The 3D structure of the selected *Pseudomonas* strains predicted using Modeller 9.20 software can be seen in Fig. 4.

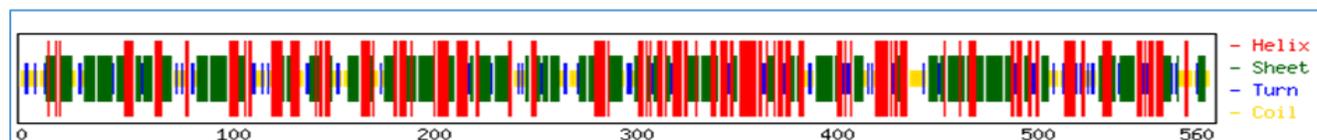


Fig. 3a. Secondary structure of PhaC protein of *Pseudomonas fluorescens* highlighting the α -helices, β - sheets, and turns.

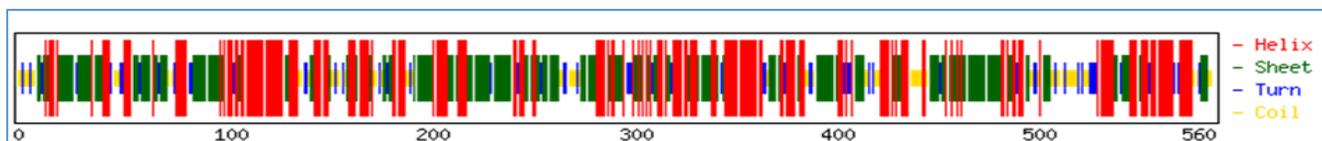


Fig. 3b. Secondary structure of PhaC protein of *Pseudomonas stutzeri* highlighting the α -helices, β - sheets, and turns.

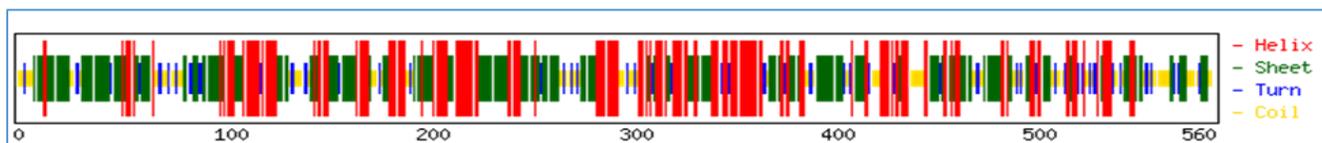


Fig. 3c. Secondary structure of PhaC protein of *Pseudomonas putida* highlighting the α -helices, β - sheets, and turns.

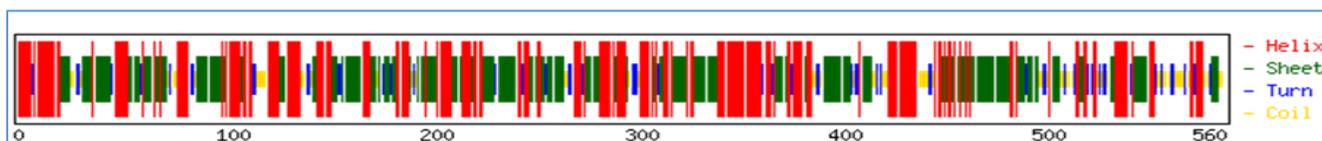


Fig. 3d. Secondary structure of PhaC protein of *Pseudomonas aeruginosa* PAO1 highlighting the α -helices, β - sheets, and turns.

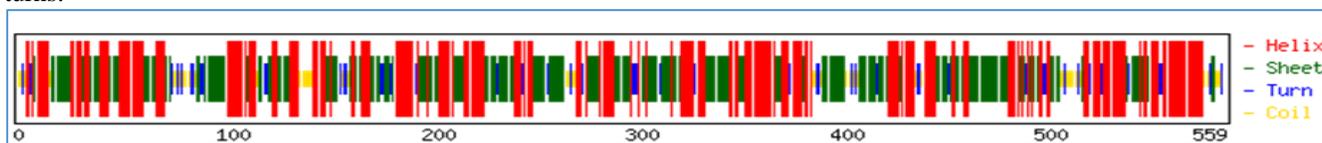


Fig. 3e. Secondary structure of PhaC protein of *Pseudomonas syringae* highlighting the α -helices, β - sheets, and turns.

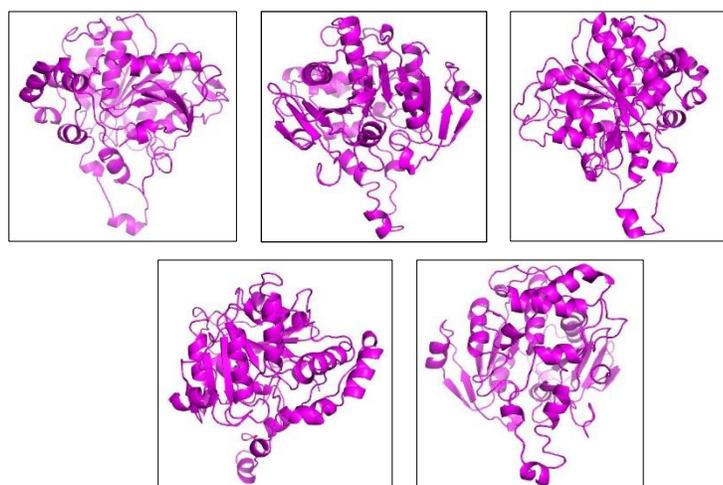


Fig. 4 (a-e). Predicted 3D structures of PhaC for *Pseudomonas fluorescens*, *Pseudomonas stutzeri*, *Pseudomonas putida*, *Pseudomonas aeruginosa* PAO1 and *Pseudomonas syringae* respectively.

PHYSIOCHEMICAL CHARACTERIZATION OF PhaC

The physiological characteristics of the PhaC proteins are observed by Protparam online tool [21]. The huge majority estimation in this server indicated the protein stability and steadiness, in the light of the fact that the steadiness and stability were identified with its appropriate functional ability shown in Table 2. The data represented that higher instability index

value (>40) for PhaC protein makes it unstable. Negative GRAVY values indicated that the protein is non-polar or hydrophilic, which makes it easier to be resolved on a 2-D gel.

Table. 2. PhaC Protparam characterization enlisting important physiochemical properties.

Organism	Amino acids	Molecular mass (Da)	Theoretical isoelectric point (pI)	Ext. coefficient	Instability index	Aliphatic index	GRAVY
<i>P. fluorescens</i>	560	62805.42	9.16	103945	44.46	86.57	-0.324
<i>P. stutzeri</i>	560	62648.31	9.20	109570	45.14	89.95	-0.315
<i>P. putida</i>	560	62809.42	9.35	109445	45.65	86.27	-0.402
<i>P. aeruginosa</i> PAO1	560	62738.41	7.79	109445	50.17	94.07	-0.253
<i>P. syringae</i>	559	62544.28	6.77	102245	43.13	85.87	-0.291

COMPARATIVE ANALYSIS OF PhaC OF *CHROMOBACTERIUM* SP. AND *RALSTONIA EUTROPHA* WITH THE PREDICTED STRUCTURES OF PhaC FOR *PSEUDOMONAS* STRAINS WITH THE DETERMINATION OF ACTIVE AND BINDING SITES

Comparative analysis of PhaC 3-D structures for *Chromobacterium* sp. USM2 and *Ralstonia eutropha* with the predicted structures of PhaC of *Pseudomonas* strains was performed. It showed that the binding ability of the catalytic site of *Pseudomonas* strains is different as compared to that already predicted in *Chromobacterium* sp. USM2 (PDB ID 6K3C), *Ralstonia eutropha* (PDB ID 5HZ2), and *Pseudomonas* sp. UMS 4-55 by Wahab et al., (2006). The 3D protein structures with the catalytic sites of the *Chromobacterium* sp. USM2 and *Ralstonia eutropha* can be seen in Fig. 5 and 6 respectively.

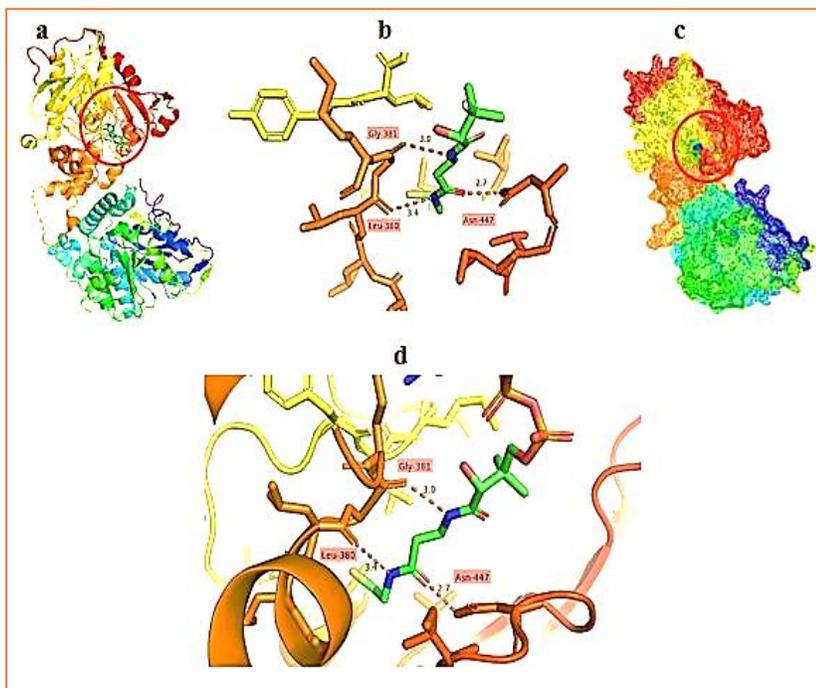


Fig. 5. PhaC of *Chromobacterium* sp. USM2 (PDB ID 6K3C) was analyzed using PyMOL. (a) 3D ribbon structure with CoA (Coenzyme-A) residue bound at the active site (encircled red) (b) Active site of PhaC of *Chromobacterium* (c) Mesh structure of PhaC with CoA shown as balls at the active site (encircled red) (d) Active site binding CoA residue with three active residues (Leucine-380, Glycine-381, and Asparagine-447) at the active site.

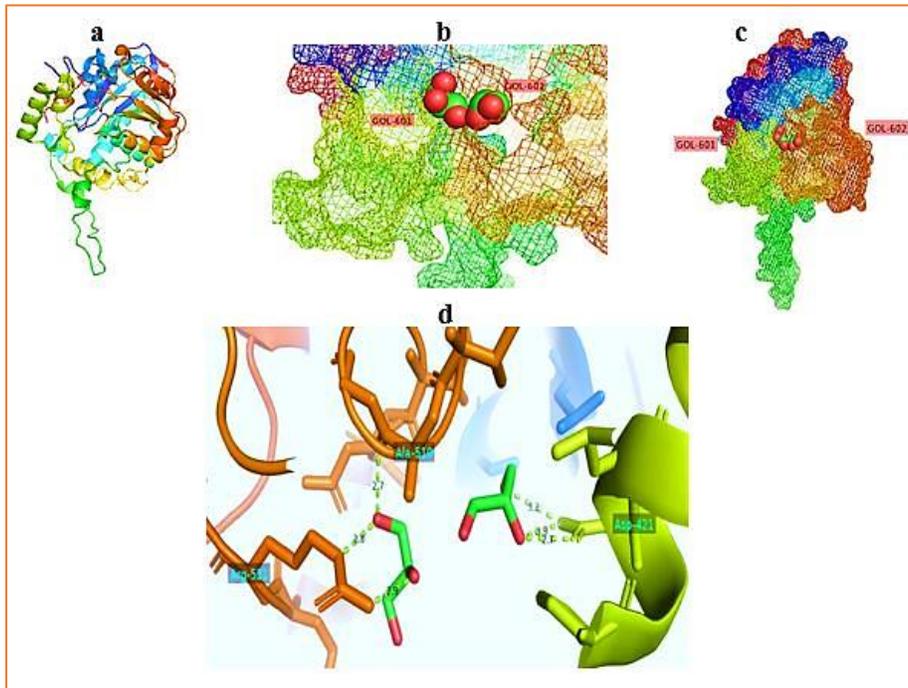


Fig. 6. PhaC of *Ralstonia eutropha* (PDB ID 5HZ2) analyzed through PyMOL (a) 3D ribbon structure of PhaC with two glycerol molecules as substrate bound at the active site (encircled red). (b) Mesh structure of the active site with glycerol molecules (GOL-601 and GOL-602) encircled red. (c) Mesh structure of PhaC with residues at the active site. (d) Residues GOL-601 and GOL-602 bound at the active site of PhaC of *R. eutropha* with the amino acids asparagine-421 (Asp-421), alanine-510 (Ala-510) and arginine-521 (Arg-521).

According to the results, the catalytic sites of these two strains are although identical when compared in terms of their residues but the amino acids that take an active part in binding the substrate are different. *Chromobacterium* sp. USM2 has leucine-380, glycine-381, and asparagine-447 at the active site while asparagine-421, alanine-510, and arginine-521 are present in the active site of *Ralstonia eutropha*. Searching for the identical sequence within the members of each group and the complete phylogenetic tree we concluded that; (1) all the strains given in the phylogenetic tree have three highly conserved regions named R1, R2, and R3. R1 has the amino acid sequence of Arg-263-Glu-264-Trp-265-Gly-266-Leu-267. R2 has the amino acid sequence of Phe-367-Ala-368-Trp-369-Met-370-Arg-371-Pro-372-Asn-373-Asp-374-Leu-375-Ile-376 and R3 having Asp-452-His-453-Ile-454-Thr-455-Pro-456-Trp-457 sequence (Fig. 7-11) for the conserved sites and the Ramachandran plots for PhaC proteins for each selected *Pseudomonas* strain [26][27]. Sequences that are conserved in bacterial groups (group A to E) can also be seen in Fig. 7–11. It was found that while the regions remain intact for their locations and sequence the conserved sites were variable among groups. This suggested that while evolution has conserved important functional residues in all the *Pseudomonads* species different habitats and natural selection have conserved different sequences in various groups of the bacteria. The 3D structures of the conserved sites R1, R2, and R3 are shown in Fig. 12 a-c while the 3D structures of the conserved sites among the selected groups of *Pseudomonas* can be seen in Fig. 13 a-e.

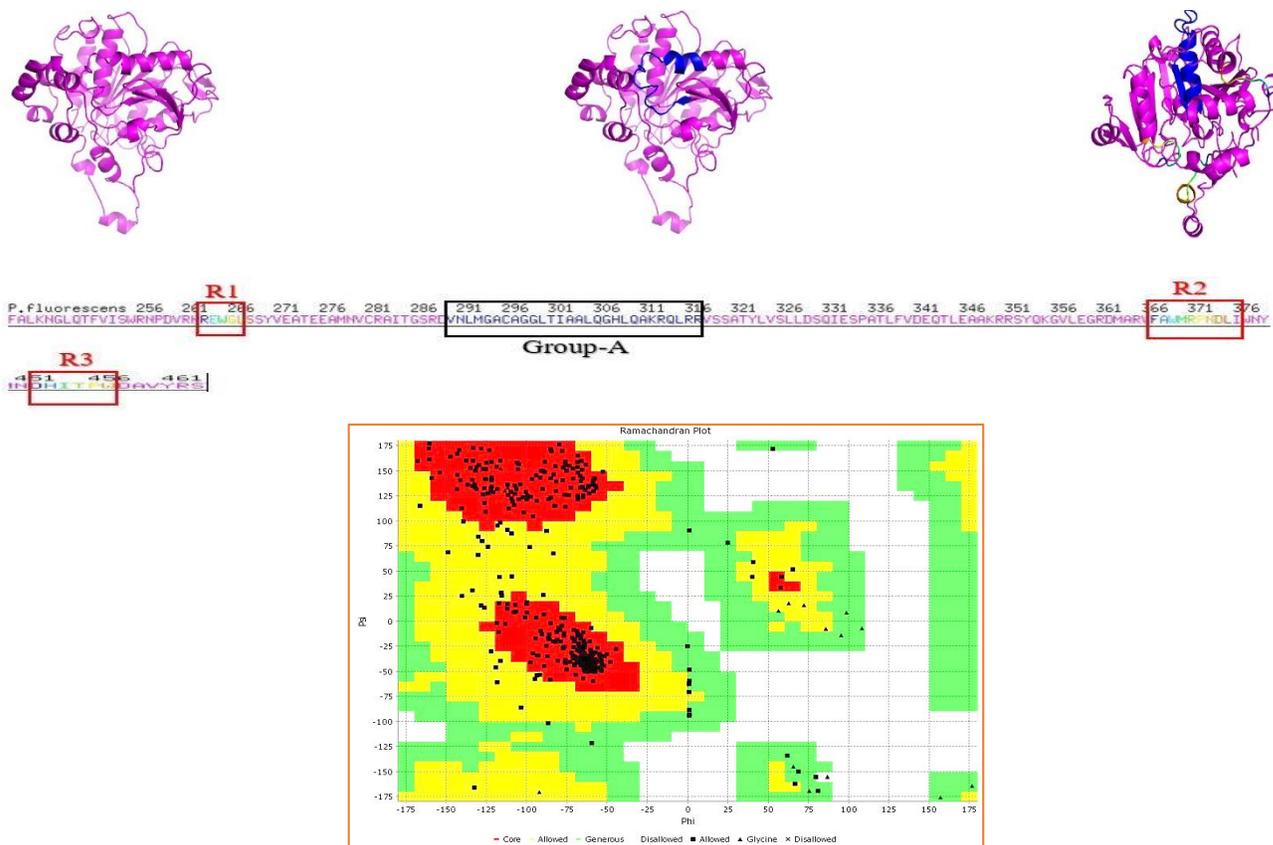
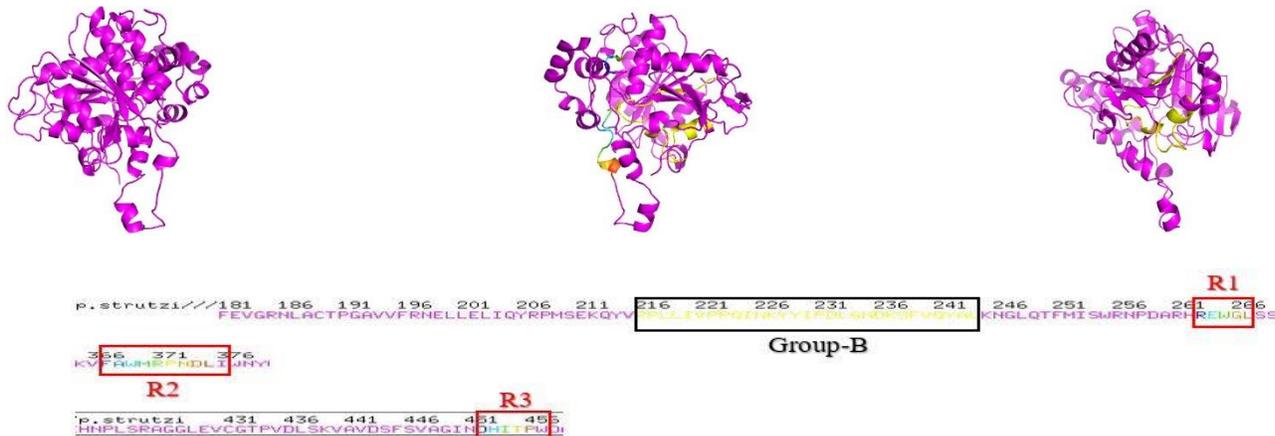


Fig.7. Evolutionary conserved regions R1, R2, and R3 of PhaC in *Pseudomonas* strain with the group-A conserved site for *P. fluorescens*. Ramachandran plot for the protein showed that 86.8% of the residues are in favored regions. The graph further indicated that almost 11.1% of amino acids are additionally allowed and 2.1 % in generously allowed regions. No residue of the protein was present in the disallowed region.



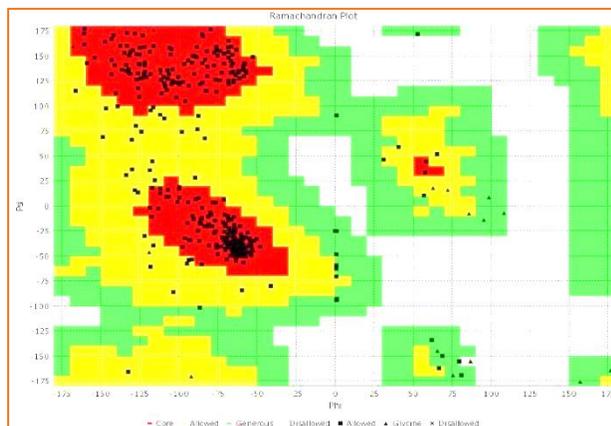


Fig. 8. Evolutionary conserved regions R1, R2, and R3 of PhaC in *Pseudomonas* strain with the group-B conserved site for *P. stutzeri*. Ramachandran plot for the protein showed that 87.3% of the residues were in favored regions. The graph further indicated that almost 11.2% of amino acids were in additionally allowed and 1.5 % in generously allowed regions. No residue of the protein was present in the disallowed region.

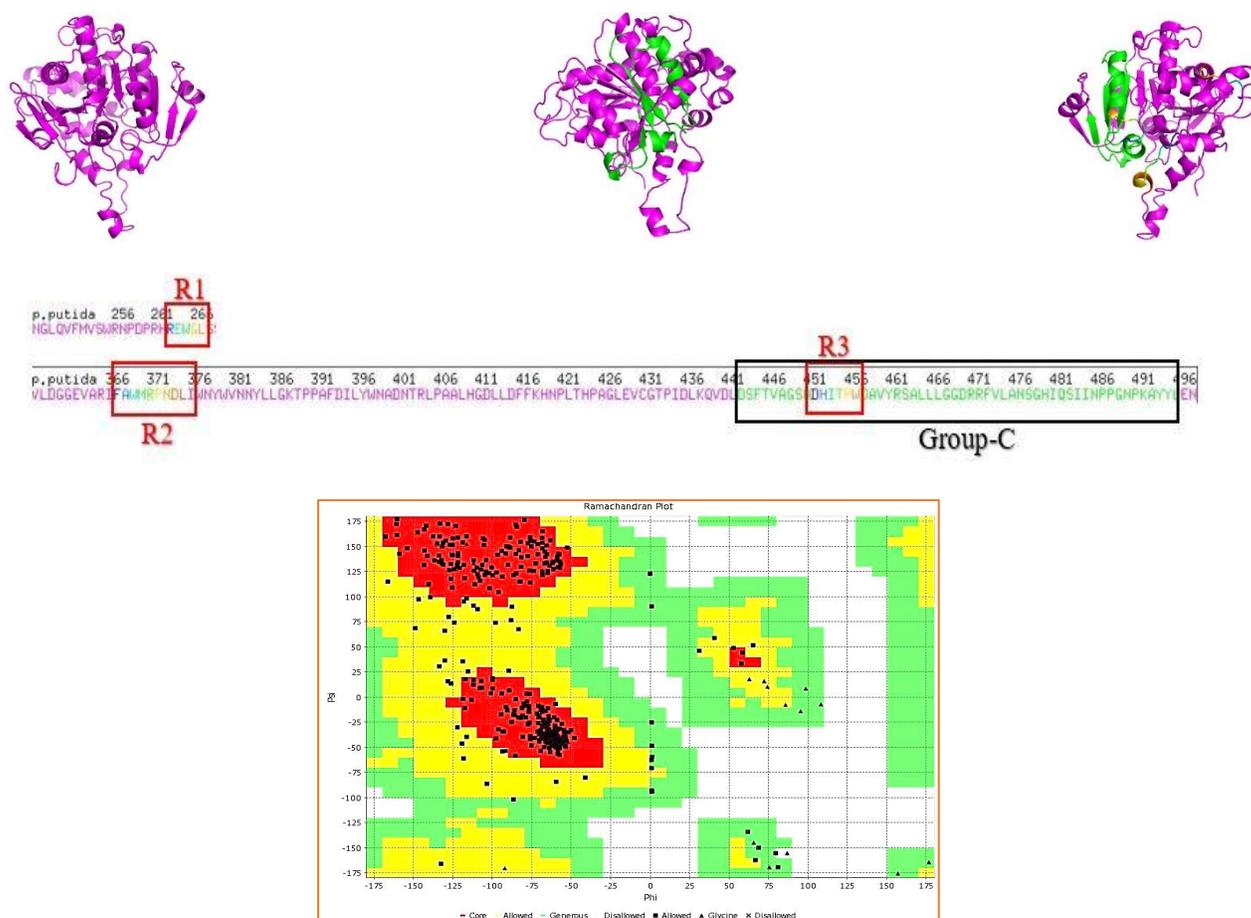


Fig. 9. Evolutionary conserved regions R1, R2, and R3 of PhaC in *Pseudomonas* strain with the group-C conserved site for *P. putida*. Ramachandran plot for the protein showed that 86.6% of the residues were in favored regions. The graph further

indicated that almost 11.8% of amino acids were in additionally allowed and 1.6 % in generously allowed regions. No residue of the protein was present in the disallowed region.

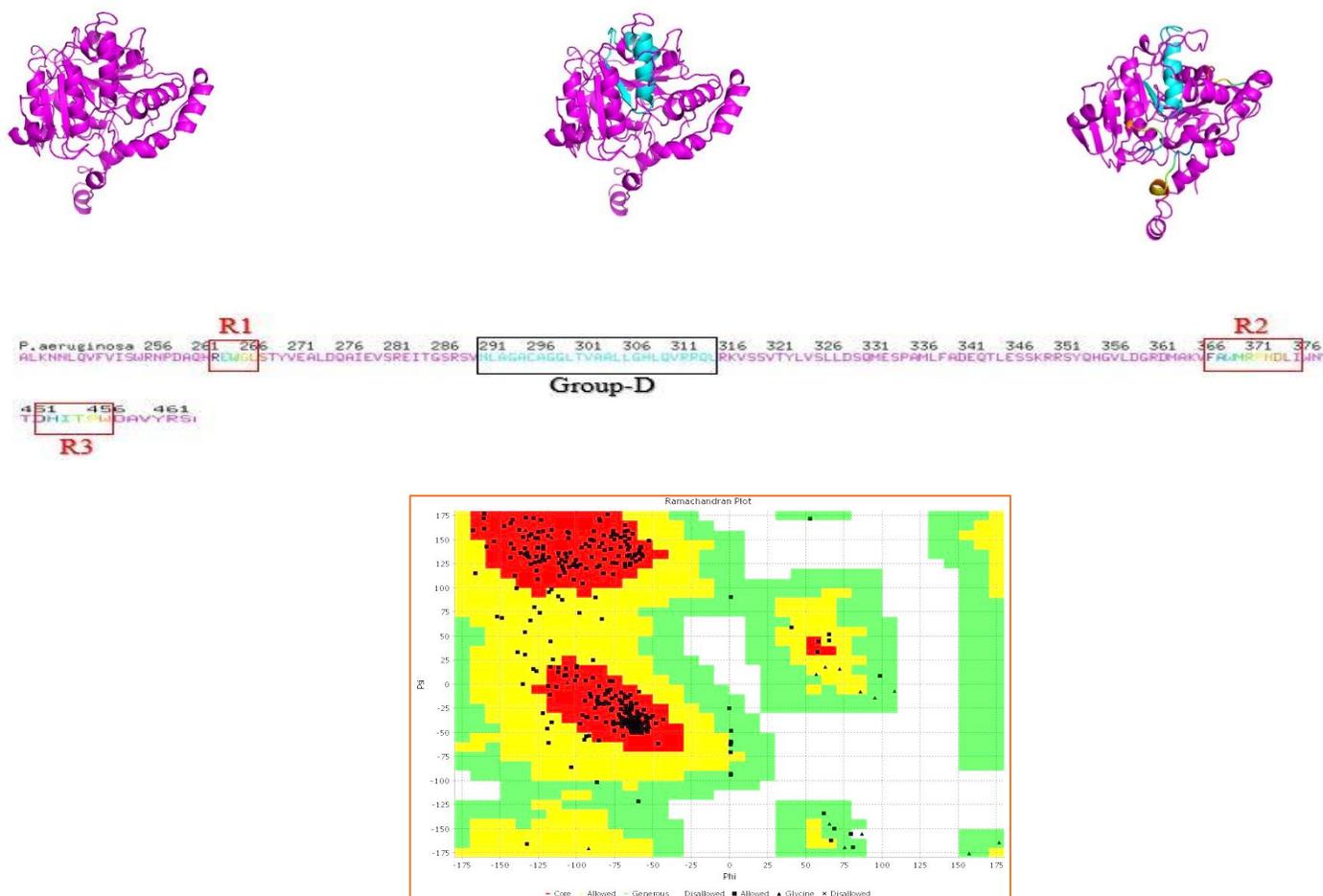


Fig. 10 Evolutionary conserved regions R1, R2, and R3 of PhaC in *Pseudomonas* strain with the group-D conserved site for *P. aeruginosa* POA1. Ramachandran plot for the protein showed that 86.6% of the residues were in favored regions. The graph further indicates that almost 11.2% of amino acids were additionally allowed and 2.1 % in generously allowed regions. No residue of the protein was present in the disallowed region.

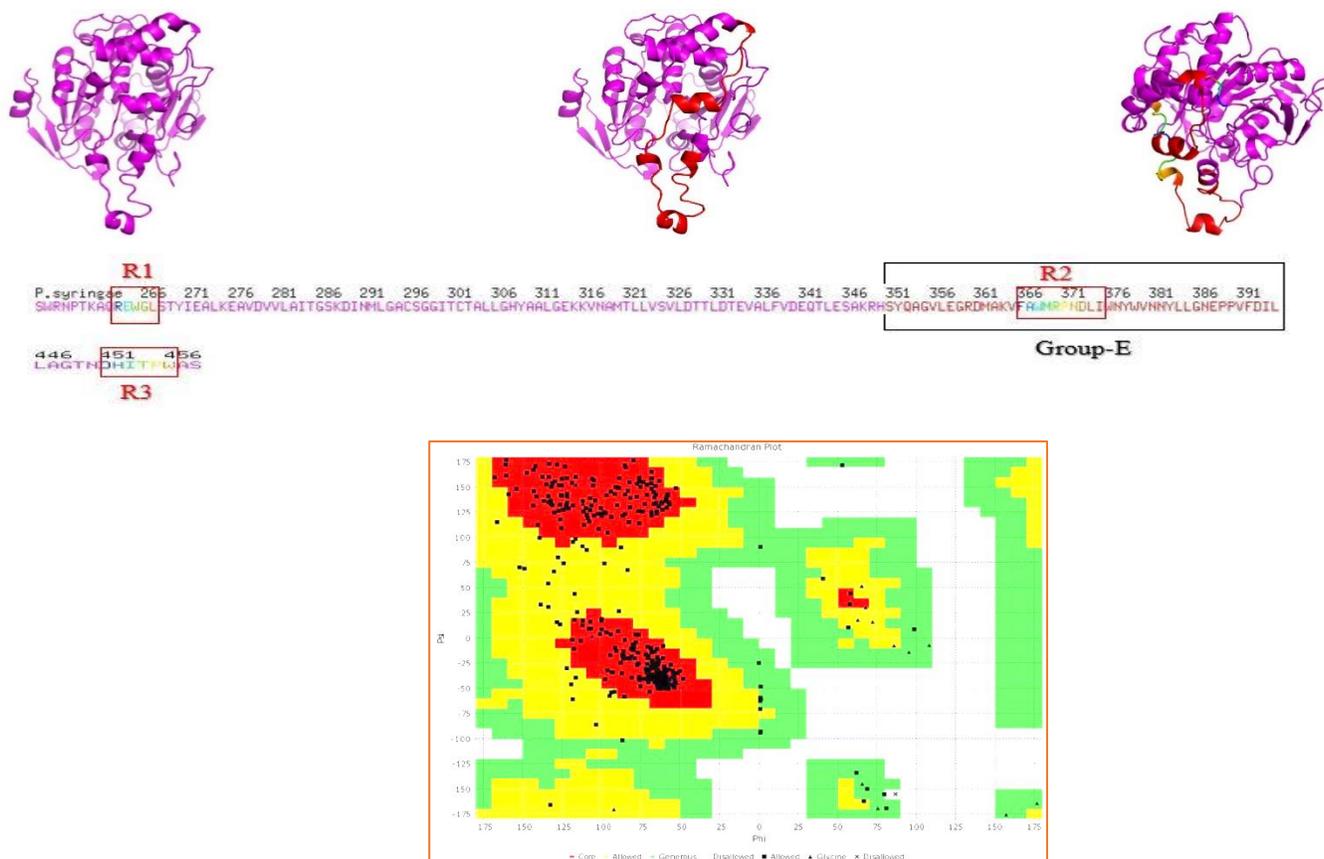


Fig. 11. Evolutionary conserved regions R1, R2, and R3 of PhaC in *Pseudomonas* strain with the group-E conserved site for *P. syringae*. Ramachandran plot for the protein showed that 87.7% of the residues were in favored regions. The graph further indicated that almost 10.2% of amino acids were in additionally allowed and 2.1 % in generously allowed regions. No residue of the protein was present in the disallowed region.

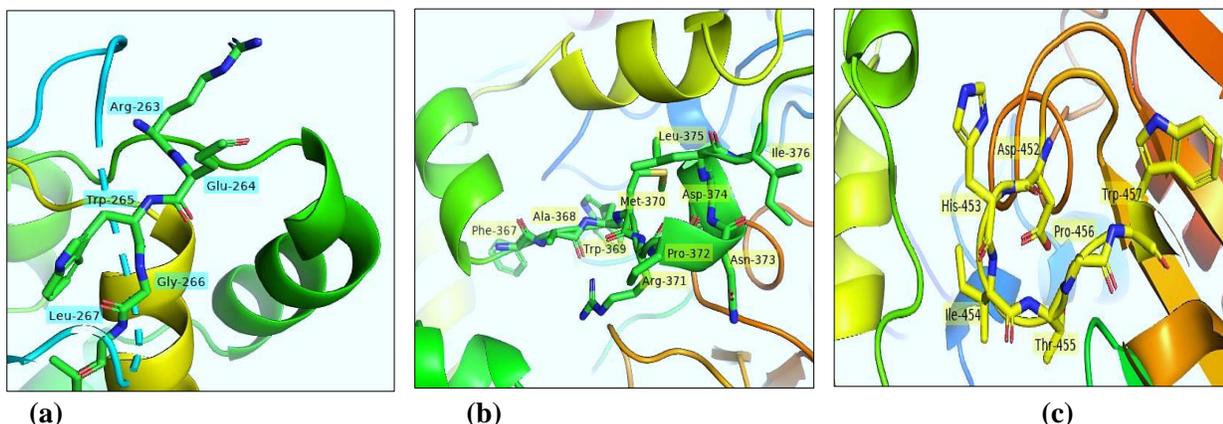


Fig. 12 Evolutionary conserved sites in the PhaC for all the selected strains of *Pseudomonas* (Fig. 1). The highly conserved residues with their locations in the protein chain are shown in (a) Region-1, (b) Region-2, and (c) Region-3. The conserved sites were determined using MEGA7 after aligning the PhaC protein.

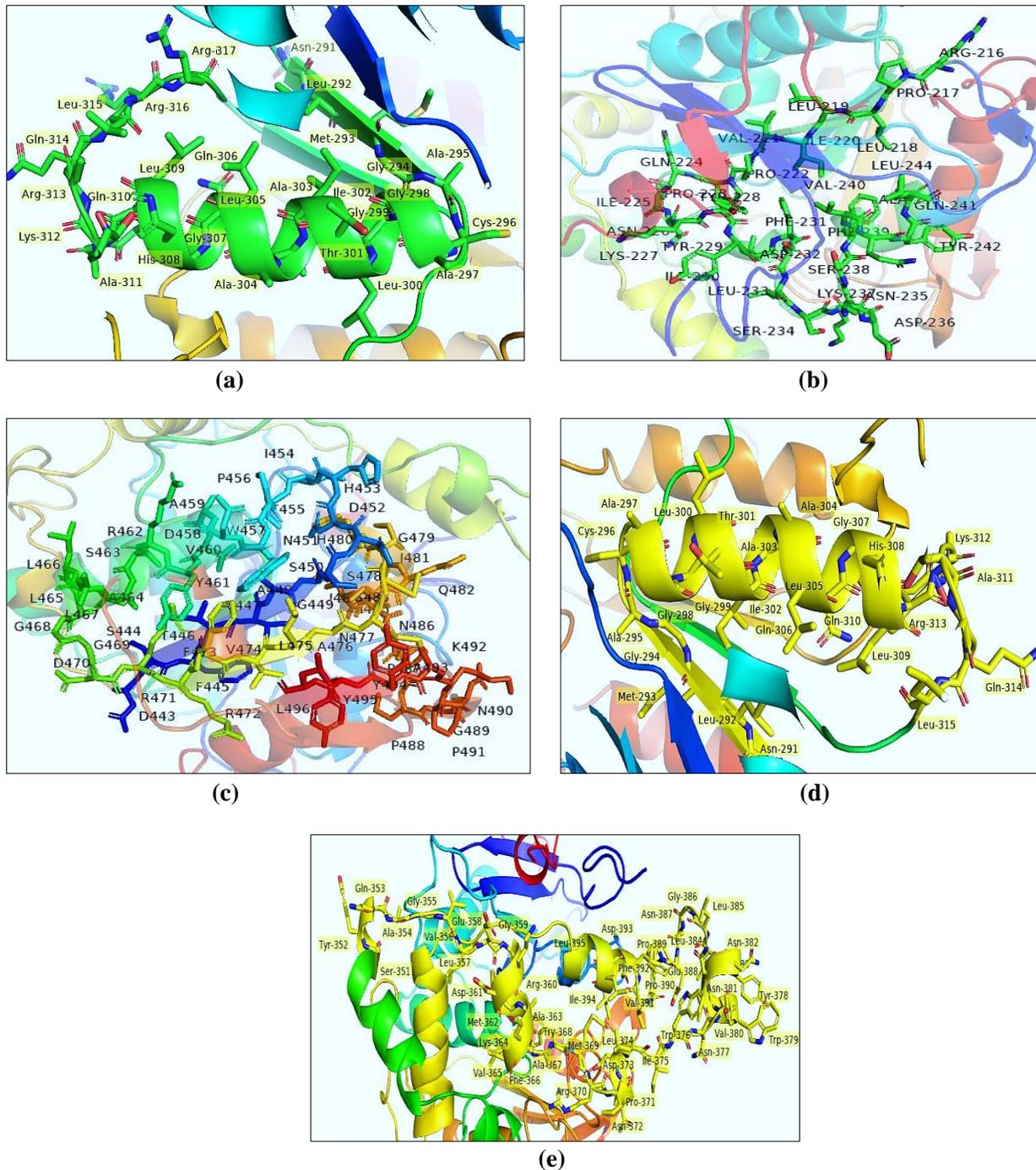


Fig. 13 Evolutionary conserved motifs of PhaC protein among the phylogenetic groups of *Pseudomonas*. The conserved site and its residues can be seen for group-A to group-E as Fig. a-e. These evolutionarily conserved regions for each taxon were determined after aligning the protein sequences using ClustalW, and BLASTp in MEGA7. PyMOL was used to analyze and visualize the amino acid residues corresponding to the sequences.

IV. CONCLUSION

Computational and *in silico* analysis of the forty different strains of *Pseudomonas* for the polyhydroxyalkanoates synthase protein (PhaC) proposed that these strains are evolutionarily related in terms of the conserved regions in the protein. These regions (R1, R2, and R3) have variable numbers of amino acids that might have a crucial role in the structure and function of PhaC. The protein sequence and phylogenetic analysis through various bioinformatics tools confirmed the presence of a unique and identical sequence of amino acids in all the members of phylogenetic groups. It was concluded from the results that *Pseudomonas* strains were experiencing a two-level evolution; one is on the genus level that conserves the same sites in the organisms as a whole while the second is on the specie level where *Pseudomonas* species within a group conserve the same sequence. 3D structural analysis and physiochemical characterization of PhaC protein confirmed a close behavior of the protein that suggested a common evolutionary ancestor. The present study has taken a unique approach towards the analysis of PhaC in terms of not only the structure and conserved sites but also its evolutionary behavior among the *Pseudomonas* species that have never been done before. We believe that further studies on the predicted sites and their possible functions can help molecular scientists design efficient PhaC protein for the hyper-production of PHA leading to new horizons in biopolymer research.

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Thyroid Ultrasound Report Generation Based On Urdu Speech Recognition

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Abstract- Medical reports generations especially in a third world countries can take unnecessary long hours. Efficient speech recognition technology trained under medical lexicon can greatly help not only the physicians but also the patients by reducing a lot of time. In order to build a robust speech recognition model that can not only differentiate and understand medical terminologies along with other generic terms and utterances but also grasps the nuances and structures of very different language. We could not make library of every medical terminology from every kind of medical field, so we chose to limit this research to only thyroid report generation. Secondly, we tried to get the optimal speech recognition results by using our local language Urdu. In order to tackle both the challenges, we used Conformer model along with other acoustic models to identify the best performing structure. CNN and deep CNN model WER (word error rate) was 16.9% and 14.2% respectively, indicating deep CNN performs better. Similarly, after the addition of maxout function in both CNN and deep CNN, the results were better i.e., 16.5% and 13.8% respectively. Furthermore, I integrated CTC with both CNN and deep CNN. WER of CTC-DCNN (maxout) was 12.2% which was better than 15.3% of CTC-CNN (maxout). We used all these models so that we can compare them to the Conformer model which is the most recent model and certainly in this research WER with the use of Conformer was 8.8%. Further adaptations in Conformer can surely improve its accuracy even more.

Keywords: Urdu Speech Recognition, Conformer, Convolutional Neural Network, Deep Convolutional Neural Network, Thyroid Ultrasound Report

I. INTRODUCTION

Speech recognition should not just be limited to major giants in the form of SIRI, UPS, Amazon, IBM or Alexa, it should be available to every field. Test report generation can consume a lot of time and when we consider third world countries it can become cumbersome. Even if we just look at its surface, the implementation scale is humongous. My idea is to give some help to the physicians who make reports on other renowned software which do not recognize Urdu language. This makes their work tiring or they have to employ some other person to do this task. Medical reports generation, from Urdu speech recognition, dictated by physicians will have a huge impact on the people's lives. In this research, I have mainly focused on thyroid report generation so we have trained our model according to that.

Thyroid disorders are increasing in Pakistan. The prevalence was around 10% at the World Thyroid Day 2021. This is not the actual number as most of the cases remain undiagnosed because of poor healthcare facilities and less awareness [1]. Timely diagnosis and detection can help in the cure of thyroid related diseases and cancer as well. In Pakistan, a normal thyroid test ranges between 20-50 USD and it takes 3-14 days to generate results. Conformer based Urdu speech recognition will have huge scale implementations in a country of 229 million people. Speech recognition and its underlying processes and layers have to be discussed to understand how our model works.

TRADITIONAL APPROACHES TO THE SPEECH RECOGNITION SYSTEM

ASR (Automatic speech recognition), which recognizes words in spoken language and transforms them into text, has a wide range of applications which includes command and control, transcribing speech which is recorded, dictation, conversations with interactive speaking and looking for audio documents. We have explained some of the previous models that have been used for speech recognition system.

URDU SPEECH RECOGNITION

Since 2008, Speech recognition primarily based on the Urdu language has started to apply very commonly [2]. In the past studies [3,4], the acoustic model primarily counts on neural networks and has been broadly used in the Urdu language and has performed extremely well. In the near past, HFNs (Hybrid Frame Neural Networks) clearly have made remarkable progress [5], with previously the most successful system achieving a WER score of 6.99 percent. However, research in the Urdu speech recognition field is very much new to the world. In the very beginning, Azam Beg [3] used a neural network for the acoustic model of the Urdu speech recognition system, resulting, significant improvement in the performance of the Urdu speech recognition and its commercialization. Researchers like Hazrat Ali and Nasir Ahmad [6] have conducted extensive studies on several areas of Urdu speech recognition. Javed Ashraf and Naveed Iqbal [7], for example, created Speech Corpus Development for a Speaker Independent Spontaneous Urdu Speech Recognition System [8]. At the experimental stage, they employed an extended vocabulary continuous speech recognition system based largely on HMM that is an advantageous attempt on language rules and acoustic properties. They employ triphones because of the primary sub-word speech unit and a statistical language model, undertake experiments meanwhile assembling HMMs. They have experience building and optimizing corpus in addition to creating models and programming [9,10]. The LVCSR Urdu speech recognition system has a recognition rate of 85.16 percent. Because of the late evolution of this technology of the Urdu speech recognition, the quantity of research papers on Urdu language recognition is comparable to that of other regularly used languages. Pakistan's Information and Communication Research Institute conducted research on Urdu speech recognition for the first time. Based on the research results, they proposed a multi-class N-gram model suitable for Urdu vocabulary features and successfully established the Urdu speech recognition system [11]. Therefore, through more than 15 years of development, the scope of research on Urdu language recognition has continued to expand and has begun to enter a deeper research stage.

Urdu Grammar, Word, and Morpheme have already been discussed in reference [12]. The DNN model is used to stimulate the acoustic unit's posterior probability directly. When combined with HMM, the latter fully exploits the advantages of the generative and discriminative models and has a noticeable recognition impact when dealing with today's huge data. It is superior to the former, but its training parameters are huge, and memory requirements are strict. How to resolve these problems, lessen education parameters, and in addition, enhance speech recognition rate is especially prominent. CNN (convolutional neural network), a kind of DNN (deep neural network), has gained growing interest because of the reduction of reliance on statistics via specific model architectures [13]. However, the DNN has strict training parameters; it still cannot achieve the intended impact, despite improving the WER (word error rate). Speeding research into Urdu speech recognition is beneficial to supporting the enhancement of traditional Urdu knowledge and has significant implications for education, transportation, and communication in Urdu. In recent years, there has been a lot of improvements in the ASR systems that were based on neural networks. The de-facto choice for automatic speech recognition have been RNNs (Recurrent Neural Networks) [4,5] as they have the better tendency to model the temporal tendencies [14].

Recently, the Transformer has enjoyed worldwide acceptability for sequencing the models using self-attention. The quality of this architecture lies in its ability to catch the long distanced interactions and training efficiency [15]. On the other hand, ASR works successfully with convolutions. This process uses the capturing of the local context in order through the local receptive field [16,17]. But the above discussed two models have their limitations. Transformers can work better with the extensive long range context but they have limited working when it comes to the extraction of fine-grained local features pattern. But when it comes to CNNs (conventional neural networks), usually local information is exploited and used as de-facto block. You will learn common position-based kernels via a local window, maintaining translation equivariance, and being able to capture features such as edges and shapes. The usage of local connectivity has the limitation when it comes to capturing the global information. It has to use multiple extra parameters/layers to get that global information. To mitigate the problem, squeeze and extinction module is being adopted by the Context Net [18]. It works on each residual block and captures the longer context [19]. But this is still limited as it only captures the global context because it only works on the application of the global average on the complete sequence. As shown in Fig. 1 Conformer consists of two macaron-like feed-forward layers with half-stage residual connections enclosing the multi-headed self-awareness and folding modules. This is followed by a post-layer norm. In the recent research, they have used the combined versions of the self-attention and convolutions and received the better results rather than running them individually [20]. When used together, their work pattern transfers to the way of combining the local and global interactions of position and content features. Simultaneously, some articles for example [12,21] have increased self-attention that maintains equivariance by positioning relatively based on the information. There is another way proposed by Wu *et al.*, [10]. It splits the multi branched architecture's input into two parts; one is convolutions and secondly self-attention. Their output is again obtained in a single branch; concatenated. The main target of this work was applications used in mobiles and it also showed the improvements in the tasks of machine translation. Combination of transformers and convolution neural networks efficiently model both audio sequence dependencies (local and global).

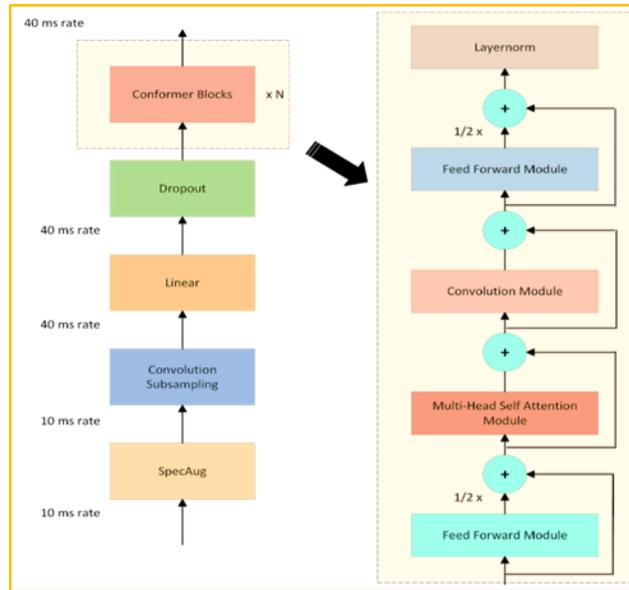


Fig. 1. Conformer encoder model architecture

In the light of all the above research, the Conformer was designed for improved speech recognition. Conformer is a combination of CNN and transformer models. This model has outperformed the previous models based on Transformer and CNN significantly by giving the best till date accuracies. As it was performed on the LibriSpeech, an extensively used benchmark, Conformer achieved WER of 2.1%/4.3% and 1.9%/3.9% without and with the usage of extrinsic language mode respectively on test other. When it was run with a tiny model having 10M parameters, a competitive result of 2.7%/6.3% was observed [22].

I. DESIGN AND IMPLEMENTATION

CONFORMER DESIGN CONFORMER ENCODER

This encoder works differently from the previous models, as the first step after input is the processing through a layer of convolution subsampling, further processed with multiple conformer blocks. This working is explained in Fig. 1. The thing which distinguishes our model from previous works is the use of Conformer blocks instead of Transformer blocks [15,23]. This block is based on 4 modules working altogether i.e. a convolution module, a self-attention module, a second feed-forward module and a feed-forward module.

MULTI-HEADED SELF-ATTENTION MODULE

MHSA (Multi-headed self-attention) is based on a vital technique from Transformer-XL [24]. This works on such an encoding scheme that considers relative sinusoidal positioning. Relative position encoding allows the self-awareness module to better generalize to different input lengths, and the modified encoder is strong to utterance length variance. They used pre-normalized residual units [25] with dropout, which supports training and regularization of deeper models. Fig. 2 below explains the multi-headed self-awareness block.



Fig. 2. Multi-Headed self-attention module.

CONVOLUTION MODULE

S. H. Zhanghao *et al.*, [10] inspired to start the convolution module with a gating mechanism which is a GLU(gated linear unit) and a pointwise convolution which follows a single 1-D depth wise convolution layer. In order to aid deep models training, Batchnorm is moved after the convolution. The Convolution block is illustrated in Fig. 3.

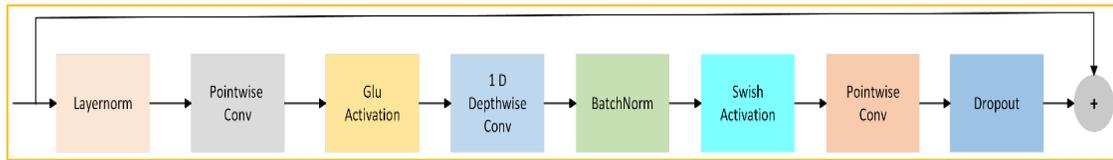


Fig. 3. Convolution module.

FEED FORWARD MODULE (FFN)

According to Vaswani *et al* [26], the architecture of the Transformer is arranged in such a way that MHSA layer is followed by feed forward module. Nonlinear activation is sandwiched between two linear transformations, make this Transformer architecture. After the normalization, addition of a residual connection over the feed-forward layers is structured. Transformer ASR models also adopted this structure [15,27]. Pre-norm residual units [25] are followed and layer normalization is applied within the residual. This is done before the first linear layer on the input. Swish activation [28] and dropout is also applied, which is a great help for the network regularization. Fig. 4. shows the FFN module.

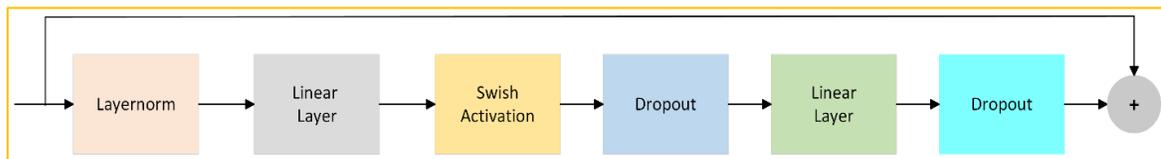


Fig. 4. Feed forward module.

CONFORMER BLOCK

As shown in Fig. 1. the conformer block is made of four structures containing the Convolution module and the Attention module which is sandwiched by two Feed Forward modules. Macaron-Net [29] gave this sandwiched idea and according to that two half-step feed-forward layers were introduced in the Transformer block instead of feed-forward layer, one before the attention layer and one after. If we define Mathematically, Conformer block *i* for input x_i , the block output y_i is:

$$\tilde{x}_i = x_i + \frac{1}{2}FFN(x_i) \tag{2-1}$$

$$x'_i = \tilde{x}_i + MHSA(\tilde{x}_i) \tag{2-2}$$

$$x''_i = x'_i + Conv(x'_i) \tag{2-3}$$

$$y_i = LayerNorm(x''_i + \frac{1}{2}FFN(x''_i)) \tag{2-4}$$

FFN is Feed forward module, MHSA is Multi-Head Self-Attention module, and Conv is Convolution module.

This conformer structure having sandwiched Macaron-net style layers have a significant improvement than the single feedforward module.

DESIGN AND IMPLEMENTATION OF URDU SPEECH RECOGNITION FOR THYROID ULTRASOUND REPORT

The ultrasound report would be incomplete without a description of the thyroid ultrasound and a summary of the findings. Currently, ultrasound results are structured in a predetermined way. Every doctor describes the phenomena of ultrasound examination in his or her method, and there is no generally great standard for controlling it within the set format parameters. While manual input is time-consuming, this content requires it. Consider that a doctor's dictation is recognized by a speech input device that is fast and accurate. It is vital to create a medical lexicon and populate it with the most essential and regularly used terms. The algorithm searches the medical lexicon to find and match the terms that doctors use and then translates them into sentences. In Fig. 5, the Urdu speech recognition system for the Thyroid ultrasonography report consists essentially of three modules.

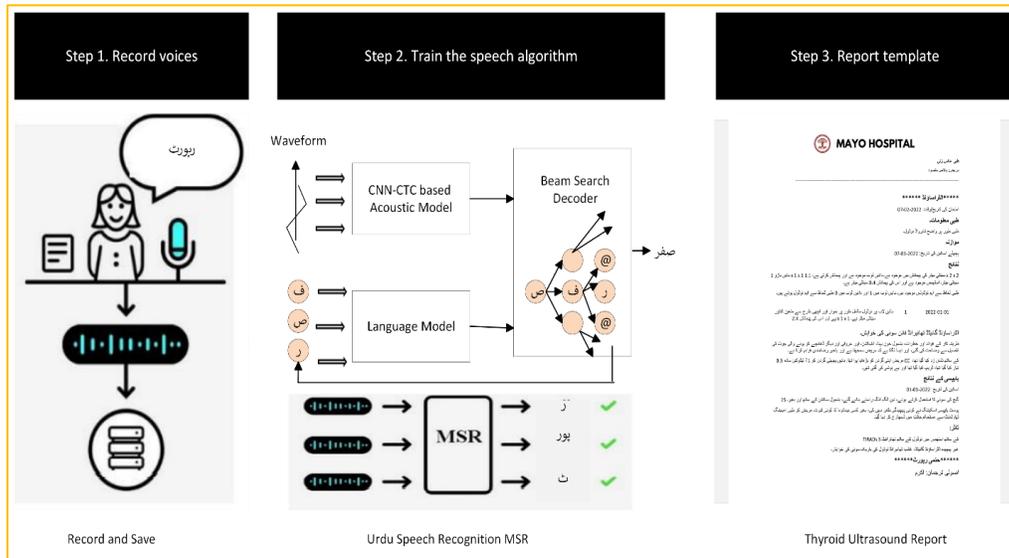


Fig. 5 Urdu speech recognition system based Thyroid ultrasound report

During the doctor's examination, the technology uses a microphone to gather voice data, which it then uses to synthesize digital speech. An Urdu speech recognition system then processes this input. As the last step, a report will be generated from the text you have created. Fourth, the patient will be given a copy of the examination report after the doctor checks it accurately. It will be printed.

SPEECH INPUT SYSTEM

The Urdu speech recognition system is linked to the ultrasound report's voice input module. It can automatically import patient and doctor data and bring it into the examination interface for review. The doctor selects a disease template based on the patient's voice input following a prompt from the system.

URDU SPEECH RECOGNITION SYSTEM

The basic role of the speech system is to translate information from speech into text. The recognition algorithm extracts the appropriate speech characteristics from the source speech. As network input for the speech characteristics, an acoustic model, a pronunciation dictionary, and a language model were employed. The network calculates the likelihood of each potential text information, and the text information with the highest probability is chosen for speech recognition. The conformer, acoustic and language models must be trained using the proper Speech databases and text sets.

REPORTING ON THYROID ULTRASOUND

The doctor can alter the ultrasound description and conclusion, collect and print the ultrasound image, and print out the ultrasound examination report using voice control. Inquiry into the past is the focus of this module. Any patient whom this system has examined can get information about their medical history and treatment from other patients who have been examined by it. With the correct information, doctors can make ultrasound diagnoses more quickly and accurately. Other similar patients' ultrasound descriptions may also be used to generate more accurate ultrasound examinations.

CTC-CNN, CTC-DCNN and Conformer models are developed in this chapter. Urdu speech recognition is constructed in this chapter, including the construction of the experimental platform and its components, composition and implementation of each component in the system, complete acoustic and conformer model training, and the Urdu speech recognition experiment.

II. EXPERIMENTAL PREPARATION EXPERIMENTAL PLATFORM CONSTRUCTION

There are some of the most popular speech recognition frameworks which are being used today, such as Caffe, Kaldi, Torch, Tensorflow, Visual Studio Code and Theano. *Kaldi* is a framework that several researchers have used to investigate speech recognition. At the same time, Tensorflow was chosen to construct the Urdu speech recognition system in this thesis. Tensorflow is an open-source computing framework suggested by the Google team in 2015. Tensorflow simplifies the model building process by integrating several functional packages and encapsulating some complex functions. One of the most commonly used development tools for researchers is

Tensorflow. Most of the functions required by deep learning can be found in Tensorflow, a framework structure that can effectively interpret data flow graphs. Each side of the structure in Tensorflow depicts the data interaction between the operation nodes, with nodes representing various function operations. There are tensors, which represent the data communicated between nodes in a multi-dimensional matrix or vector, and flows, which indicate the flow of information through the diagram. This is a diagram of the Tensorflow architecture, as shown in Fig. 6.

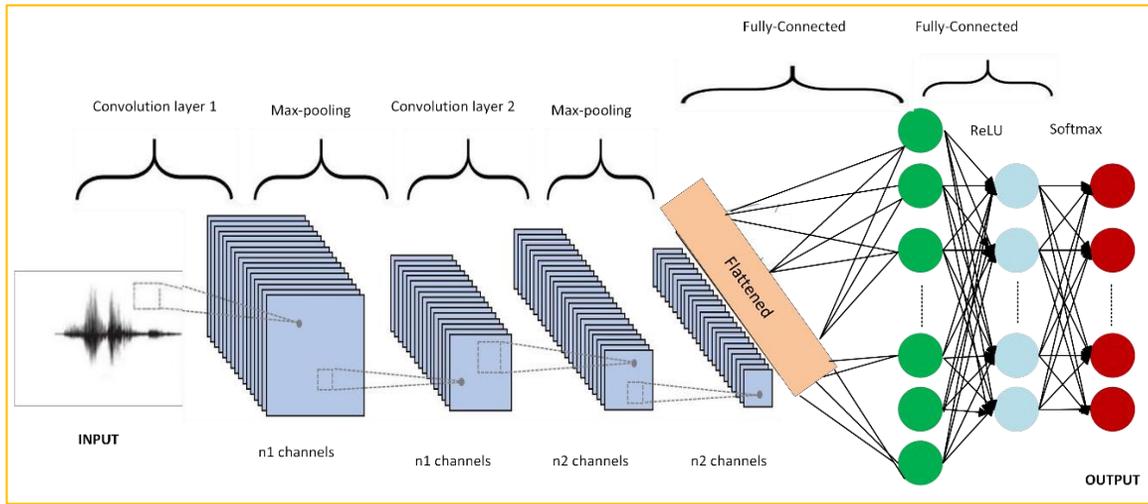


Fig. 6 The structural sketch of Tensorflow

Our experimental platform was built with windows, allowing us to simulate and test. The following are the steps:

- (1) Make sure your computer's hardware is up to date. By utilizing the server, one can develop and implement a system and its functions. Many of them, including The CPU, an 8-core Intel i7-9750. Selecting an NVIDIA GTX1650 and 4000MB of VRAM for the GPU.
- (2) Install Latest Python on Windows.
- (3) Setup the Python requirements. The majority of the packages in this dependency list are dedicated to the extraction, processing, and calculating of speech. A wide range of tools may be found in these libraries, such as NumPy, Libros, and tlearn. Libros is used to extract features from voice data, among other things. Deep learning library tlearn provides Tensorflow with APIs to better construct experimental environments and conduct operations. The training data is preprocessed using Scikit-image. Once we have extracted the feature vector from the speech data, the speech feature can be treated as a map, just like an image. Data processing and analysis are performed with the help of Numpy and Pandas.
- (4) Please make use of PyCharm by installing it on your computer. After selecting Tensorflow as the experimental framework, PyCharm was chosen as the compiler for the Urdu speech recognition system. In order to better exploit the coding and simulation capabilities of Python, the integrated development environment PyCharm was created.

DIALECT URDU SPEECH DATABASE

There was no Urdu speech database or text corpus to analyze. First, we developed an Urdu voice corpus with approximately 20000 utterances captured from 600 distinct sentences uttered by 10 male and female speakers. We separate the training and test sets in our database. The voice collection is more than 5 hours long in total. The training set is called the ABC group, and each group comprises 200 sentences; the test set is labeled the D group. The sampling frequency is set to 16000 Hz, and the sample size is set to 16 bits. The ABC group trains and learns the speech recognition model, while the D group represents the recognition effect. Table 1 below is the composition of our speech. The corpus consists of various thyroid medical reports. The reading atmosphere was a silent environment.

Table 1 The Dialect Urdu speech database

Data content	Training set	Test set
Speaker	10	4
Female	3	1
Male	7	3
Age Range (years)	20-35	19-25

Time Consuming (Hours)	5	1
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Before using the database, data preparation is required, including the voice data required by our models, the voice model requires text data, and so on. The data structure is shown in Table 2. In Table 2, the word.txt contains information about the modeling unit, including the number of the modeling unit, and the corresponding content. The pronunciation dictionary information is stored in lexicon.txt in the format: phrase, syllable (including initials and tones). The text file contains voice information, including voice id and content. Wav.scp is stored in the wav folder for the specific voice and the corresponding path.

Table 2. Data content and format

File name	Information of content
Word.txt	B2_250 The maternity ward of the children's health center was equipped
Lexicon.txt	health care thyroid
Text	B2_250 Thyroid ultrasound contextual details
Wav.scp	C:\data\wav\train\A2_250.wav
Word.3gram.lm	-4.829394 thyroid -0.18121

EVALUATION

Word sequences are the most common output of continuous speech recognition. The recognition results are compared with the right annotation sequence using a dynamic programming approach. Insertion mistakes, deletion errors, and substitution errors are the three forms of errors that exist. Insertion mistakes occur when other words are inserted between two tags adjacent to each other, deletion errors occur when the corresponding words to a tag are not discovered in the results being recognized, and substitution errors occur when the words that are identified and associated tags are inconsistent. Assuming that a test set has N labels, the number of insertion errors is I, the number of deletion errors is D, and the number of errors is R. The evaluation index was the word error rate.

$$WER = \frac{I + D + R}{N} * 100\% \tag{3-1}$$

III. EXPERIMENTAL RESULTS AND ANALYSIS

EXPERIMENTAL RESULTS

In this section, we use tensor flow to design and build several URDU speech recognition systems based on CNN, CTC-CNN, CTC-DCNN, Conformer and other models and complete four groups of experiments. In these four experiments, firstly, the Convolutional neural network model of the shallow layer is analyzed and verified. Then the recognition accuracy of the proposed end-to-end deep Convolutional neural network acoustic modeling is analyzed. At the same time, optimize the acoustic model for CTC-CNN and CTC-DCNN and train under different iterations, and the recognition results are shown in Fig. 5. The superiority of the modified CTC-DCNN acoustic model in this paper is verified by these comparative experiments. Finally, a preliminary experiment and analysis of the model in a noisy environment are carried out.

Experiment 1: Urdu Speech recognition based on CTC-CNN and related CNN acoustic models. The experimental results are shown in Table 3. It can be seen that under the same iteration times, the recognition effect of the CTC-CNN acoustic model proposed in this paper is better than that of the CNN acoustic model. In this section, through Tensorflow, Python is used to build the Urdu Speech recognition system and compile the code. After the Urdu Speech data training set, the test set speech input recognition system, after feature extraction, complete pattern matching, and finally get the corresponding output.

Table 3 Recognition results of systems

Model	Convolutional layer activation function	Full connection layer activation function	WER%
CNN	sigmoid	ReLU	16.9%

CNN (maxout)	maxout	maxout	16.5%
CTC-CNN	sigmoid	ReLU	15.7%
CTC-CNN (maxout)	Maxo	maxout	15.3%

Experiment 2: The recognition is based on CTC-DCNN and other models. It can be seen that the recognition effect of the CTC-DCNN model is 12.9%, while the error rate of UDRU speech words is reduced to 12.2% under the improved CTCDCNN acoustic model of maxout function.

Table 4 Recognition results of systems

Model	Convolutional layer activation function	Full connection layer activation function	WER%
DCNN	sigmoid	ReLU	14.2%
DCNN (ReLU)	ReLU	ReLU	13.8%
CTC-DCNN	ReLU	ReLU	12.9%
CTC-DCNN (maxout)	maxout	maxout	12.2%

Experiment 3: The recognition is based on Conformer and other models. It can be seen that under the same iteration times, the recognition effect of the conformer acoustic model proposed in this paper is better than that of the CNN acoustic model.

Table 5 Recognition results of systems.

Model	WER%
CTC-CNN (maxout)	15.3%
CTC-DCNN (maxout)	12.2%
Conformer	8.8%

Experiment 4: The effect of different iterations on the model. After the previous model training, it is found that the Conformer model has the highest accuracy of speech recognition when the number of selection iterations is 16 times. In order to verify whether there are more suitable iterations, this paper is for the Conformer, CNN model, DCNN model, CTC-CNN model, CTC-DCNN model, and maxout improved CTCDCNN model were retrained, and the recognition effect was verified under different iterations as shown in Figure 7.

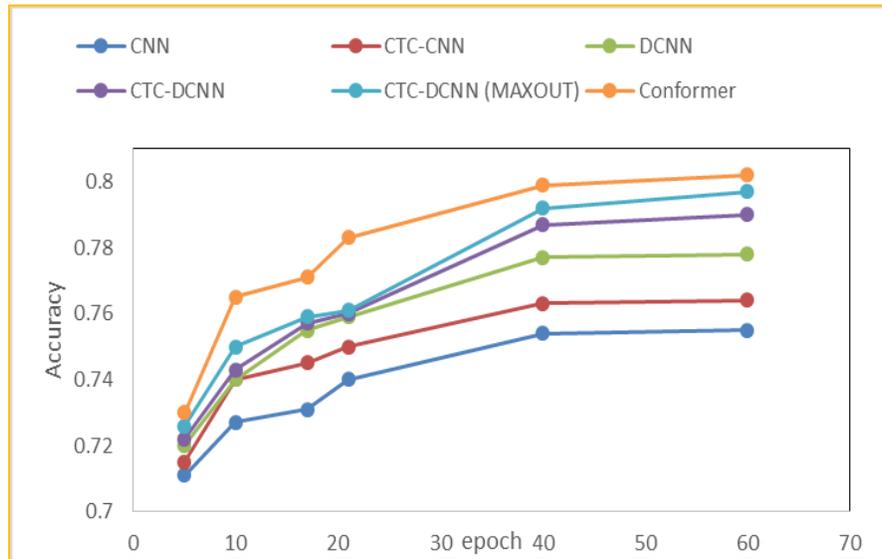


Fig. 7 Effect of iteration number

Experiment 5: The effect of noise on the Urdu Speech recognition system. In this section, after analyzing the Conformer model, in order to explore whether the model can still achieve a good recognition effect under a noisy environment, the model in the noisy environment is trained, and the recognition result is obtained through the test set. This model did a preliminary study with or without noise. The result of the recognition is shown in Figure 8.

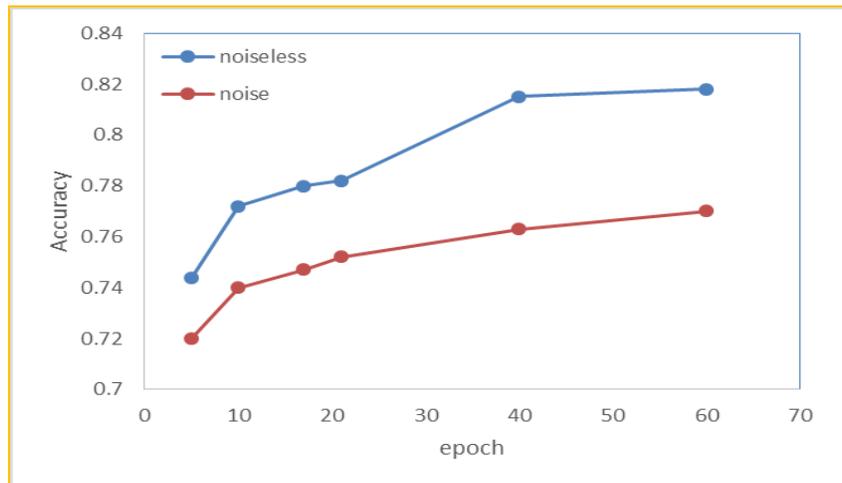


Fig. 8 The Effect of Noise on Recognition

ANALYSIS OF EXPERIMENTAL RESULTS

From Table 3, different acoustic models are selected, and the effect of Urdu Speech recognition is also different. In Urdu Speech recognition, the homonym, synonym, and other factors existing in Urdu speech will further aggravate the difficulty of the recognition process, so the recognition effect has not been particularly ideal. In the CNN acoustic model, the word error rate of the test is 16.9%; if the maxout function is employed as the CNN activation function, after training and testing again, the recognition impact improves by 0.4 percent. After the end-to-end structure design of the CTC-CNN acoustic model, it is found that the CTC structure can directly optimize the input and output sequence, which is closer to the distribution of real speech and more "intelligent" in the recognition process, making the robustness of the model further improved, and the recognition effect has nearly 1.2% improvement compared with CNN model. Compared with CNN and CNN (maxout) model, CTC-CNN, and CTC-CNN(maxout) model, it is found that the recognition effect is better when the activation function is maxout. This is because the maxout function has a strong fitting ability. Given

a constant gradient, it can effectively improve the gradient disappearance phenomenon in the model during the convolutional process to improve the speech effect.

Table 4 shows that different deep convolutional neural network models produce different results in speech recognition, as demonstrated by the findings. The error rate of the DCNN model for word recognition is 14.2 percent when the Convolutional and pooling layers are alternately connected. The DCNN (ReLU), CTC-DCNN model, and CTC-DCNN(maxout) models are built using the residual structure of the DCNN model. Speech recognition is accurate to a level of 13.8%, 12.9%, and 12.2%, respectively. Residual structure (ReLU) can be better conserved and improved as compared to the DCNN model. At the same time, the residual structure itself can improve the gradient, so it can get a better recognition effect. Compared with the DCNN(ReLU) model, the CTC-DCNN model improves the recognition accuracy by 0.9%, which shows that in the deep convolutional structure, CTC can still play a good role and improve the robustness of the model.

Compared with Table 3 and Table 4, it can be seen from the experimental data that the speech recognition accuracy of the deep convolutional network is improved by 0.9% to 4.7% compared with the shallow convolutional network, which shows that with the deepening of the network layer, the speech feature can be extracted better. But Table 5 clearly shows the dominance of conformer model in terms of its word error rate accuracy. Conformer gives 8.8% word error rate accuracy while CTC-CNN(maxout) and CTC-DCNN(maxout) gives 15.3% and 12.2% respectively which clearly shows the outperformance of conformer model.

It can be found in Fig. 7 that the accuracy of the conformer and all the acoustic models increases with the number of iterations. This is because, with the increase in training times, the model can learn more accurate speech features. In this section, the number of iterations is selected as 5 at the beginning, and the test results are not very ideal. When the iteration number is increased and the test is conducted, it is found that the accuracy of the model has a significant improvement and then gradually tends to be stable. The increase in the number of iterations means that the training time of the model is longer. When the Iteration number exceeds 40, the results tend to be stable gradually, reaching a "saturation value." At this time, the model for Urdu Speech recognition reaches a more ideal value, and the learning effect is better.

Fig. 8 shows the results of the Conformer model for Urdu Speech recognition in a noisy environment. As shown in Fig. 8 that the recognition effect of the Conformer model in a quiet environment is significantly better than that in a noisy environment. Through the preliminary analysis of the accuracy of the noisy environment, it can be seen that the recognition rate of the conformer model in a noisy environment is significantly lower than that in a quiet environment, and the recognition effect still needs to be improved, which is also the focus of our next work.

IV. CONCLUSION

Image and speech recognition are two of the most common uses of deep learning CNN network topology. The first half of this thesis was devoted to the framework and basic principles of speech recognition, as well as the major state of thyroid ultrasonography report creation. Analysis of speech recognition and feature extraction in the Urdu Speech recognition system was conducted. As we can see, the acoustic model is a critical component of a speech recognition system but Conformer presents the best results. Conformer has a direct impact on speech recognition accuracy. After that, we concentrated on the speech recognition method with different acoustic models as well as conformer.

End-to-end Convolutional neural network-based acoustic modeling. On the one hand, when CNN is used for speech recognition, it can guarantee the invariance of the speech signal in time and space. The model's resilience will be further enhanced by reducing the number of parameters. A CTC-CNN acoustic model for Urdu Speech recognition was designed and established. The classical acoustic model is compared to CTC and a Convolutional neural network. A more accurate word string can be found by using an end-to-end structure, which does not need labeling data or performing other actions on it. For Urdu Speech recognition, the CTC-CNN model developed in this research outperforms the standard CNN model. The CTC-CNN acoustic model's error rate for Urdu speech recognition is 17.7 percent, which is lower than the CNN model's error rate by 1.2 percent. Deeper layers of the network suffer from the gradient disappearance phenomena, which affects the recognition results because the parameters of the shallow Convolutional network training are huge. The residual block is used in the Convolutional neural network structure to generate a more accurate audio model in this study. Also, we developed a new CTC-DCNN model, where the optimization of this model was performed by employing the maxout function. A new and enhanced Urdu speech recognition system has been developed and built. To further improve gradient disappearance, a maxout function was introduced to the acoustic model developed in this research. The model's end-to-end structure was also found to match the entire speech sequence. The error rate of the Urdu Speech recognition system is 14.2 percent after training and testing the Urdu Speech database. A 2 percent reduction in word mistake rates is achieved over the DCNN acoustic model.

There have been experiments on various Urdu speech recognition systems, and the residual block structure is better at retaining Urdu speech characteristics in the deep Convolutional neural network, and the end-to-end structure analyses the probability output of the entire Urdu speech, while the maxout function improves the gradient problem in the network, which ensures the recognition effect of the end-to-end deep Convolutional neural network.

Undoubtedly, conformer-based end-to-end automated speech recognition has gotten a lot of attention since it outperforms recurrent neural network-based versions and that's exactly what happened in our research. Conformer parallel computing is more efficient than recurrent neural networks, because the conformer-based end-to-end automatic speech recognition model was trained on very limited

medical lexicon. There is a lot of work still required to make it robust for thorough medical terminologies and all the reports. The model may also perform poorly with accented speech.

At last thyroid ultrasound report generation based on Urdu, Speech recognition is possible as long as we have an efficient speech recognition system for Urdu Speech-language. As we find out that our purposed thyroid ultrasound report generation based on Urdu Speech recognition can be built up by including three significant modules: speech input system, Urdu Speech recognition system, and thyroid ultrasound report. The system searches and matches the contents dictated by doctors in the vocabulary and converts them into words.

In this work we had to deal with some of the chalanges that we did not know. We trained different models including various acoustic variances and conformer on Urdu language. This language structure is very different to most commonly spoken languages. The data set arranged in this work was only from the doctors because patients with thyroid probelms could not properly comprehend our research. Most of the patients, due to lack of trust, were not comfortable to give us their details because of technophobia. Our country does not have centralized hospital system. Everything is independent and if there is an organization who collects data from different hospitals, their data security and management is not upto the mark. So, data collaboration is a highlighted issue as there is no database supported by the government, so everytime one who wants to carry out the research must collect the data by himself. The versatility of data is another problem, as the society lacks the awareness, collecting data from different areas to get versatile data was problematic. The model, Conformer, we used along with other accoustic models is a latest model. It requires latest machinery to run these models and the technology is not that updated in Pakistan.

The future of speech recognition technology beholds efficient Conformer models. Techniques such as quantization and weights pruning to reduce inference time will become the prerequisite in model structuring. Adaptive fusion mechanism, that weighs every modality on the basis of noise level, would be very interesting to further investigate in the future. In the future, Conformer training on various dialects of Urdu and other local languages have to be employed to make in order to implement this model in all regions of Pakistan. A great extent of research work has to be done to further improve Conformer accuracy while dealing with all the accents of Urdu speech recognition. Moreover, why do we have to stick ourselved to only thyroid ultrasound report generation, when we can expand this to all the medical fields. Currently, Urdu speech recognition technology is infant and when it couples with medical lexicon, the horizons are unthinkable. Furthermore, end-to-end automated speech recognition is gaining traction in academics and industry. The acoustic model, pronunciation model, and language model are all combined into a single neural network. It produces competitive performance with Urdu speech recognition while also streamlining the training and decoding processes.

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Factors Affecting Community Anxiety In Facing Covid-19 In Traditional Markets, Sumbermanjing Wetan District, Malang Regency

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Abstract: During the COVID-19 pandemic, people's habits in daily life have changed a lot, so it's not surprising that many people often ask questions or even experience anxiety about current conditions. Public anxiety about events during this pandemic is influenced by several factors, one of which is gender, media exposure, education, and visiting status. The purpose of this study was to identify the factors that influence anxiety in dealing with Covid-19 in the community at the traditional market of Sumbermanjing Wetan District, Malang Regency. The research design used a cross-sectional study. The sample in this study was 115 respondents with a simple random sampling technique. Each independent variable was evaluated using Fisher's test analysis to determine the most influential variable. The results of the analysis showed the effect of gender ($p=0.509$); education ($p=0.080$); the purpose of visiting ($p=0.37$); mass media exposure (0.04582); The conclusion of this study showed that there was no effect of gender ($p=0.509$); education ($p=0.080$); the purpose of visiting ($p=0.37$) on anxiety; there is the influence of mass media exposure (0.04582); against anxiety. Based on this study, it was found that anxiety is influenced by various factors, so it needs to be studied further to determine the factors that influence it.

Keywords: Anxiety, Society, COVID-19

INTRODUCTION

The very rapid spread of the coronavirus outbreak is supported by the prognosis and onset of treatment time that sufferers must undergo so it is not surprising that many people who hear about it become restless, anxious, afraid, suffer from psychological problems, or experience anxiety (Liang et al., 2020). This feeling is a natural reaction during this Covid-19 pandemic. However, if it lasts for a long time, it can cause psychological, physical and cognitive disorders (He et al., 2021). At this time, the government and related parties have made efforts to reduce the number of new cases and at the same time try to provide an understanding to the general public about Covid-19. This outreach and effort aim to provide an understanding of Covid-19. With the hope of understanding and recognizing Covid-19, the symptoms of anxiety, a person is expected to be able to help himself and those around him (WHO, 2020).

Coronavirus disease 2019 or also known as COVID-19 has now become a pandemic in almost all countries in the world (Soltan et al., 2021). The existence of this pandemic outbreak hurts the physical and psychological health of individuals and communities (Conway et al., 2020). According to Brooks et al. (2020), psychological impacts during the pandemic include post-traumatic stress disorder, confusion, anxiety, frustration, fear of infection, insomnia, and feeling helpless. Even some psychiatrists and psychologists note that almost all types of mild to severe mental disorders can occur in this pandemic condition. Even cases of xenophobia and cases of suicide due to fear of being infected with the virus have started to emerge. Experts have agreed that physical and mental health are interrelated, and must be managed in a balanced way. The balance between physical and mental health during the pandemic has also become a concern for the government. The Ministry of Health has issued a guidebook for Mental Health and Psychosocial Support (DKJPS) during the COVID-19 pandemic. Research conducted on students at U.S. Universities reported moderate to severe symptoms of anxiety during the COVID-19 pandemic (Coakley et al., 2021)

The Corona Virus or what is currently known as Covid-19 causes many differences from previous habits and this greatly affects lives around the world. The existence of isolation, social restrictions, and changes in living habits will certainly have a new impact on

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a person or the wider community in general. According to WHO (2020), the COVID-19 virus can be transmitted during close contact through breathing (such as coughing) and vomiting. Therefore, to limit the transmission of the virus, WHO (2020) continues to recommend frequent hand hygiene, use of respiratory protection, regularly cleaning and disinfecting surfaces, maintaining physical distance, and avoiding people with fever or respiratory symptoms.

Prevention of the spread of the COVID-19 virus is a challenge for anyone, this is due to the high ability of virus transmission and treatment handling which takes a relatively long time (WHO, 2020). Thus the coronavirus disease 2019 (COVID-19) can be considered the 'perfect storm' to increase one's emotional stress (Ahmed et al., 2020). In such a short time, everything has changed, and almost all regions in the world and Indonesia have been affected by the Covid-19 outbreak.

With this impact, the government has taken a policy by taking decisive action to limit the community's movement, especially in the educational environment. The closure of all agencies that were previously carried out face-to-face was immediately changed to an online meeting (Supriyadi & Setyorini, 2020). The government's policy of instructing restrictions and Lockdown policies makes some people restless and anxious. This can be a mental health risk during the COVID-19 pandemic in the community. Anxiety, lack of social contact and reduced opportunities for stress management are major concerns. Another major threat is the increased risk of parental mental illness, domestic violence, and child maltreatment (Lee, 2020).

In a survey conducted by the American Psychiatric Association (APA) of more than 1000 adults in the United States, it was found that 48 percent of respondents were worried they might catch the coronavirus. Around 40 percent are worried that they will become seriously ill or die from Covid-19, and 62 percent are worried that their family or loved ones are infected. More than a third of respondents (36 percent) said the Covid-19 pandemic had a serious impact on their mental health, and 59 percent said the effect was quite severe on daily life. Respondents' biggest concern regarding this pandemic is the impact on finances, lack of food, medicine, and other necessities.

Anxiety reactions will be different for each individual. For some people, anxiety reactions are not always accompanied by physiological reactions. But in certain people, the complexity of the response to anxiety can involve momentary physiological reactions such as a faster heart rate, sweating, stomachache, headache, itching, and other symptoms. After a person begins to feel anxiety, the self-defense system will then reassess the threat accompanied by efforts to overcome, reduce or eliminate the feeling of being threatened. A person can use self-defense (defense mechanism) by increasing cognitive or motor activity (Ahmed et al., 2020).

Anxiety usually comes from the perception of events that are not controlled (uncontrolled), so individuals will focus on controlled actions. In the context of this pandemic, examples of controlled actions taken include exercising, meditation, painting, playing music, gardening, cooking, reading books, watching movies, and so on. These various activities are by individual interests and abilities as a formidable and protective strategy to deal with stress, anxiety, and panic (Hardiyati et al., 2020). Other studies also mention that providing appropriate information about psychoeducational-psychological support services is very much needed (Tasdemir Yigitoglu et al., 2021).

METHODOLOGY

This study was quantitative with observational analysis and used a cross-sectional design. The variables used in this study are public anxiety as the dependent variable and the independent variables as the causative factor, namely threats, impacts, experiences, and education. The population in this study is the public, namely the general public who visit traditional markets. Determination of the sampling technique using simple random sampling. Of the 213 total population that was targeted in the research subjects, there were 114 who returned the online-based questionnaires that were taken at random. So that the number of samples in this study was 114 respondents who were willing to be sampled in this study.

RESULTS AND DISCUSSION

Table 1. characteristics of respondents that affect anxiety in dealing with Covid-19

characteristics of respondents	Frequency (%)
Gender	
Man	41 (35,6%)
Woman	73(63,6%)
Education	
Elementary	5 (4,3%)
Junior high school	15 (13,1%)
Senior high school	78 (67,7%)

Bachelor	16 (13,9%)
Media Exposure	
Never	13 (11,3%)
Ever	101 (88,7%)
Purpose of Visit	
Pengunjung	85 (73,9%)
Marketer	30 (26,1%)

Table 2. Results of the Bivariate Test of Respondents' Gender Factors on Anxiety in Facing Covid-19

	Anxiety	No anxiety	P value
Sex			
Man	4	19	0,509
Woman	5	68	
	7	107	

Table 3. Bivariate Test Results of Respondents' Education Factors on Anxiety in Facing Covid-19

	Anxiety	No anxiety	P value
Pendidikan			
Elementery	1	4	0,080
Yunior High School	0	15	
Senior High School	3	75	
Bachelor	3	13	
	7	107	

Table 4. Results of the Bivariate Test of Respondents Visiting Objectives Against Anxiety in Facing Covid-19

	Anxiety	No anxiety	P value
Purpose			
Seller	5	61	0,370
Purchaser	2	46	
	66	107	

Table 5. Bivariate Test Results of Respondents' Media Exposure Factors to Anxiety in Facing Covid-19

	Anxiety	No anxiety	P value
Media Exposure			
Not Exposed	6	95	0,04582
Exposed	1	12	
	7	107	

Based on the results of the study, shows that there is no influence between education on anxiety in dealing with Covid-19. This is because the respondents in this study are someone who needs to fulfill their daily needs tend to fulfill their daily needs so to achieve a certain goal according to their core needs, they will tend to ignore any risks that may arise. This study is different from research that states that there is a relationship between education and anxiety (Supriyadi & Setyorini, 2020). The education level of the respondents in this study was the majority of Junior High School 78 (67.7) people. (Hawari, 2001) states that the higher the level of education a person will be able to find information and receive information carefully it will motivate him to solve a problem can reduce the level of anxiety. Roestriyani in her research also said that the many sources of information obtained by someone about Covid-19, caused various impacts, both positive and negative impacts. In principle, the general public needs to update information regarding the latest Covid-19 cases in the hope that the information obtained is used as a basis for being more vigilant and careful in complying with health protocols.

This study also shows that the gender factor does not affect anxiety. This is because respondents who visit traditional markets are women who have a goal to carry out activities according to their needs so in this case, they have a more open and more stable emotional tendency to immediately respond to their needs. This is in line with research conducted by Tiara (2020) which states that gender is not always a predictor that has a significant effect on emotional reactivity, such as anxiety and fear. Anxiety will arise when there is pressure from the outside that can hinder one's activities and the results of this study also state that the respondent's visiting

status factor does not affect anxiety (Tsay et al., 2020). In a study conducted on patients diagnosed with Covid-19, it was also stated that there was no significant relationship between demographic status and anxiety (Thaweerat et al., 2021).

Based on a review in CNN Indonesia news (CNN Indonesia Team, 2020) it is explained that the flow of information both through mass media and social media affects mental health. Exposure to information from the media is known to affect stress and anxiety levels (Rohmi & Aditya, 2020). Information from the media on the one hand is also very important to build individual awareness of the dangers of COVID-19, but it is also stated that it is not uncommon for people to become anxious and afraid of this condition (Vibriyanti, 2020). Information in the digital era 4.0 through several media, one of which is also social media, is an important factor that determines respondents' anxiety during a pandemic like this. Collinson explained that sensational news in explaining an outbreak can cause anxiety and cause negative emotional responses to news reporters (Bender, 2020). Further explained by Adebayo, Neumark, Gesser-Edelsburg, Ahmad, and Levine (in Taylor, 2019) that social media is the main source of health information around the world and becomes a global platform as a risky communication for information on an outbreak or pandemic and health. Taylor (2019) explains that 147 most miscommunications are informed through social media. Then social media can influence the emotions and behavior of individuals. As stated by Quick (in Taylor, 2019) which explains that in the face of a pandemic that feels like terror, rumors, conspiracy theories, and panic, one of the solutions to solving it is to provide and maintain clear and honest communication. WHO (in Taylor, 2019) explains the important elements of a communication guide in dealing with these situations, including announcing the outbreak as soon as possible even though the information is incomplete to minimize the spread of untrue news and misinformation, providing information on what to do by the public to make themselves to be safe, maintain transparency to ensure the trust of the general public, demonstrate an effort has been made to understand the public's views and concerns about the outbreak and lastly evaluate the impact of the progress of the communication program to ensure that messages are conveyed appropriately and suggestions given has been followed by the general public. From this research it was found that various factors influence a person's anxiety, so providing the right intervention requires further assessment.

CONCLUSION

Based on the findings of this study, the following conclusions were drawn gender, education the purpose of visiting not significant, and mass was significant

LIMITATIONS

This research study is limited in several ways. The main limitation lies in the information obtained for filling out the instrument (limited by the date determined by the researcher) so that it is possible to change all psychological aspects such as the atmosphere. Generalization may be limited to the community around the research site. However, the sample included a diverse group of participants. The exact response rate cannot be calculated because the exact number of people who received the google form for the recruitment process was not determined.

RESEARCH ETHICS

Research permit Number 0238.1/LPPM/STIKes-KPJ/II/2020 from the Research and Community Service Institute of the Kepanjen School of Health Sciences. The principles of research ethics are applied in this study; Informed consent, Anonymity (without a name), Confidentiality (confidentiality).

CONFLICT OF INTEREST

The author declares that there is no conflict of interest

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Geometry Application: 3D Batik Design Development using jBatik Software

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Abstract- Surabaya is one of the producers of Indonesian batik. The development of Surabaya batik motifs is currently increasingly innovative. This situation is an excellent opportunity in the use of technology in making batik designs, so that market needs can be met. jBatik software is a software that serves to help make batik designs quickly and easily. This software is a geometry application, using fractal principles and the Lindenmayer System. This study aims to produce innovative 3-dimensional batik designs in a fast and easy way. This research is expected to be able to increase the artistic and economic value of Surabaya batik. This research was carried out in two stages, the first stage included literature study and field observation. In the next stage, Batik designs were explored using the jBatik software. The themes raised relate to history, figures or heroism, the sea, and plants. The result of this research is a Surabaya batik motif design, with a 3-dimensional shape combined with bright colors.

Key Words- Development, design, Surabaya batik, jBatik, 3 Dimensions

I. INTRODUCTION

Surabaya is one of the producers of Indonesian batik. The development of Surabaya batik motifs is currently increasingly innovative. This situation is an excellent opportunity for the use of technology in making batik designs, so that market needs can be met. jBatik software is one of the software that serves to help make batik designs quickly and easily[1]. Batik is a cultural heritage of Indonesian ancestors. Mathematics is part of culture and history, and the culture around us has many mathematical concepts, such as making houses, and batik craft patterns[2]. The concept of geometry is widely used in Surabaya batik patterns.

Similar to batik in other coastal areas such as Madura batik and Cirebon batik, Surabaya batik also has bright colors with very distinctive unique motifs. What distinguishes Surabaya batik from other regional batiks is the themes raised relating to history, figures or heroism, the sea, and plants. However, the Surabaya batik motif also contains the local wisdom of the Surabaya people. This can be seen from the emergence of motifs, such as: ships, clover leaves, high-rise buildings, and the atmosphere of the mall. So that the 3D batik design will make Surabaya batik motifs more innovative without losing their identity.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

2.1 Research methodology

This research uses two stages. Beginning with literature study, and observation. After analyzing the data, the next stage is the development stage of Surabaya batik designs using jBatik software.

2.2 Tools and materials

The tool used in this research is the jBatik Pro software, which is first installed on the laptop. Furthermore, the batik design is described in the software. The resulting design is then printed on cotton cloth using a digital printing machine.

2.3 Work procedures

This research begins with the process of collecting data through a literature study, which includes searching for data on the development of batik in Surabaya. Information about the development and use of jBatik software is also deepened. Literature studies are carried out through books, journals, and scientific articles. Furthermore, field observations were carried out to determine the development of Surabaya batik motifs. jBatik software perfects batik designs using a computer with Surabaya cultural ornaments.

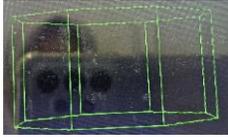
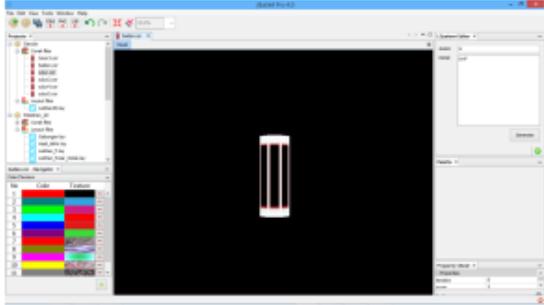
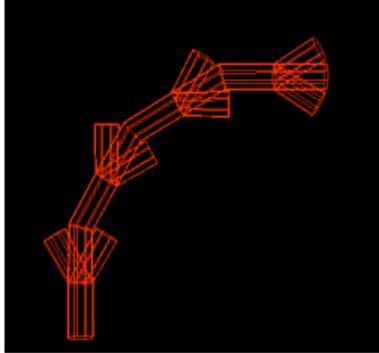
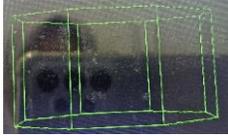
III. RESULTS AND DISCUSSION

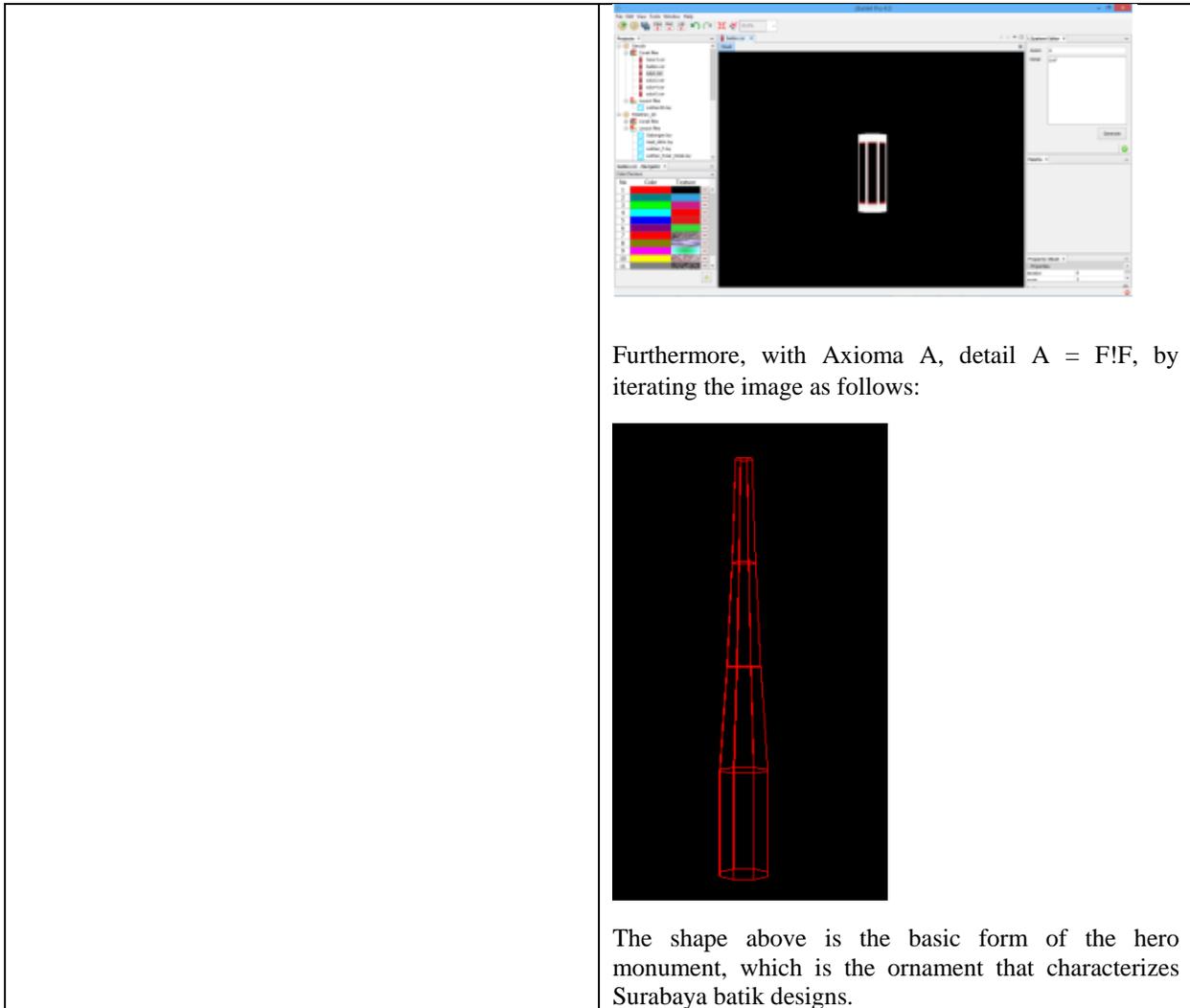
JBatik is software for making batik motif designs using fractal formulas, where fractal is a branch of mathematics that studies repetition and equations that are usually generated in a way to repeat a composition. With the jBatik design software, the process of making batik patterns can be done by mapping batik patterns mathematically to be translated into digital batik patterns by the jBatik software. The fractal pattern is generated by a mathematical function in a recursive process and iterates in finite or infinite order.

3.1 Making patterns

Several geometric shapes are used to make batik ornaments, such as monuments and tendrils

Tables 1: Build Geometry

Build Geometry	Information
<p>Octagonal</p> 	<p>With a length of 10, a width of 1, the shape of the octagon becomes as follows:</p>  <p>Next, with an angle of 30°, Axioma A, and detail A = F [+F] F, by iterating, we get the following form:</p>  <p>The shape above, becomes a tendril shape.</p>
<p>Octagonal</p> 	<p>With a length of 10, a width of 1, the shape of the octagon becomes as follows:</p>



Then it is saved in 3D format to the PNG library, so it can be used on 2D layers, and the result is as shown below:

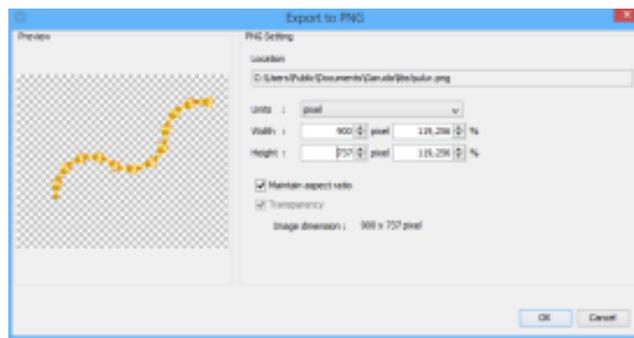


Figure 1: 3D Vines

Furthermore, in the same way, the 3D ornament pattern of the hero monument, clover leaves, and red flowers is made, which are ornaments that show the characteristics of the city of Surabaya.

3.2 Making batik design

1. Click on file→select New Project→click Next

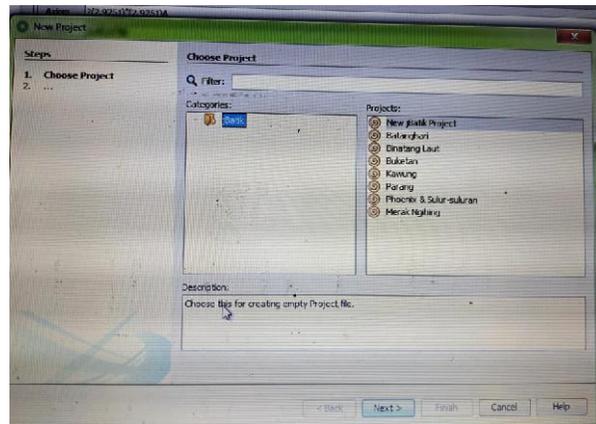


Figure 2: Visual jBatik

2. Give it a name and set the size → click Finish

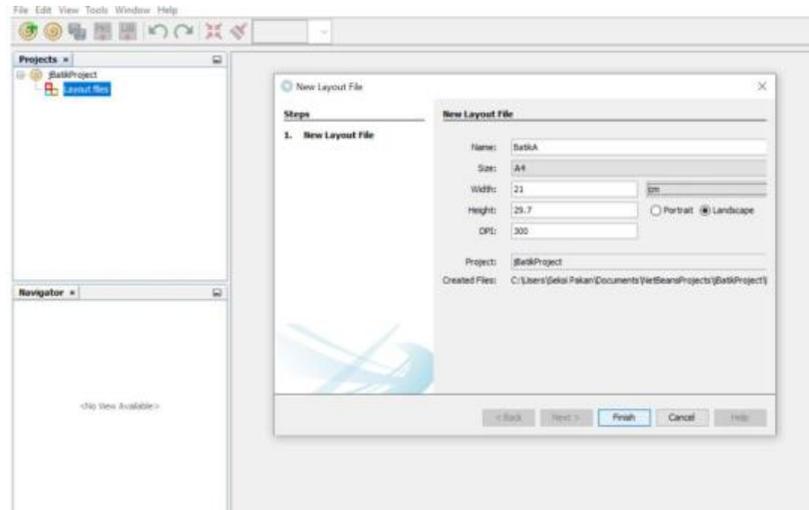


Figure 3: Visual jBatik name and set the size

3. Click New Layer, then drag the selected image onto the layer
Images can be imported from other storage media. Not only the patterns available in the jBatik software can be used, but you can also choose the desired alternative pattern, by importing the pattern in .png format.
4. Then grouped, cloned and arranged
5. To add a hero's memorial and flowers, click New Layer
6. Next drag the image into the box that appears
The final result of the design is as shown in the following image:

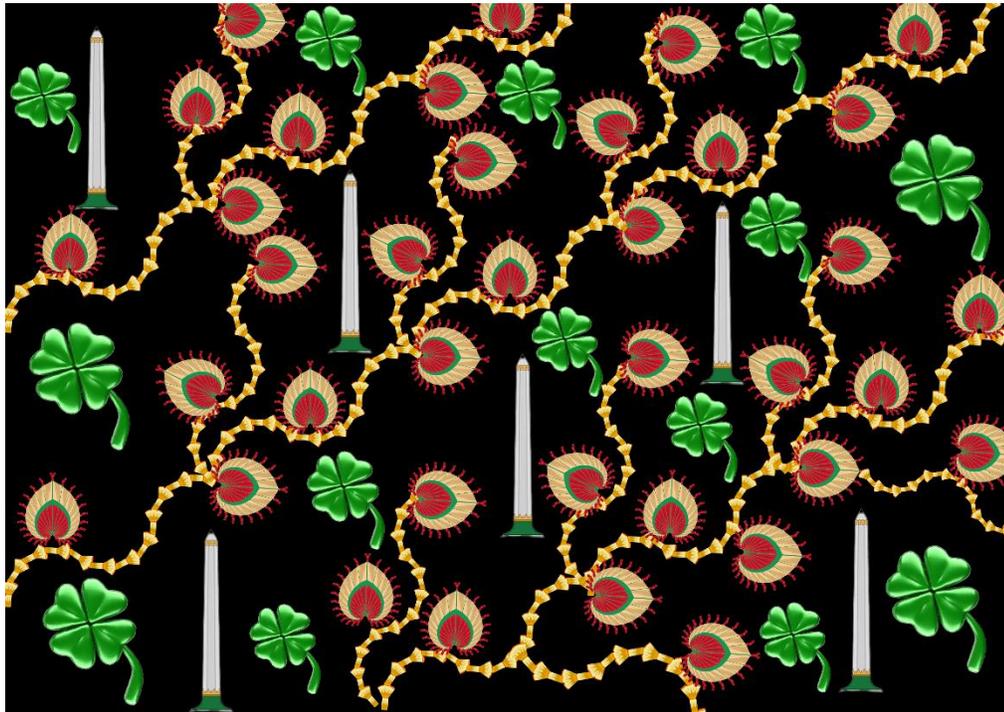


Figure 4: Final design Surabaya batik

In the batik design, the vines and the hero's monument are made from the basic shape of an octagon, with axioms and iterations, resulting in an image with a 3D effect.

IV. CONCLUSION

With the features offered by the jBatik Pro software, batik craftsmen will be greatly assisted in the process of designing and making batik designs with 3-dimensional motifs. The data storage process can be done digitally, so the resulting designs can be printed directly on the cloth. In this way, craftsmen can make batik faster and in large quantities, so that they can meet market needs.

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Aggregate Properties Of Fluvial Deposits Of Malir, Lyari And Hub Rivers Of Karachi Embayment, Southern Indus Basin, Pakistan

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Abstract- Karachi Embayment is a part of southern Indus Basin, which is located in the south of Sindh province of Pakistan. Fluvial deposits in Karachi Embayment are a major source of crushed fine and coarse aggregate for use in concrete in Karachi city. Therefore, engineering properties (physical and mechanical) of Hub, Malir and Lyari Rivers natural coarse aggregate were determined. In addition, comparison between these properties have been made. Nine samples (three samples from each river) were carefully collected and tested to evaluate engineering properties. The results of overall aggregate properties pointed out that Hub, Malir and Lyari rivers natural coarse aggregate is within the international (ASTM) standard values limits and it is suitable for use in concrete. In addition, by the comparison of laboratory testing of the various samples of Hub, Malir and Lyari Rivers indicates that aggregate of Hub River deposits has superior mechanical and physical properties in comparison with other aggregate of Malir and Lyari rivers deposits hence are potentially suitable for many special concrete purposes.

Index Terms- Aggregate, ASTM, Fluvial deposits, Karachi Embayment, Specific gravity test, Concrete, Laboratory Testing, soundness test, Water absorption test.

I. INTRODUCTION

The Karachi Embayment is located in the southernmost portion of Sindh and Lower Indus Basin, lies between latitude 66°35'00"-67°30'00" E and longitude 24°45'00" to 25°05'00" N (Figure 1). The Karachi region is home of a broad range of landforms with various nature and origins. The landscape assemblage depicts a fascinating and convoluted denudational timeline. (Saeed et al. 2017) mentioned that "Coastal part of Sindh lies in the seismically active zone" (Tatheer and Yasmeen, 2012). In terms of geology, Karachi region represents sedimentary rocks of late tertiary which are overlain by fluviate and aeolian sediments of Quaternary age (Shah, 1977). The landscapes of the study area give evidence of structural and lithological control. However, aeolian sandy/silty sediments covers much of the ground surface like a blanket, and gravely mounds of varying proportions are visible as relics of ancient river terraces in several locations. The relief condition of the land, in general, demonstrates maturity. The Malir River and Lyari River are the main streams draining Karachi region (Figure 2). The liquefaction potential is affected by the earthquake's intensity, magnitude, duration of ground motion, distance from the epicenter, site-specific conditions, ground acceleration, type and thickness of soil deposits, relative density, grain size distribution, fine contents, plasticity of fines, degree of saturation, confining pressure, permeability of soil layer, position and fluctuation of ground water table, reduction of effective stress, and shear modulus. (Youd and Perkins, 1978; Tuttle et al., 1999; Youd et al., 2001). The Karachi region presents the landforms of varied nature and origin ranging from the arid to fluvial and marine landscapes. This assemblage of landscape reflects polygenesis in origin. Structurally the whole region of Karachi presents a series of plunging folds trending NE-SW which is name after the localities as Cape Monze, Pir Mangho, Drigh road and Landhi-Korangi anticlines. These four anticlines are alternated with three synclines named as Laljee, Lyari and Malir synclines which are traversed by these sizeable seasonal streams (Hamid et al., 2019).

Malir River (MR). Lyari River (LR) and Korangi Conglomerate (KG) on the down side of the probable Malir River fault (MR). This is perhaps part of a fault zone (thick wavy red line) that forms this tectonic boundary which

runs west to east from the SW tip of this map to Thatta and beyond. Right lateral movement and drag along this tectonic boundary caused by eastward creep of Karachi Arc (red arrow) (Sarwar et al., 2013).

Karachi's uneven plain tract is made up of two alluvial-filled valleys, the basins of the brief Lyari and Malir rivers. The earlier synclinal lows are reflected by these two valleys, which are flattened by the fluvial deposits (coarse river gravels and calcareous sand). The Hub River Basin, to the west, presents very comparable characteristics like the basins of Malir and Lyari Rivers. The thickness of fluvial sediments exceeds 30 feet in most dug water wells in Karachi's central area.

The main purpose of our study is to evaluate the mechanical properties and comparison of the fluvial deposits of the three ephemeral Malir, Lyari and Hub Rivers in the Karachi Embayment as coarse aggregates for the construction purpose. We completed our field work in 7 days, we made the traverses along the bank of the rivers which were highly exposed by fluvial deposits. We used GPS, Brunton compass, geological hammer sample bags and safety equipment for data collection during the field work.

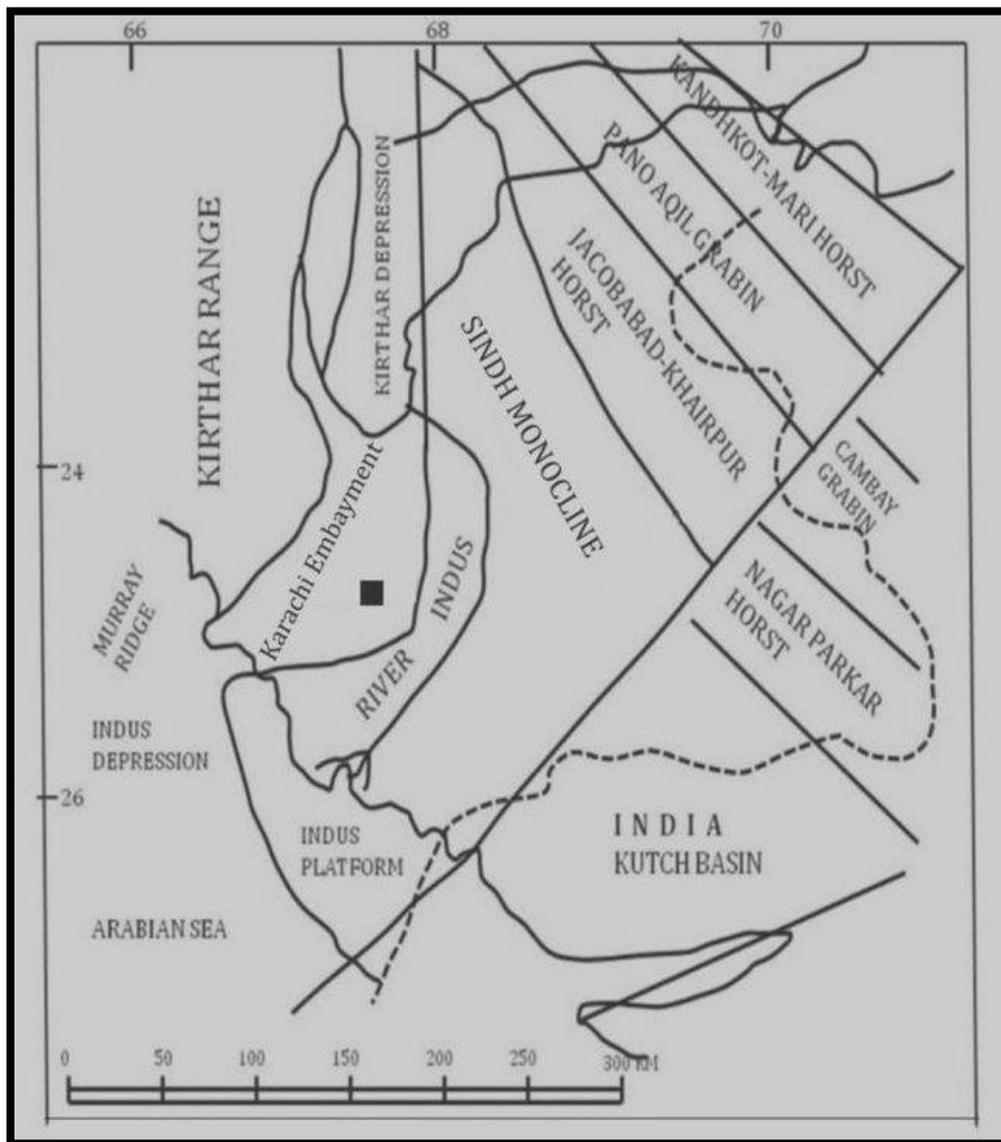


Figure 1. Tectonic map of Sindh (Southern Indus Basin), rectangle shows study area (Modified after Kazmi and Rana 1982; Raza et al, 1990). Karachi Embayment is an interesting feature as it is embayment opening up into Arabian sea.

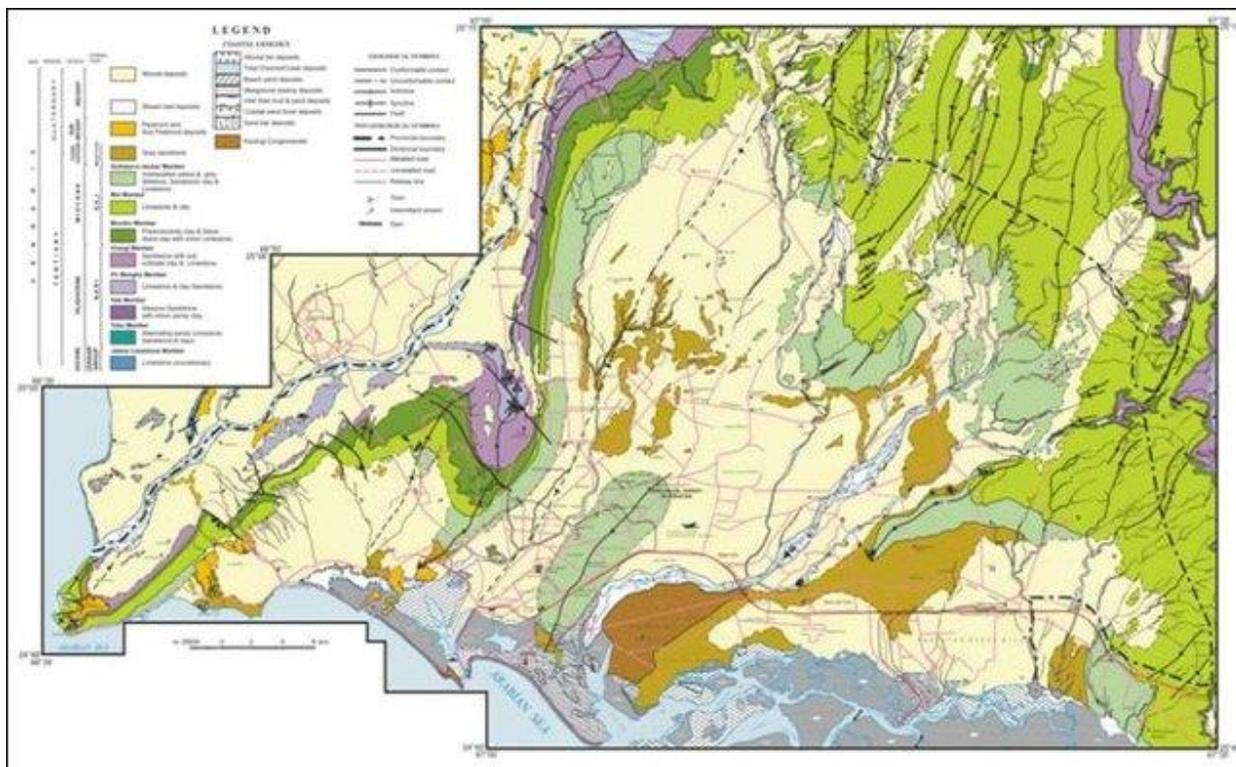


Figure 2. Showing the Geology of the Karachi Embayment (after Qureshi et al. 2001).

1.1. Stratigraphy

The stratigraphy of the study area ranges from Eocene Kirthar Formation to Pleistocene Dada Formation (Shah 1977) (Table 1).

Table 1: Stratigraphic sequence of the project area. (Fatima A N Stratigraphy of Pakistan Shah S.M.I (1977).

Formation	Age	Description
Dada Formation	Pleistocene	Mainly consists of gravels, loosely cemented sand and silt matrix. Upper part is covered by sub recent to recent fluvial deposits (rock fragments, conglomerate, sand, silt and clay).
Manchar Formation	Pliocene	Consists of sandstone which is thickly bedded and massive, grey and greenish grey color, soft friable, coarse grained interconnected with sandy clay. Sandstone suggests the shallow water deposition environment and there is an unconformity between Manchar formation and Dada formation.
Gaj Formation	Miocene	Consists of three members which are Metan clay (greyish to brown, soft to moderate hard) in lower part, Jhill limestone (hard thin bedded light brown to cream colored, massive and nodular), and Talawa limestone (brown color, hard, thin to thick bedded) in the upper part.
Nari Formation	Oligocene	Consists of limestone (dark brown, nodular, thin to medium bedded, silicious and fossiliferous) in lower part, sandstone and shale (greenish to grey) in the upper part.
Kirthar Formation	Eocene	Dominantly consists of dark grey, golden brown, or light grey color limestone.

1.2. Geology and Tectonic Setting of the Study Area

The geological structural setup of Karachi region belongs to the Southern Indian Basin which is a result of the rifting during Triassic and oblique collision of the Indo-Pakistan plate with the Afghan blocks during the Late-Cretaceous, and by post collision deformation during Neogene and Quaternary periods. Tectonically the counter clockwise movement of Indian plate during Eocene time, after its collision with Eurasian plate, has resulted in the formation of Karachi Embayment. It has remained as a trough in the recent geological time. It was followed by structural deformation in the late Pleistocene to middle Pleistocene related to the Himalayan Orogeny (Bender and Raza, 1995). Structurally, the city of Karachi lies approximately 150 km east of the triple junction between the Arabian, Indian, and Asian plates (Apel et al. 2006). A thrust and fold belt extending northward parallel to transform fault separating India from Asia, and the Kuch fault system trending westward toward the city. Karachi is a part of a major synclinorium stretching from Ranpathani River in the east to Mehar and Mol Jabals in the north and sea coast in the south (Hamid et al., 2019). Karachi is situated on or close to four minor faults. The first is the Allah Bund fault, which runs through the seaside village of Shah Bundar, the region around Pakistan Steel Mills, and through the city's eastern sections, finishing near Cape Monz. Another fault may be seen near Sindh's southeastern border with India, in the Rann of Kutch. The Pabb fault, located near the Makran coast west of Karachi, is the third, while the Dadu fault, located on the city's northern border, is the fourth (Bender and Raza 1995). The Karachi region is structurally part of Lower Indus Basin's Kirthar fold belt, which consists of series of plunging folds that make trend from NE-SW. Four large anticlines name Cape Monze, Pir Mangho, Drigh road and Landhi-Korangi anticlines with three intervening Laljee, Lyari and Malir synclines structures are shown in cross section from West to East direction. Synclinal troughs are alluvial-filled basins that connect three stream drainage networks (Figure 3).

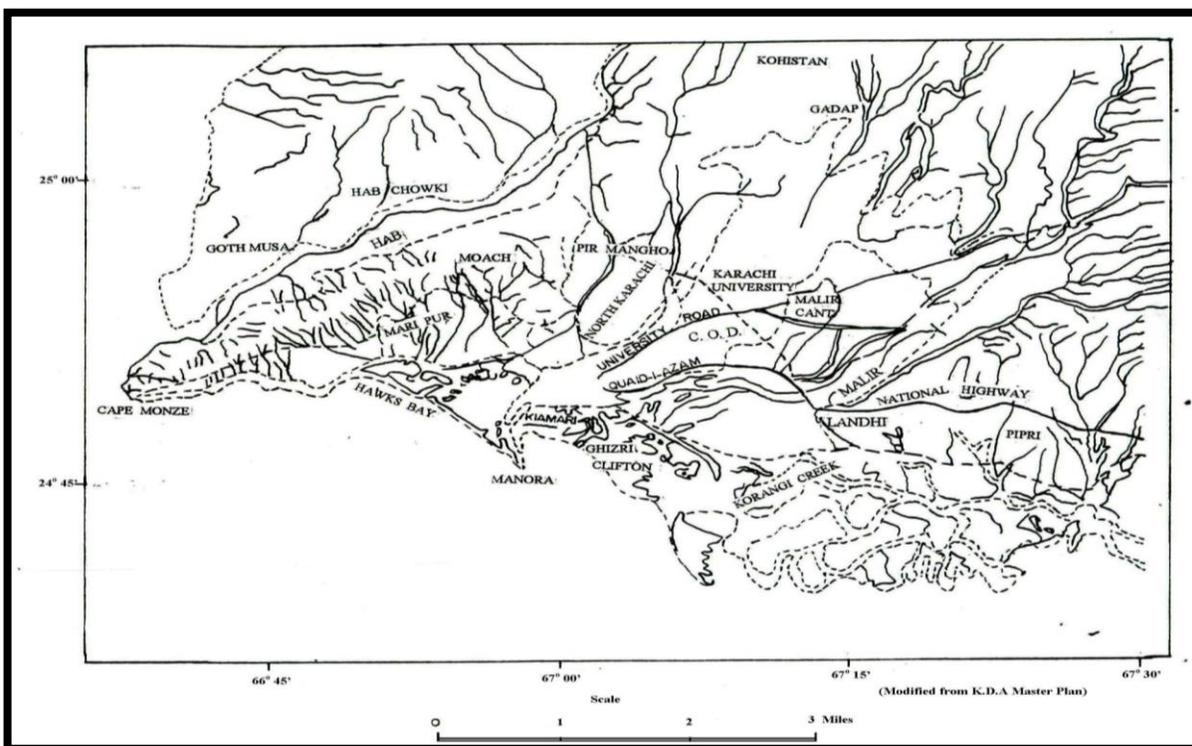


Figure 3. Shows the drainage pattern of the study area. (Modified after K.D.A Master Plan).

1.3. Climate

Karachi has an arid climate; however, it is a mild form of it. As a result of its location on the Arabian Sea's shore, it has a comparatively warm climate.

Summer and winter are the two primary seasons of Karachi, with spring and fall being brief. The summer season lasts the longest during the year. Karachi is also rained on from July to September (Monsoon). The city has a tropical climate, with mild winters and scorching summers. The humidity levels are normally high from March to November,

but are relatively low in the winter due to the north-east wind direction. In the winter, the temperature drops below 10°C on occasion, with a daytime temperature of around 25°C (Figure 4).

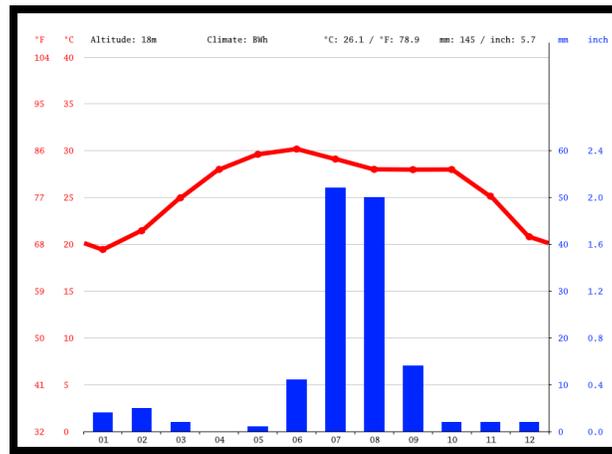


Figure 4. Show the Average Weather, Temperature of Karachi (Climate-data.org)

1.4. Location and Accessibility

The location marks by GPS, Brunton compass. Various locations were marked at the sampling points, like Memon Goth, Rais Goth, near Khan Crusher, Goth Band Murad on the banks of the three rivers. The sampling of Lyari River accessible by Lyari Express,

1.5. Objective

To investigate the mechanical characteristics of Fluvial deposits of Hub, Malir and Lyari Rivers and compare them to ASTM standards using aggregate testing.

II. METHODOLOGY

2.1. Selection of Sampling Site

Choosing a sample site is a technical procedure that takes place during field operations. The samples are taken from a location that is both conveniently accessible and well outcropped. To determine the mechanical properties of a samples, they were chosen. The texture, structure, size, and form of the samples were all taken into consideration while choosing them. For identifying position and dip strike, we used a Brunton compass, and for collecting samples, we used a geological hammer with proper safety. Field date samples are analyzed in the lab after they are collected.

III. RESULTS

3.1. Los Angeles Abrasion Test (ASTM C 131)

Los Angeles Abrasion resistance test carried out to indicate crushing, degradation, disintegration and toughness of aggregates. Principally, this test produces abrasive action on aggregates by using standard steel balls in revolving hollow cylinder of Los Angles Abrasion resistance testing machine to determine the percentage weathering of aggregates. The machine contains a hollow cylinder closed at one end having a diameter of 700 mm and a length of 500 mm. In this cylinder 5kg of aggregates are filled with the steel balls of size 40mm & weight 390- 445kg each. After mixing the cylinder is allowed to rotate with the speed of 30-33 RPM with total of 500-1000 revolutions as selected by category. the sample is removed and washed over a No. 12 (1.70mm) sieve and placed in an oven to dry and the percent loss or the difference between the original mass and the final mass is calculated with the help of formula, weight of aggregate pass through 1.7 mm sieve divided by total weight of sample multiply by 100 we can get the percentage value for Los Angles Abrasion resistance values of aggregates (Table 2, 3 and 4).

Table 2: Shows Los Angeles Abrasion Resistance Test values after lab-testing of samples Hub River collected from study area.

S/ N	Sample	Coordinates	Dry Weight (g)	Retain Weight (g)	Loss Weight (g)	Abrasion Value	A/ V Average value	ASTM standard value
1	KCHR-01	N 25 01 38 E 66 56 47	5000	4100	900	18%	18.1 %	>60%
2	GBMHR-02	N 25 05 33 E 67 00 07	5000	4120	880	17.6%		
3	RGHR-03	N 25 00 45 E 66 53 21	5000	4065	935	18.7%		

Table 3: Shows Los Angeles Abrasion Resistance Test values after lab-testing of samples Malir River collected from study area.

S/ N	Sample	Coordinates	Dry Weight (g)	Retain Weight (g)	Loss Weight (g)	Abrasion Value	A/ V Average value	ASTM standard value
1	IGMR-01	N 24 54 25 E 67 15 53	5000	3820	1180	23.6%	24.8 %	>60%
2	GMR-02	N 24 53 23 E 67 14 13	5000	3700	1300	26%		
3	MGMR-03	N 24 54 07 E 67 15 28	5000	3765	1235	24.7%		

Table 4: Shows Los Angeles Abrasion Resistance Test values after lab-testing of samples Lyari River collected from study area.

S/ N	Sample	Coordinates	Dry Weight (g)	Retain Weight (g)	Loss Weight (g)	Abrasion Value	A/ V Average value	ASTM standard value
1	ISLR-01	N 24 55 41 E 67 05 13	5000	3980	1020	20.4%	19.4 %	>60%
2	HSLR-02	N 24 53 49 E 67 03 11	5000	4060	940	18.8%		
3	PPLR-03	N 33 40 981 E 73 38	5000	4050	950	19%		

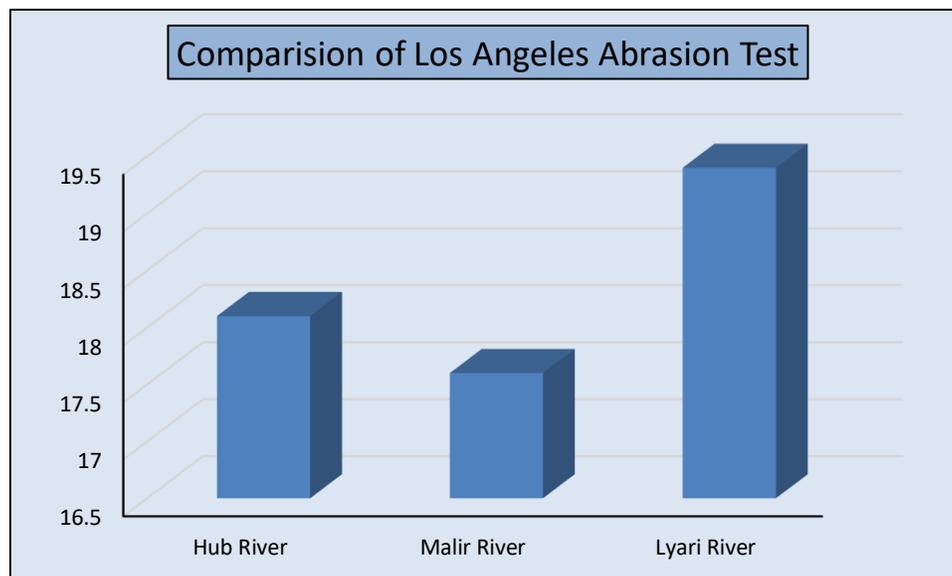


Figure 5. Comparison of Los Angeles Abrasion test results of samples collected from Hub, Malir and Lyari river.

3.2. Soundness Test (ASTM C 88)

Aggregate test samples were carefully sorted and weighed before being soaked in a sodium sulphate or magnesium sulphate solution and oven dried under certain conditions. The formation of salt crystals in the test sample's pores is thought to cause disruptive internal forces comparable to those produced by water freezing or salt crystallization. The weight reduction is calculated after a certain number of cycles.

When evaluated with sodium sulphate and magnesium sulphate, the average weight loss after 10 cycles should not exceed 12 percent and 18 percent, respectively.

Table 5: Shows Soundness Test values after lab-testing of samples Hub River collected from study area.

S/ N	Sample	Coordinates	Dry Weight (g)	Retain Weight (g)	Loss Weight (g)	Abrasion Value	A/ V Average value	ASTM standard value
1	KCHR-01	N 25 01 38 E 66 56 47	5800	5570	230	3.96%	3.96%	12%-18%
2	GBMHR-02	N 25 05 33 E 67 00 07	5800	5571	229	3.94%		
3	RGHR-03	N 25 00 45 E 66 53 21	5800	5567	233	0.4%		

Table 6: Shows Soundness Test values after lab-testing of samples Malir River collected from study area.

S/ N	Sample	Coordinates	Dry Weight (g)	Retain Weight (g)	Loss Weight (g)	Abrasion Value	A/ V Average value	ASTM standard value
1	IGMR-01	N 24 54 25 E 67 15 53	5800	5341	459	7.91%	7.8 %	12%-18%
2	JGMR-02	N 24 53 23 E 67 14 13	5800	5550	450	7.75%		
3	MGMR-03	N 24 54 07 E 67 15 28	5800	5367	433	7.74%		

Table 7: Shows Soundness Test values after lab-testing of samples Lyari River collected from study area.

S/ N	Sample	Coordinates	Dry Weight (g)	Retain Weight (g)	Loss Weight (g)	Abrasion Value	A/ V Average value	ASTM standard value
1	ISLR-01	N 33 58 260 E73 83 186	5800	5484	316	5.4%	5.1 %	12%-18%
2	HSLR-02	N 33 45 337 E 73 42 511	5800	5500	300	5.1%		
3	PPLR-03	N 33 40 981 E 73 38	5800	5517	283	4.8%		

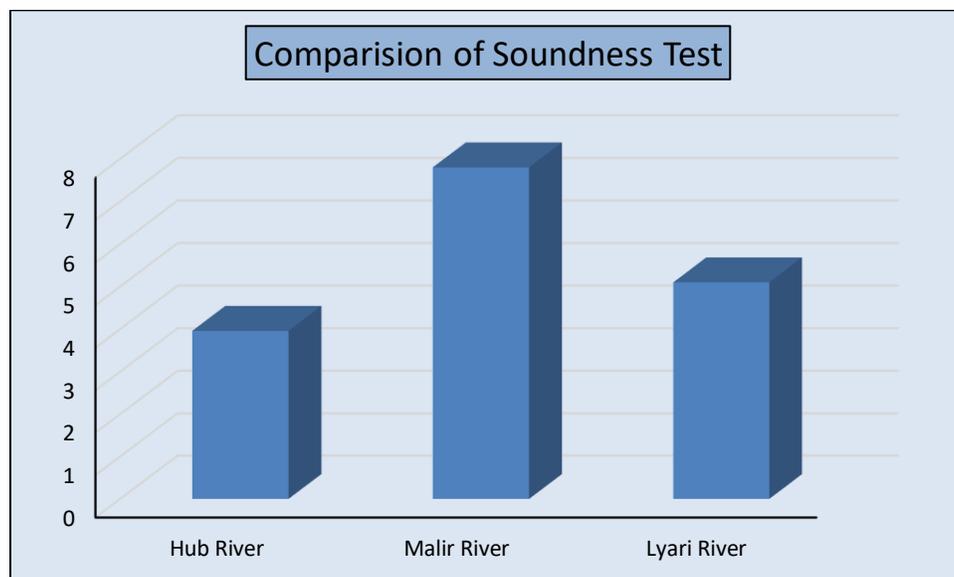


Figure 6. Comparison of Soundness test results of samples collected from Hub, Malir and Lyari river

3.3. Aggregate Crushing Value Test (ASTM D 5821)

Aggregate crushing value test on coarse aggregates gives a relative measure of the resistance of an aggregate crushing under gradually applied compressive load. In this method coarse aggregate passing 12.5mm IS sieve and retained on a 10mm IS sieve are selected and heated at 100 to 110°C for 4 hours and cooled to room temperature. The quantity of aggregate shall be such that the depth of material in the cylinder, after tamping as described below shall be 10 cm. Put the cylinder in position on the base plate and weigh it (**W**), put the sample in 3 layers, each layer being subjected to 25 strokes using the tamping rod, and weigh it (**W1**). Level the surface of aggregate carefully and insert the plunger, place the cylinder with plunger on the loading platform of the compression testing machine. Apply load at a uniform rate so that a total load of 40T is applied in 10 minutes. Release the load and remove the material from the cylinder. Sieve the material with 2.36mm IS sieve, care being taken to avoid loss of fines. Weigh the fraction

passing through the IS sieve (**W2**). W2 =Weight of fraction passing through the appropriate sieve W1-W =Weight of surface dry sample. The mean of two result to nearest whole number is the aggregate crushing value.

Table 8: Represents the Aggregates Crushing Values after Lab- testing of samples from Hub River collected from study area.

S/ N	Sample	Coordinate s	Present value	Average value	ASTM standard value
1	KCHR-01	N 25 01 38 E 66 56 47	20%	20%	10-30%
2	GBMHR-02	N 25 05 33 E 67 00	19.8%		
3	KHKS-03	07 N 25 00 45 E 66 53 21	20.4%		

Table 9: Represents the Aggregates Crushing Values after Lab- testing of samples from Malir River collected from study area.

S/ N	Sample	Coordinate s	Present value	Average value	ASTM standard value
1	IGMR-01	N 24 54 25 E 67 15 53	20.9%	20.4%	10-30%
2	JGMR-02	N 24 53 23 E 67 14	20.2%		
3	KHKS-03	N 24 54 07 E 67 15 28	20%		

Table 10: Represents the Aggregates Crushing Values after Lab- testing of samples from Lyari River collected from study area.

S/ N	Sample	Coordinate s	Present value	Average value	ASTM standard value
1	ISLR-01	N 33 58 260 E 73 83 186	24.2%	23 %	10-30%
2	HSLR-02	N 33 61 034 E 73 77 983	22.7%		
3	KHKS-03	N 33 38 376 E 73 44 734	21.9%		

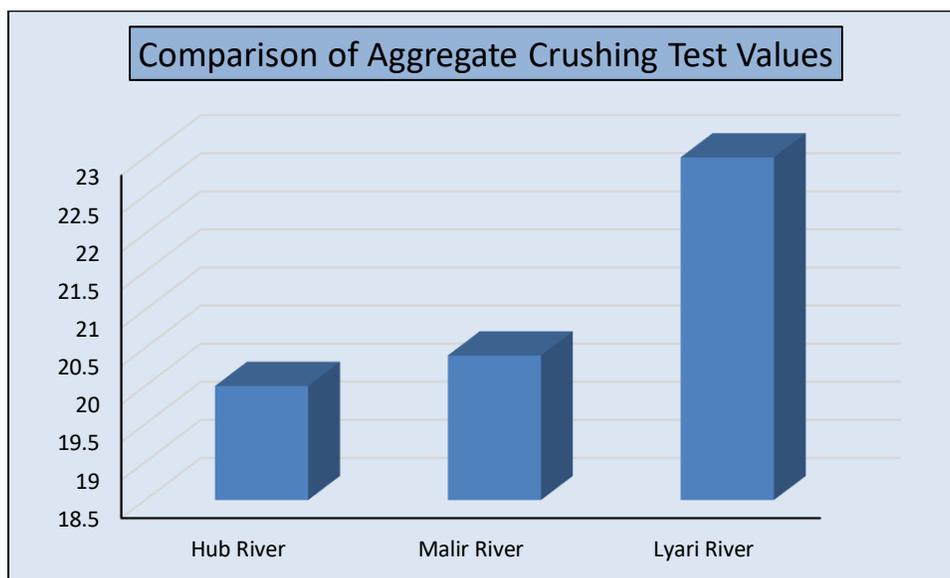


Figure 7. Comparison of Aggregate Crushing Value test results of samples collected from Hub, Malir and Lyari river.

3.4. Water Absorption Test (ASTM D 570)

The purpose of **ASTM D570** is to determine the rate of absorption of water by immersing the specimen in water for a specific period of time. The formula $B-A$ divided by A is used to calculate Water Absorption values, where B is the saturated surface dry weight of the sample after submerge in water for 24 hours and A is the sample's oven dry weight. The average water absorption value from the test findings was 2.24, which is greater than the ASTM (American Society of Testing and Materials) standard range of 0.1-1.0 or 0.6 per unit weight. The period of immersion, the temperature of the water, the thickness of the sample, and the kind of sample are the important elements to consider while doing this test.

Table 11: Shows the values from Lab- Data for the Water. Absorption Test of Hub River samples collected from study area.

S. N	Sample Name	Water Absorption values	Mean values	Standard value for water absorption
1	KCHR-01	1.9%	1.95	Less than 0.6 per unit by weight
2	GBMHR-02	2%		
3	RGHR-03	1.96		

Table 12: Shows the values from Lab- Data for the Water. Absorption Test of Malir River samples collected from study area.

S. N	Sample Name	Water Absorption values	Mean values	Standard value for water absorption
1	IGMR-01	2%	1.86	Less than 0.6 per unit by weight
2	JGMR-02	1.6%		
3	MGMR-03	2%		

Table 13: Shows the values from Lab- Data for the Water. Absorption Test of Lyari River samples collected from study area.

S. N	Sample Name	Water Absorption values	Mean values	Standard value for water absorption
1	ISLR-01	2%	2.13	Less than 0.6 per unit by weight
2	HSLR-02	2.4%		
3	PPLR-03	2%		

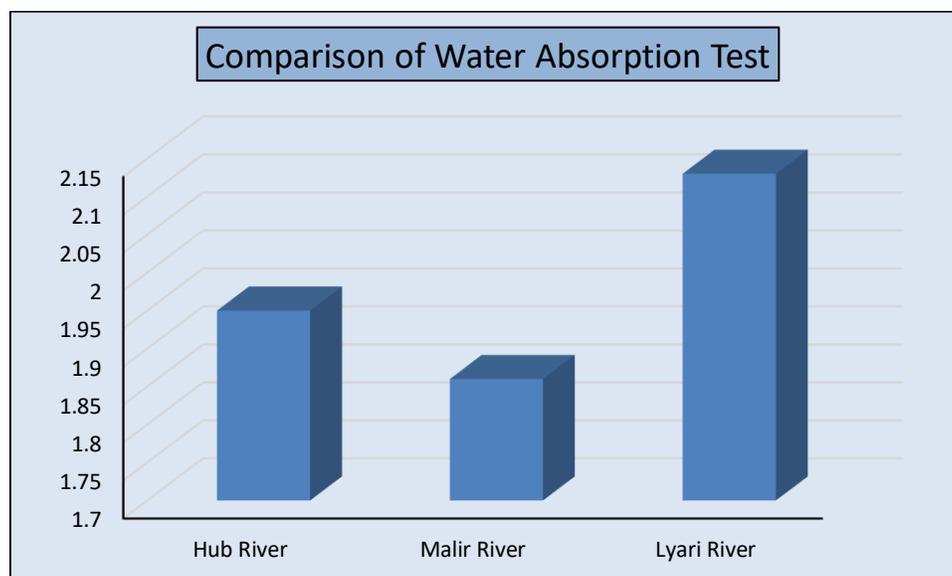


Figure 8. Comparison of Water Absorption test results of samples collected from Hub, Malir and Lyari river.

3.5. Specific Gravity Test

Table 14: Shows the values of Specific Gravity values from Lab-Data for Hub River collected from study area.

S. N	Sample Name	Coordinates	O. Dry Wt. (g)	O. Dry Wt. (g)	App S.G.	Mean Value	ASTM standard value
1	KCHR-01	N 25 01 38 E 66 56 47	1000	380	2.63	2.6	2.6 - 3.0
2	GBMHR-02	N 25 05 33 E 67 00 07	1000	389	2.57		
3	RGHR-03	N 25 00 45 E 66 53 21	1000	382	2.61		

Table 15: Shows the values of Specific Gravity values from Lab-Data for Malir River collected from study area.

S. N	Sample Name	Coordinates	O. Dry Wt. (g)	Wt. in Water (g)	App S.G.	Mean Value	ASTM standard value
1	IGMR-01	N 24 54 25 E 67 15 53	1000	390	2.56	2.56	2.6 - 3.0
2	DMGMR-02	N 24 53 23 E 67 14 13	1000	388	2.57		
3	MGMR-03	N 24 54 07 E 67 15 28	1000	391	2.55		

Table 16: Shows the values of Specific Gravity values from Lab-Data for Lyari River collected from study area.

S. N	Sample Name	Coordinates	O. Dry Wt. (g)	Wt. in Water (g)	App S.G.	Mean Value	ASTM standard value
1	ISLR-01	N 33 61 034 E 73 77 983	1000	382	2.6	2.62	2.6 - 3.0
2	HSLR-02	N 33 38 376 E 73 44 734	1000	380	2.63		
3	PPLR-03	N 33 45 337 E 511	1000	380	2.63		

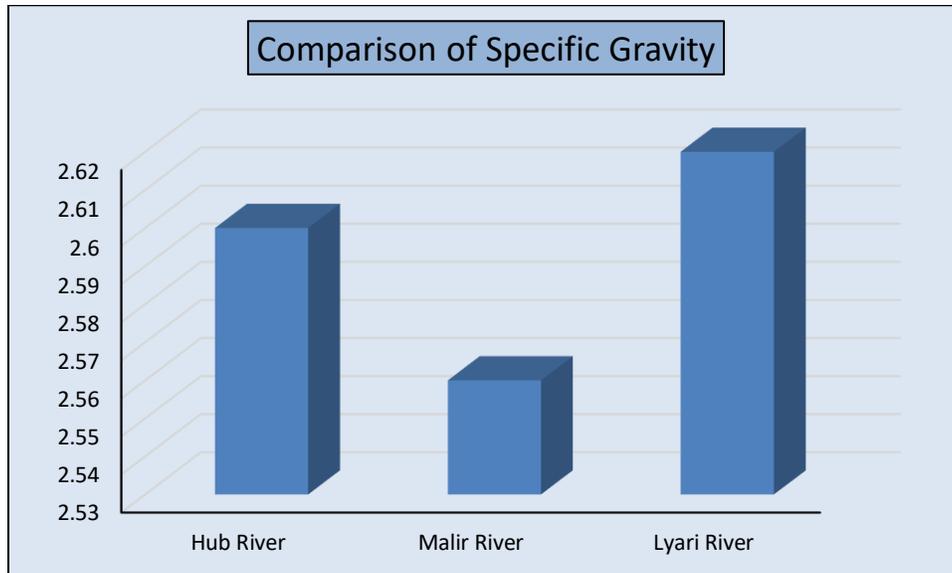


Figure 9. Comparison of Specific Gravity test results of samples collected from Hub, Malir and Lyari river.

IV. DISCUSSION

The evaluation of mechanical properties, determined by analyzing the resulting values of the tests like Los Angeles abrasion resistance, Aggregate Crushing Value, Soundness, Water Absorption and Specific gravity. 9 samples were collected from the banks of the three rivers (three samples from each river) to conclude the, Los Angeles Abrasion resistance values, Aggregate crushing values, Soundness test values, Water absorption and Specific gravity values of the coarse aggregate to examine its mechanical properties to be used in the construction industry, and on the basis of mechanical properties, to compare the aggregates of Hub, Malir and Lyari rivers. The average resulted abrasion values of Hub River samples is 18.1 percent loss (table 17) indicates very satisfied condition, and the other two Malir River and Lyari River having good resulted values of 24.8 percent loss (table 17) and 19.4 percent loss (table 17) respectively which are also giving a satisfied condition and can be used as coarse aggregate for construction purpose as the ASTM standard value is for coarse aggregate is less than 60% of loss. If we talk about Aggregate Crushing values, the ACV of Hub River is 20 percent (table 17) which is less than the other two Malir and Lyari rivers crushing values. The ASTM standard value for ACV lies between 10-30% and the results of ACV of all the samples lies in 10-30% which provide a satisfied condition. The resulting values of Soundness test of all the samples are also lies in the standard ASTM values. Likewise, Water Absorption values from results as an average of 1.95 (table 11) percent, 1.86 percent (table 12) and 2.13 percent (table 13) that are considerably bigger than to the ASTM standard value i.e., 0.1-1.0 or 0.6 per unit weight. The values obtained don't qualifying ASTM absorption values. And the mean specific gravity results are 2.6 (table 14), 2.56 (table 15) and 2.62 (table 16) for Hub, Malir and Lyari rivers respectively which may be between 2.6-3.0.

Table 17: Shows the comparison between Aggregate Crushing Values and Los Angeles Abrasion resistance test values from Lab- Data of the samples of Hub, Malir and Lyari Rivers, collected from study area.

S/N	Sample	Avg. Abrasion Values	Avg. Crushing Values	Avg. Soundness Test Values
1	Hub River	18.1%	20%	3.96%
2	Malir River	24.8%	20.4%	7.85%
3	Lyari River	19.4%	23%	5.1%

V. CONCLUSION

After doing the evaluation of mechanical properties of the coarse aggregate samples of three rivers and their comparison, we concluded that aggregate of the Hub River is comparatively best than the aggregate of other two rivers for the construction purpose. After Hub River we can consider the aggregate of Lyari River as better aggregate, and aggregate of Malir River is also good for the

construction purpose. We also concluded that the resulting values of all the aggregate samples are the standard ASTM values of their mechanical properties which indicates that fluvial deposits of the rivers of Karachi can use as aggregate for construction purpose.

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Conflict of Interests

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Assessment Of Landscape Design In Hospital Environments In Ota, Ogun State, Nigeria.

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Abstract: Humans are thought to be affected by the visible landscape in a variety of ways, including aesthetic appreciation, good health, and overall happiness. Hospital landscapes have been shown in studies to provide psychological, physical, and social advantages that help patients recover. The therapeutic landscape has been a frequently utilized idea in the architecture of medical institutions in many regions of the world due to its healing benefits. This is the utilization of various landscape aspects in an area to assist patients in achieving physical, mental, and spiritual rehabilitation. On this note, the study examined the extent to which the design of the therapeutic landscape was adopted to improve patient recovery at selected treatment centers in Ota, Ogun State, Nigeria, to identify potential areas for improvement. This study adopted a high-quality research approach using direct observation and review of previous study literature related to the topic of data collection, content analysis, and quantitative data collection from respondents. According to the findings, none of the medical institutions surveyed employed a therapeutic landscape to complement the standard medical care they provided. Softscape elements like grass, shrubs, flowers, and trees were included in the medical institutions' sites, although they were not offered for therapeutic purposes, but rather for aesthetic and shade purposes. Finally, the study has added to the body of knowledge by demonstrating the extent to which the therapeutic landscape was used to improve patient recovery in the selected medical institutions in Ota, Ogun State, Nigeria. The study's findings add to the body of knowledge on the subject and lay the groundwork for future research in the field.

Keywords: landscape design, medical facilities, therapeutic landscape.

1.0. BACKGROUND

The impact of the environment on human health is becoming increasingly recognized in Nigerian studies and policy. In hospitals, landscapes and gardens are critical for patients' rapid rehabilitation. Through psychological and physical changes, it increases the quality of life. Visiting and observing landscaping at hospitals has been shown in numerous studies to assist patients to recover faster from surgery and to help staff focus on their jobs. Physiological responses in people are frequently triggered by environmental factors. According to studies, natural landscapes produce more favorable physiological reactions than non-natural variables, resulting in stress reduction and faster recovery after medical procedures. [1–3]. A setting with water or green features increases psychological benefits compared to fully human-made environments (which lack any landscape aspect) [4–10]. According to historical statistics, the design of places around hospitals is a key aspect in ensuring that patients are comfortable, and landscape design has had a significant part in reducing patient stress". Sustainable landscapes are environmentally sensitive, regenerative, and resilient," according to the American Society of Landscape Architects (ASLA 2017), and can help people live better lives. Sustainable landscapes absorb carbon, enhance air and water quality, increase energy efficiency, restore ecosystems, and bring significant economic, social, and environmental benefits. The American Society of Landscape Architects (ASLA) published a report in 2017.

The visible elements of a piece of land, such as its landforms and how they interact with natural and manufactured features, are referred to as the landscape. A landscape can take on several forms based on its components, which are divided into two categories: hardscape and softscape. The hardscape refers to the non-living aspects of the landscape system, such as terraces, which are an attractive method to transform an unsightly slope into a succession of lovely gardens. Walkways, benches, and gazebos are the most widely used landscape components. There are also decks and patios, garden ponds, waterfalls, fountains, and other attractions. Landscaping also includes hardscape elements like lighting and fencing. Components such as rocks, concrete, bricks, and stone make up the hardscape in general. Softscape consists of living elements such as perennial flowers, shrubs,

succulents, and trees. (Landscape Architecture, Fifth Edition: A Manual of Environmental Planning and Design by Barry Starke and John Ormsbee Simonds)

The therapeutic landscape is a framework for analyzing the process of bringing health and wellness to places. Physical surroundings, social environments, and symbolic environments are the three components. (Gesler, 2018). Medical facilities, which are sites where medical treatments are administered, such as hospitals, outpatient care centers, and specialized care centers, can create therapeutic landscapes privately or for public benefit. The therapeutic landscape is currently commonly employed in medical institutions all over the world as a consequence of the healing benefits it brings. The goal of this study is to see how far a therapeutic landscape was used to enhance patient recovery at a few medical institutions in Ota, Ogun State, Nigeria, to identify places where things could be better. Two objectives were defined to achieve the study's goal. They involve determining the therapeutic landscape characteristics applied at selected medical institutions in the research area, as well as determining how helpful the therapeutic landscape features are for boosting patients' recovery in those medical facilities.

2.0. REVIEW OF LITERATURE

During the first decades of the twentieth century, the hospital landscape fell dramatically. However, as medical research has advanced, hospital administrators and architects have begun to focus on the design of healthcare facilities that will limit the danger of infection while also providing an effective setting for new medical technologies. The formation of hundreds of major hospitals around the world has been shaped by a strong emphasis on infection control and efficiency. In an unsatisfactory and inappropriate manner for the emotional requirements of patients, their families, and even health care personnel, this is today's perception as a strong, stressful institution. [11, 12].

2.1. Natural Environments in Hospitals Have a Number of Benefits

Physical benefit

Patients' physical endurance and well-being are improved by regenerating structures and processes, according to studies. Environmental development has a good impact on patients' feelings of well-being, which in turn has a positive impact on their physical health. There is theoretical and practical research showing the natural good effects on blood pressure, cholesterol levels, and stress reduction, as well as unorthodox data [13–17]: according to a study by Robert Ulrich (2016), patients who recover actively leave their environmentally friendly rooms faster and take fewer analgesics when they have windows, compared to patients in identical rooms with brick walls [18, 19], and home-based studies indicated that a living room with windows reduces blood pressure, cholesterol levels, and stress levels. [18, 19].

Psychological Benefit

Allowing patients to choose between privacy and communicating with the public can aid in their recovery. For most patients, strict control over time and activity during hospitalization can have serious psychological consequences, such as loss of confidence or a sense of control, as well as increased stress. According to research [21-23], high blood pressure and cardiovascular activity caused by stress can be reduced when patients are exposed to nature scenes, because such scenes take their attention away from problematic thoughts, assisting in their recovery. Patients prefer well-designed hospital landscapes because of their favorable psychological consequences and the ability to spend time there, according to a study done by the Bow Center in London, which used flower beds and cuttings for horticultural treatment. [24]

Social Benefits

Everyone, regardless of age or sickness, requires entertainment and community support. For individuals with physical limitations, participation in community events may be the only option to interact and integrate with family and community, as well as to share the same information. Patients with strong social support networks have been proven to have less stress and better health, as well as improved recovery rates and survival rates from a variety of illnesses [25]. Social support enhances immunological and emotional processes, as well as treatment adherence [26]. Natural surrounds in health care institutions assist to social integration by providing interaction and support areas; evidence suggests that they are particularly effective in increasing patient, family, and staff access to community support. [27].

2.2 Therapeutic Landscape

A therapeutic landscape is a sort of healing garden created to work in tandem with a treatment program such as occupational therapy, physical therapy, or horticultural therapy. When a garden is created to fulfill the requirements of a certain person or group, it is considered to be therapeutic. It should be adapted to the therapy goals of the client and include both horticultural and non-horticultural activities. It should also be generated collaboratively by a group of specialists as part of a multidisciplinary approach. "Healing gardens" or "medical gardens," as defined by therapeutic scientists, are settings that give areas for gardening

activities while also encouraging physical exercise, such as medical walking (Detweiler, 2012). In addition, a "healing garden" is a garden or natural setting in a health facility that helps to reduce user stress and facilitate patient rehabilitation. A landscape can take on several forms depending on its constituents, and parts might be classified as hardscape or softscape. Softscape, which is mostly made up of plants and flora, is the most soothing component because of its major component: plants are used to build various kinds of man-made gardens. The treatment area can stand alone or be included in a larger healing garden. For a home treatment program, it might be an extension of the space [American Horticultural Therapy Association, 2017]. According to the American Horticultural Therapy Association, treatment facilities must include the following characteristics:

- I. Landscape characteristics, equipment, and components are all chosen or adjusted to give the most accessible settings, activities, and experiences. With each alteration to the therapeutic garden setting, patients, visitors, and gardeners can examine and study plants, touch and smell them, and enjoy the lush garden development in their own unique way, on their own terms, and at their own pace.
- II. Garden regions and unique zones of activity within the garden should be carefully delineated to direct patients', visitors', and other users' attention and energies to the garden's components and exhibits.
- III. People are introduced to landscapes that are organized into legible and green, plant-dominated open areas with basic routes and workspaces for repair, horticulture teaching, treatment, and social interactions.
- IV. The environment has the ability to make people feel safe, secure, and at ease. The therapeutic garden provides personal comfort and refuge to the garden user by avoiding potentially hazardous chemicals such as herbicides, fertilizers, and insecticides, providing shade and other protective structures, flourishing plants, and the therapeutic garden's protected and protective nature.
- V. The landscape has been intended to be accessible and pleasurable for those with various disabilities. As cheerful alternatives to the visual experience of gardens, these gardens often involve the complete range of senses, including memory, hearing, touch, smell, and even taste, and serve as helpful and entertaining landscapes for people of all ages and abilities. Within its restrictions, the therapeutic landscape makes use of the widest range of human and plant interactions and experiences feasible.
- VI. The scenery is straightforward, homogeneous, and easy to comprehend. Increases the visitor's attention to plant-related sensuality, comfort, and independence, which is a key goal in any landscape design project.

3.0. METHODOLOGY

The study takes place in Ota, Nigeria, in the state of Ogun. The state covers an area of 16,980.55 km² in the southwestern part of the country. According to the 2006 Nigerian census, the state's population was 3,751,140 people. The study used a qualitative research approach to reveal the current situation of chosen medical facilities in the province. With the help of a research guide, field data were collected from several different health facilities. Useful data on treatment status has been gathered from relevant literature to establish a follow-up guideline to improve patient recovery. The information gathered was examined, and the results were presented in descriptive language with the inclusion of graphics to aid comprehension. As stated in the introduction, field data were obtained from medical centers in Ota, Ogun State, which were specifically chosen. In the study region, there are 51 medical facilities. The medical facilities chosen are the top five standard medical facilities in the research area, developed specifically for the treatment of patients. All of the medical facilities are private, including Central Specialist Hospital, Ota; Mother Well Hospital; Smile Pride Clinic; Faith Specialist Hospital; and ACE Medicare Clinic. A qualitative and quantitative survey design approach was used in this study. This study used a high-level research approach that included direct observation and evaluation of previous case studies on data collection, content analysis, and quantitative data acquisition from respondents. A questionnaire was created to obtain the required information using open-ended questions. The question was based on the following considerations: the patient's view of the hospital environment; the patient's perception of the rehabilitation effect of horticultural therapy; the patient's perception of the psychological and social status of the hospital in recovery; and the current view; the state of the plant; the condition of the hospital; and their proposal for its development.

4.0. RESULTS

Respondents were asked a basic question about their thoughts on the current landscape design in the hospital area. Table 1 shows that 45.5 percent of respondents thought it was fair, 54.5 percent thought it was ordinary, and 0 percent of respondents thought it was exceptional.

Table 1. Respondents' views on the current landscape design in the hospital environment.

Respondents Hospital	Yes	No
Ace Medicare Clinic	19	5
Faith Specialist Hospital	0	20
Central Specialist Hospital	13	11
Mother Well Hospital	9	8
Smile Pride Clinic	4	12
Total	45	56
Percent %	44.6	55.4

Source: researcher's fieldwork, 2022

The perspectives of the respondents on stress relief and therapeutic advantages are shown in Table 2. The findings show that 44.6 percent of respondents experienced some stress relief and therapeutic benefits as a result of the landscape surrounding the hospital, while 55.4 percent of respondents experienced no stress relief and no therapeutic benefits as a result of the landscape surrounding the hospital.

Table 2. Respondents' views on stress and therapeutic benefits from the landscape around the hospital environment.

Respondents Hospital	Yes	No
Ace Medicare Clinic	24	0
Faith Specialist Hospital	20	0
Central Specialist Hospital	24	0
Motherwell Hospital	17	0
Smile Pride Clinic	16	0
Total	101	0
Percent %	100	0

Source: researcher's fieldwork, 2022

Table 3 indicates the respondents' opinions on the addition of more landscape elements to the hospital setting. The findings demonstrate that 100% of respondents believe that more landscape components should be supplied surrounding the hospital setting, while 0% disagree.

Table 3. Respondents' views on the provision of more landscape components around the hospital environment.

Source: researcher's fieldwork, 2022

A Survey of Landscape Components in Hospitals Under Study

An observational survey was also conducted to determine the level of landscape components in the hospitals under investigation. This is to determine the level of landscaping in the hospitals that have been chosen. Pavements, pedestrian walkways, kerbs and connectors, water bodies, trees, shrubs, flowers, ground covers, or grass are all landscape components to consider.

Ace Medicare Clinic

ACE Medicare Clinics was designed from the beginning to be a medical facilities that serve the purpose for which it was developed. The external landscaping was created to accommodate both softscapes (lawns, shrubs, and a few trees) and hardscapes (stones, pavers, and a few trees) (interlocking paving stones). It also features a fountain inside the building, which is primarily for the purpose of beautification. There was no softscape on the inside of the hospital building.

Faith Specialist Hospital

Only the external half of Faith Specialist Hospital was planned to allow both softscapes (lawns, shrubs, and a few trees) and hardscapes (interlocking paving stones). There was no softcape on the inside of the hospital building.

Central Specialist Hospital

Softscapes (lawns, bushes, and a few trees) and hardscapes (interlocking paving stones) were only allowed on the exterior of

Respondents Hospital	Poor	Average	Excellent
Ace Medicare Clinic	0	24	0
Faith Specialist Hospital	20	0	0
Central Specialist Hospital	9	15	0
Motherwell Hospital	7	10	0
Smile Pride Clinic	10	6	0
Total	46	55	0
Percent %	45.5	54.5	0

Central Specialist Hospital. There was no softcape on the hospital inside. Mother Well Hospital

Only the external half of Mother Well Hospital was planned to allow both softscapes (lawns, shrubs, and a few trees) and hardscapes (interlocking paving stones). There was no softcape on the inside of the hospital building.

Smile Pride Clinic

Only the exterior of the hospital structure was planned to support both softscapes (lawns, shrubs, and a few trees) and hardscapes (interlocking paving stones). There was no softcape on the inside of the hospital building.

The therapeutic landscape was not provided in any of the hospitals in the research area, according to the findings. The buildings' interiors had no softcape at all. The areas where softcape was installed, such as within the site premises, were primarily for aesthetic reasons. In general, none of the five medical facilities examined used therapeutic landscape aspects to help patients recover faster.

5.0 DISCUSSION

The researchers looked at five medical centers in Ota to see how the therapeutic landscape was employed to help patients recover. To attain the goal, two objectives were specified. The first step was to discover whatever therapeutic elements were used in the facilities, and the second was to see how effective these features were in helping patients recover. The findings revealed that, while the five facilities did not have any plant life within their internal spaces to meet the needs of the treatment areas, they were all structured in such a way that softscape features such as grass, bushes, and trees were recognized on the outside.

The researchers examined five medical sites in Ota to investigate how the therapeutic landscape was used to assist patients in their recovery. Two objectives were set to achieve the goal. The first step was to determine which therapeutic aspects were used in the institutions, and the second was to determine how beneficial these features were in assisting patients in their recovery. While the five facilities did not have any plant life within their internal spaces to suit the needs of the treatment areas, the findings revealed that they were all built in such a way that softscape features such as grass, shrubs, and trees could be recognized from the outside.

6.0. CONCLUSION

The goal of this study was to evaluate how far a therapeutic landscape has been implemented to help patients recover at a few medical institutions in Ota, Ogun State, Nigeria, to discover prospective development areas. T medical institutions were the focus of the study. Among these are the Medicare Clinic, Faith Specialist Hospital, Central Specialist Hospital, Mother Well Hospital, and Smile Pride Clinic. Therapeutic landscape was not a design feature in any of the medical institutions, according to the research. Despite the fact that all of the medical facilities were given plants to assist improve their surroundings, a closer look reveals that the plants do not meet therapeutic landscape criteria. Rather, they were provided for the sake of aesthetics and shade.

Therapeutic landscapes have yet to be deployed in medical institutions in the study region, according to the findings. This demonstrates that in the study region, therapeutic landscape application is not a design requirement for medical facility construction. As a result, medical officials in the research region should make therapeutic landscape qualities a design criterion for new medical institutions. Medical experts on the topic should also give forums for training building industry design professionals, such as architects and town planners, on what the therapeutic landscape comprises, according to the report. Future medical facilities with therapeutic landscape qualities will be able to be imagined by architects and designers.

The study added to the research by demonstrating how the therapeutic landscape was used to aid patient recovery at some medical facilities in Ota, Ogun State, Nigeria. The study's findings add to the body of knowledge on the subject and lay the groundwork for future research in this area. The research also adds to the growing body of knowledge about how to employ the therapeutic landscape to aid patient recovery in medical settings. The small number of medical facilities evaluated and the summary area of their settings, however, is a research concern, as the results cannot be applied to the current situation in Ogun State or Nigeria. To date, more research should be undertaken to employ a wide range of other medical facilities in Ota, Ogun State, or across Nigeria to enable a more comprehensive analysis of the study's findings.

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Ayurvedic efficacy of the medicinal plants utilized by Rabari tribes in Kachchh, Gujarat: An Ethno-botanical Study

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Abstract

Known for owing sheep and camels, the people of the *Rabari* tribal community have been practicing the traditional herbal system of medicine for ages and have not been much documented due to their nomadic lifestyle. *Nomadism*; is a way of life of people who do not continually live in the same place but move cyclically or periodically. It is distinguished from migration which is non-cyclic and involves a total change of habitat. This paper enlists the medicinal plants (with their IUCN conservation status globally) used by the local healers of the *Rabari* community to cure various diseases rampant in the villages of Kachchh, Gujarat. The study has documented 75 medicinal plants belonging to 36 botanical families utilized for various herbal formulations. Fabaceae family has been the most documented botanical family (12/36) followed by Malvaceae (5/36), Boraginaceae, Cucurbitaceae, and Convolvulaceae (4/36) followed by many others like Asteraceae, Poaceae, Menispermaceae, Euphorbiaceae, etc. Out of the 75 documented medicinal plants, 27% are herbs, 25% trees, 23% shrubs, 18% climbers, 4% grass, and 3% liane. Ayurvedic literature such as Charaka Samhita and Sushruta Samhita validates 60% (45/75) of the exact herbal formulations documented in the study, whereas for other formulations though the exact validation is not available in Ayurveda but the usage of medicinal plants is duly mentioned. The present study has also documented the other uses of the same plant than the given remedy to broaden the information on the utilization of medicinal plants in herbal medicines.

Keywords: Ethno-botany, Medicinal Plants, Conservation, Rabari tribe, Kachchh

Introduction

Kachchh is the largest district in India; it alone accounts for 24 percent land of the state of Gujarat. About half of this land remains uninhabited due to the inhospitable climatic and geographical conditions. In spite of its remoteness, aridity, and harsh climate, quite magically, Kachchh has managed to be a point of confluence for nomadic pastoralists from Pakistan, Afghanistan, Turkey, and other regions of Middle East as well from regions in India. These pastoralists brought their traditions, cuisines, breed and settled down in Kachchh over centuries.

The richness of cultural diversity is also matched by a splendid variety of ecosystems; Kachchh is home to a wide variety of biodiversity and varied ecosystems such as Mangroves, Grasslands, Scrub Forests, Tropical thorn forests, wetlands, and the salt desert of Great & Little Rann. These ecosystems have afforded little or no agriculture but have housed and nurtured many pastoral communities who have developed an astounding variety of pastoral breeds, all of them faultlessly adapted to living on this low rainfall land.

Pastoralism has long been considered primitive, but new and strong evidence has started highlighting the resilience of pastoral production systems, making them valuable, especially, in the face of a rising threat of climate change. The *Rabari* community is a nomadic pastoral community indigenous to north-west India, particularly modern-day Gujarat. Traditionally, the *Rabari* kept camels but in recent times they maintain flocks of sheep and goats as well. Tradition traces their origins to the Himalayas, as the creation of Shiva and Parvati. The *Rabari* community cherishes its customs, mythology, history and ancestral heritage, which are intimately

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entwined with their traditional occupation of animal keeping. The *Rabaris* form a very close-knit community, which only in recent decades has started to show signs of adapting to modern times. However, constitutional protection eludes the *Rabari*, or at best is ill-defined, owing to their nomadic lifestyle and the lack of governmental understanding (Majumdar, 2021). In the Kachchh district, the *Rabaris* follow three distinct patterns of migration, which are season-based movements: small-range migration within Kachchh; long-range migration between Kachchh and Gujarat hinterlands, and circular migration within a delimited area, outside Gujarat (Salpeteur *et al.*, 2015).

Rabaris are most found in Mindiyala, a small village in the Anjar taluka of the Kachchh district, Gujarat, is home to the majority of the *Rabari* community, and is considered the biggest *Rabari* village in India. Being a nomadic tribe they keep migrating within the district for various reasons, livelihood being the most prominent rationale behind their migration. *Rabari* community is also, known for their folklore medicine to provide home herbal remedies for various diseases rampant in the village. The present study therefore has documented various herbal formulations which the local healers belonging to *Rabari* community have practiced for several years to cure diseases. The study enlists the medicinal plants documented through interpersonal communications with the healers and their herbal formulations have been duly validated following ayurvedic evidences (*Charaka samhita* and *Sushruta Samhita*) to highlight the most efficacious remedy for the disease. The objective of this paper is to revitalize the local health traditions followed by the *Rabaris*, which is receding due to modernization.

India has been a country which provides a great amalgamation of rich culture and tradition since time immemorial. Several ethnobotanical studies from the country have given effulgence to the art of curing diseases using the medicinal plants and giving the most efficacious remedy. Pandey *et al.*, (2015) has highlighted the use of indigenous plants by Mishing tribe of Assam, India, to cure various diseases (Pandey *et al.*, 2015). A detailed study on how Chakma tribe of Tripura, India, practices folklore medicines has been reported. The authors have highlighted the herbal formulations used by the local healers of Chakma tribe to cure various diseases (Pandey *et al.*, 2015). Significance and commercial aspects of Ethno-fishing techniques used by Baiga Tribe to improve their Livelihood in Amarkantak, Madhya Pradesh, India has been documented with an aim to showcase the art of using grass by the community to earn their livelihood (Singh & Pandey, 2015). Kachchh being an arid province of India has been bereft of much of documentation of folklore medicines irrespective of local healers of *Rabari* community practicing it for several years in Kachchh, Gujarat. There have been few studies that only enlist the medicinal plants from Kachchh but no studies document the ethnobotanical practices with special mention to *Rabaris* in Kachchh (Joshi & Soni, 2013; Patel *et al.*, 2014; Patel *et al.*, 2014). This encourages the significance of the present research manuscript in the existing literature to provide the documentation and assessment of medicinal plants for home herbal remedies by the local healers from the *Rabari* community.

Material and Methods

Study area

Kachchh district, a peninsula, is situated between Sindh and Saurashtra, in the north-western part of the state. It is an ancient land possessed of great antiquity, which takes its name from its geographical characteristics and topographical features resembling a tortoise. This crescent shaped region called Kachchh forms part of north-west Gujarat. It lies between the parallels of latitude 22° 44' to 24° 42' and the meridians of longitude 68° 10' to 71° 55'. It is largest district in India, in terms of area and consist longest coast line of about 406 km in the state (Kachchh census, 2011). Climate of Kachchh is one of its kinds in terms of its uniqueness and extremity. With very hot summers and cold winters the district remains pleasant throughout the year catering to biodiversity values and management of natural ecosystem. The climate is mostly dry which entertains succulents (A plant adapted to arid conditions and characterized by fleshy water-storing tissues that act as water reservoirs) as an adaptation to the aridity that the district contains.

In addition to its unique climatic condition, Kachchh has red soil with very less opportunity of cultivation. The temperature at Kachchh-Bhuj district ranges from 45.8°C (June-2011) higher in the summer and 2.0°C (January-2011) lowest in the winter (in January Month). Maximum relative Humidity 100% and range of sea water temperature is 16.8° C to 31.8° C. The average annual rainfall is 345 mm. The district consists of two major ecosystems i.e. Great Rann of Kachchh and Little Rann of Kachchh having an area of 12,454 km². It mainly covers Kachchh Desert Sanctuary in Great Rann of Kachchh (GRK) and Wild Ass Sanctuary in Little Rann of Kachchh (LRK). GRK and LRK are the most saline and marshy tracts of the forest in the world (Kumar *et al.*, 2017). Despite an arid region, it has a special and different plant species population status in comparison to the other deserts as it is near to the sea

due to which sea water enters the soil and leads to the underground water recharge and further entertains the existence of biodiversity which otherwise is a challenge with many other arid deserts of the world.

Target groups

The study was conducted through extensive inter-personal communications, in-depth discussions and participant observations with the traditional medical practitioners and selected knowledge holders of eight villages belonging to two taluka i.e. Nakhatrana and Lakhpat. Villages Lifri, Mata No Madh, Valka Mota, Valka Nana, Ghadani, Paneli belong to Nakhatrana whereas Dolatpar and Dayapar villages belong to Lakhpat taluka of district Kachchh.

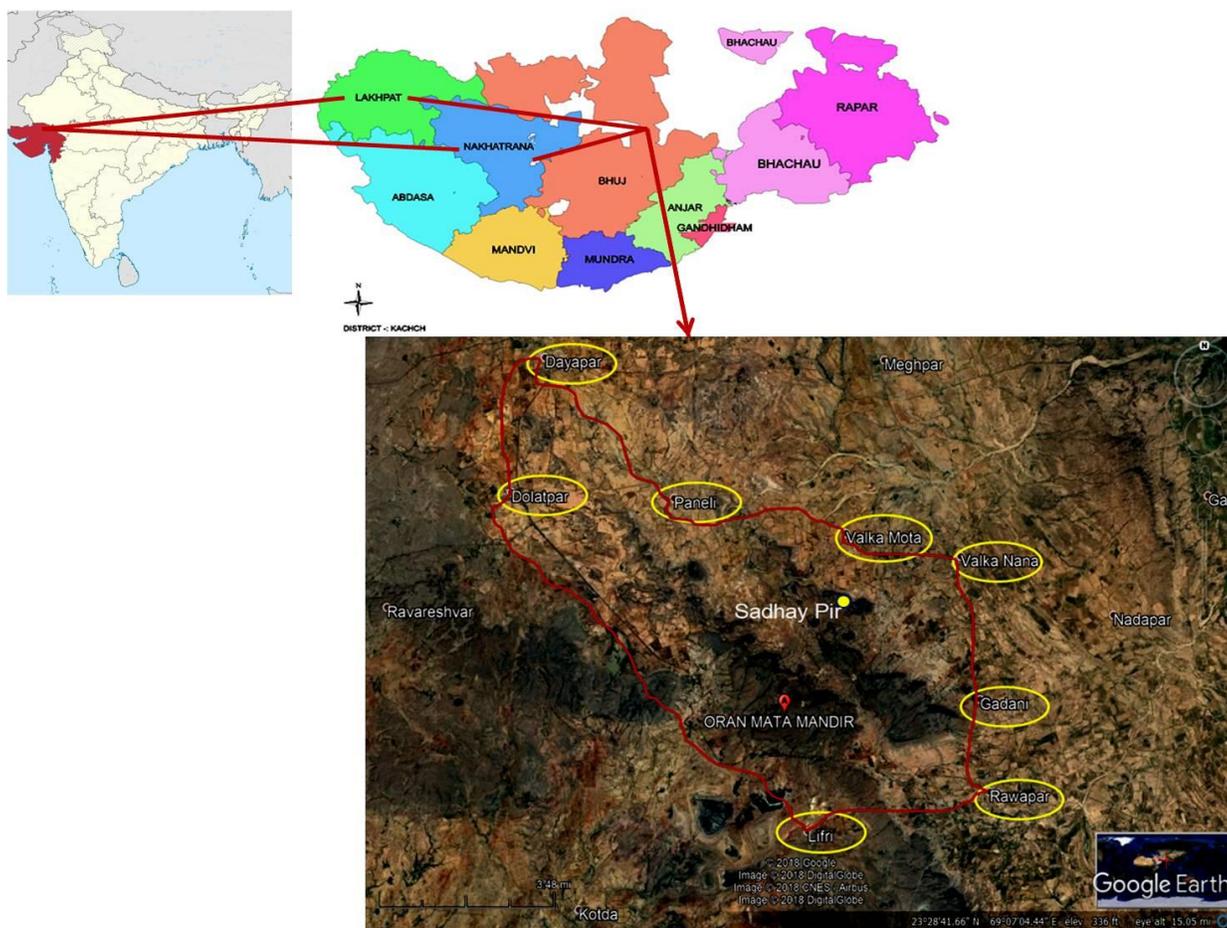


Figure 1: Map depicting the study area

The healers were visited 9 times at their respective homes in the village during the years 2018-2021 as per healer's availability. The target group of the study includes elderly and experienced local healers (both male and female) belonging to the age group of 40-80 years. The healers are a part of *Rabari* community who have been dwelling in these villages for more than 50 years and also, have been practicing the folklore medicine to earn their livelihood. The healers originally belong to Mindiyala village of Anjar taluka, Kachchh but had migrated to these villages in search of livelihood and later got settled here. Total of 23 healers (19 males and 4 females) were interviewed and their knowledge was documented. They are usually cultivators and most of them are familiar about the traditional uses of indigenous plants in various purposes. Moreover, the housewives who collect different medicinal plants for the herbal formulations are otherwise not allowed by their husbands to practice their knowledge and only males are prominently practicing the home herbal remedies. Though the present study do has identified female local healers but they are few in numbers as compared to males.

Interactions

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The documentation of local health traditions commenced with structured questionnaires to get the direct information on the traditional knowledge that are prevailing and usually practiced in the community. The detailed information about the indigenous plant species used by the *Rabari* tribe was collected along with the plants parts used in the treatment of different ailments. Most of the plants were commonly occurring plants and known to most of the people. All the enumerated plant species were documented in their local names and then botanical names were identified with the help of relevant and standard literature (Patel et al., 2011; Ishnava et al., 2011).

The ayurvedic efficacy of all the formulations with medicinal plants given by the local healers has been validated by following *Charaka Samhita* and *Sushruta Samhita* (MLA, 1890; Suśruta, & Bhishagratna, 1907). The conservation status of the plants documented under ethno-botanical uses have been followed using the IUCN Red-List criteria (<https://www.iucnredlist.org/>) for sustainable utilization of these plants and cultivation of the same towards mainstreaming the long term conservation of the medicinal plants.

Results and Discussions

The study has documented 75 medicinal plants belonging to 36 botanical families (Table 1) utilized for various herbal formulations by *Rabari tribes* of Kachchh, Gujarat, India. Fabaceae family has been the most documented botanical family (12/36) followed by Malvaceae (5/36), Boraginaceae, Cucurbitaceae and Convolvulaceae (4/36) followed by many others like Asteraceae, Poaceae, Menispermaceae, Euphorbiaceae etc. Out of the 75 documented medicinal plants 27% are herbs, 25% trees, 23% shrubs, 18% climbers, 4% grass and 3% liane (Figure 1). The IUCN conservation status of the medicinal plants used by *Rabari tribes* have also been reported which is concomitant with their global status of conservation (Figure 2). The analysis of the conservation status of the medicinal plants has revealed that 63% of the documented plants are least concern followed by 13% vulnerable, 12% endangered, 8% critically endangered and 4% data deficient. This further levitates the cultivation of these indigenous plants used by the tribe for their scalability and sustainability. There is also an immediate need of the tools and techniques of sustainable utilization of medicinal plants for their long term monitoring and existentiality (Pandey & Gusain, 2016). The result also reveals that the documented herbal remedies have utilized 68% of leaves, 11% roots, 9% stem and bark, 8% flowers and fruits and 4% seeds in preparing the herbal formulation using the medicinal plants (Figure 3). The *Rabari* tribe utilizes these medicinal plants to cure various diseases which have been found to be efficacious in improving the individual's health condition. 49% of the documented herbal formulations have been given to cure common flu, fever, cough and cold, 21% for skin diseases, 12% for Heart related diseases, arthritis, bone setting, cuts and wounds, 11% to cure gynecological complexities (menstrual bleeding, micturition, abdominal pain, parturition, lactation, fertilization) and 7% to cure snake bite, scorpion bite, ulcers, stomach infection (Figure 4). As per ayurvedic evidence 37 documented medicinal plants out of 75 have been reported to be highly efficacious in immunity enhancement and are effective towards combating the bacterial, viral and fungal infections in the body.

Habit of the documented medicinal plants

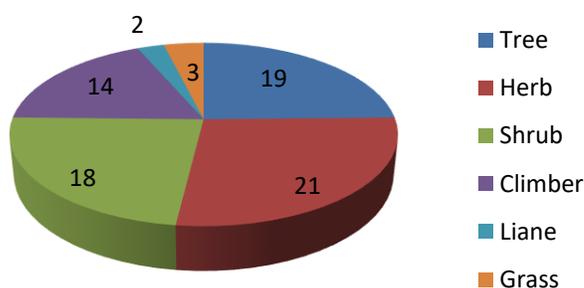


Figure 1

Conservation status of documented medicinal plant

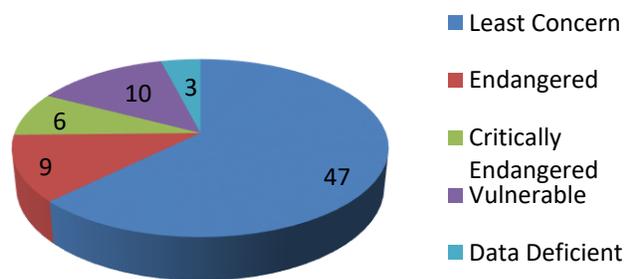


Figure 2

Plant part used in the documented herbal remedy

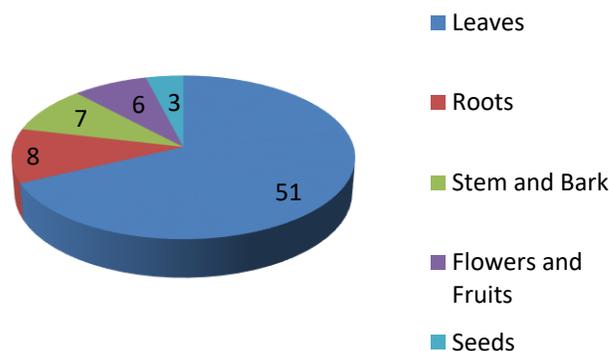


Figure 3

Number of herbal formulation reported

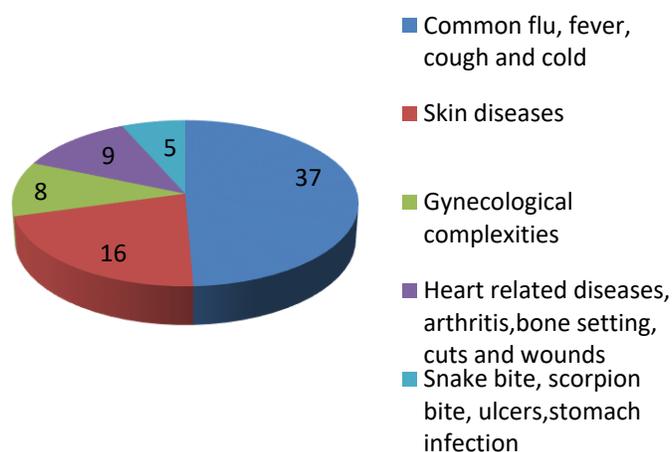


Figure 4

Ayurvedic literature such as *Charaka Samhita* and *Sushruta Samhita* validates 60% (45/75) of the exact herbal formulations documented in the study, whereas for other formulations though the exact validation is not available in ayurveda but the usage of medicinal plant is duly mentioned. The present study has also documented the other uses of the same plant than the given remedy to broaden the information of the utilization of medicinal plant in herbal medicines.

Conclusion

The unique yet elegant and scenic, Kachchh has a natural ambience with Rann has one of the most prominent nomadic tribal community known as *Rabaris*, dwelling in this region since ages, following their culture, rituals and legends which marks the existence of the iconic and historic existence of Kachchh and its people. Their legends constitute folklores, fables, parables and many more of similar kind of oral traditions. The tribal living in the documented villages is dependent upon the herbal practices as a way to earn their livelihood, exorbitant cost of allopathic medicines and also due to their invincible faith in the old treaties and tradition. The plant part such as roots, leaves, stems, barks are used by tribal as the most significant ingredient of the herbal formulation. The local healers cultivate the medicinal plants in their backyard of the house or in the farmlands which they use in the medicines. Also, in the villages such as Valka Mota and Valka Nana, the local dwellers has a tradition of planting a medicinal plant (mostly asparagus, aloe vera and periwinkle) after a birth of the child as a mark of celebration and even after a demise in the loving memory of the departed soul. Such practices should be highly recommended and implemented in the region. Today, with the advancement of industrialization and westernization there has been a huge deterioration posed to the practice of traditional healthcare medicines. In the current scenario this flow of indigenous knowledge from elder to younger generations is snagged as the young generation shows their repugnance to learn about traditional medicinal practices. The younger generations often leave their villages because of the profound economic rigor and perks. Indigenous practices and knowledge regarding the sustainable harvest and utilization of plant resources should be documented and preserved before their presence becomes zilch, also it should be encouraged and valued for its worth and disseminated to all the masses to protect the rapid receding of the traditional knowledge.

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Table 1. A list of medicinal Plants used by the healers of Rabari community of Kachchh, Gujarat along with the Ayurvedic evidence of the remedies

S.No.	Species Name	Description of the plant: Botanical family and habit of the plant	Local Name	IUCN Red List Criteria of the plant	Documentation of herbal remedies from local healers of Rabari tribe		Ayurvedic evidence of the medicinal plant (Charaka Samhita and Sushruta Samhita)
					Plant part used	Dosage and mode of administration (herbal formulation)	
1.	<i>Abutilon pannosum</i> (Forst. f.) Schlect.	Malvaceae, Perennial shrub	Dabaliar	Least Concern	Seeds, Roots , Flower	Root juice antilithic; leaf juice stypic, applied to cuts and sores, externally in ague.	The given formulation is validated in Charaka samhita and it is also used as a demulcent, aphrodisiac, laxative, diuretic, sedative, astringent, expectorant, tonic, anti-convulsant, anti-inflammatory, anthelmintic, and analgesic and to treat leprosy, ulcers, headaches, gonorrhea, and bladder infection
2.	<i>Achyranthes aspera</i> L. var. <i>argentea</i>	Amaranthaceae, wild, perennial, erect herb	Kandhero	Least Concern	Roots and Leaves	Leaves are pasted and mixed with very little amount of water and applied on the affected part in various skin diseases, twice a day	According to Ayurveda, the root paste of it helps to reduce itching, skin rashes when applied externally due to its property of balancing Vata and Kapha. The juice of <i>Achyranthes aspera</i> leaves help in healing of wound and ulcer.
3.	<i>Althea rosea</i> (L.) Cav.	Malvaceae, Cultivated herb	Gul Kheru	Least Concern	Roots and Flowers	2-3 leaves are finely pasted and mixed with ½ liter Luke warm water and taken 4-5 times per day(for infants its only 2-3 times per day). This remedy is effective in stopping bedwetting and inflammation in the genital region of the body.	Ayurveda validates the formulation and the medicinal plant is also beneficial for chest complains, gastrointestinal disorders, boils, abscesses, skin cuts, ulcers, burns, peptic ulceration, renal calculi, kidney disorders, cough, arthritis, inflammatory

							conditions, asthma, bronchitis.
4.	<i>Amaranthus viridis</i> L.	Amaranthaceae, Terrestrial, annual, erect or somewhat prostrate herb	Adbau Rajgaro	Least Concern	Root and Leaves	Equal amount of leaf and roots are smashed and about 2 teaspoonful of juice are collected and given orally in morning in empty stomach for one week to the patient suffering from intestinal worms, abdominal pain diarrhea and menstrual bleeding.	In ayurveda medicine this plant is also used in the treatment of fever, pain, asthma, diabetes, dysentery, urinary disorders, liver disorders, eye disorders and venereal diseases.
5.	<i>Asparagus racemosus</i> Wild. var. <i>javanicus</i>	Asparagaceae, A small climber plant about 1- 3 m tall. It is an extensively scandent spinous, much branched under-shrub	Chini Ji val	Least Concern	Roots	Roots are pounded and 1-2 teaspoonful mucilaginous juice is taken early in the morning in empty stomach for one week in case of upset stomach (dyspepsia), constipation, stomach spasms, and stomach ulcers.	The formulation has its evidence in ayurveda and in ayurveda the plant is also used to treat depression as the roots have strong antidepressant abilities. They also impact the neurotransmitters in brain.
6.	<i>Azadirachta indica</i> A. Juss.	Meliaceae, Tree	Limbdoo, Neem	Least Concern	Leaves	Leaves are grinded into a paste and mixed with very little amount of water and applied on the affected part, twice a day in case of skin diseases.	Ayurveda confirms the formulation. Other than this neem whole plant is extensively used in Ayurvedic System Medicine for various skin disorders and diabetes.
7.	<i>Barleria prionitis</i> L. var. <i>prionitis</i>	Acanthaceae, A bushy prickly shrub with 3-4 spines in leaf axils	Kanta Aserio	Least Concern	Leaves	Powder of dried leaves is used as antihemorrhagic, astringent, antihemorrhagic, emolument, used in hematemesis, tonic useful in fever, cough, menorrhagia, nausea, vomiting, snake bite and given to horses in cough and cold.	In Ayurveda this plant (Vajradanti) also has been used for the treatment of skin diseases, burning urination, fever, localized swelling, goiter, dental caries and act like blood purifier.
8.	<i>Bauhinia purpurea</i> L.	Fabaceae, small to medium-sized deciduous fast-growing shrub	Kanchaner	Least Concern	Bark	Bark of the tree is finely pasted, boiled and then consumed, twice per day. The formulation has been efficacious in jaundice and gastritis.	The flowers, roots and bark of the plant have been used in Ayurvedic medicinal formulations. They are laxative, astringent, and beneficial in hemorrhagic diseases, leucorrhoea and cough. Dried buds are anthelmintic, useful in piles and dysentery associated with

							blood. Flowers and flower buds are useful in treating cancer.
9.	<i>Bergia suffruticosa</i> (Del.) Fenzl	Elatinaceae, aromatic perennial herb, woody at base, prostrate or spreading, glandular-velvet-hairy	Jal jambu	Least Concern	Leaves	The leaves are dried and grinded with lukewarm water. The paste is used as poultice on sores and broken bones.	Ayurveda gives an exact remedy for this plant, used traditionally to repair bones and heal wounds.
10.	<i>Bidens biternata</i> (Lour.) Merr. and Sherff	Asteraceae, Annual herb, erect, 0.1–2 m high; stem reddish tinged	Pilu Fuladu	Least Concern	Leaves	The sap from crushed leaves is used to speed up clotting of blood in fresh wounds; a leaf decoction is used for treating headache; sap from the plant is put in the ear to treat ear infection; a decoction of leaf powder is used to treat kidney problems; and a herbal tea made from the plant decreases flatulence.	Ayurveda has reported this plant to be also effective in the treatment of tumors, inflammation/immune modulation, and diabetes, viral and microbial infections.
11.	<i>Boerhavia diffusa</i> L.	Nyctaginaceae, A hairless, prostrate perennial at first, then ascending herb	Acchi satodi	Vulnerable	Root	The roots are dried and grinded with pestle and mortar and mixed with flower paste of <i>Hibiscus rosa-sinensis</i> (Jaasood) the decoction of the aforementioned mixture is then given to the patient twice a day to cure asthma, urinary disorders, leucorrhea, rheumatism, and encephalitis.	Though the exact formulation is not available in ayurveda but it is mainly used to treat accumulation of fluids (Oedematous conditions) in the body. It is considered to be an effective "Rasayana". It is also used in the treatment of anemia and liver diseases, which is quite intuitive of the documented herbal formulation by the local healer.
12.	<i>Bombax malabaricum</i> DC.	Bombaceae, Deciduous trees; to 45 m high; bole straight, buttress 1-2 m high, armed with conical prickles; bark 20-30 mm thick	Rato Shamaro	Least Concern	Stem, Leaves	Powder of the green portion of stem is used as antihemorrhagic, astringent, antihemorrhagic, emolument, used in hematemesis, tonic useful in fever, cough, menorrhagia, nausea, vomiting, snake bite and given to horses and camels in cough and cold.	In Ayurveda System of Medicine it is used as diuretic, anti-dysenteric, emetic, anti-diarrhoeal, and aphrodisiac. It is used to treat wounds, acne, skin blemish, pigmentation, cold and cough.

13.	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae, a small-sized dry-season deciduous tree, growing to 15 m (49 ft) tall. It is a slow-growing tree	Kesudijo Zad	Least Concern	Flowers, Bark	Flowers are dried and crushed, mixed with milk and the paste is used in beauty care and to maintain complexion and suppleness of skin.	The use of its gum as external astringent application is mentioned in 'Charaka samhita'. The leaves are good have astringent, depurate, diuretic and aphrodisiac in pharmacological properties. It stimulates and promotes diuresis and menstrual flow.
14.	<i>Capparis grandis</i> L.	Capparaceae, Tree with bark thick, dark brown vertically ploughed. White fragrant flowers	Dumaro	Vulnerable	Whole plant	Whole plant or parts (fruit and stem) are used for curing asthma, rheumatism, diabetes, paralysis, toothache, as antihelmintic, antiallergic, snakebite antidote, etc.	The decoction of fruit and bark is found to be carminative and aphrodisiac, and has been used to treat ulcer, cough, asthma, and stomach aches.
15.	<i>Catharanthus pusillus</i> (Murr.) G. Don	Apocynaceae, a rare herb commonly known as tiny periwinkle	Ubhi Singani	Endangered	Flowers, Leaves, Stem	Paste of dried flowers and leaves mixed together has been used for massaging to relieve muscle pain, depression of the central nervous system, also used for applying to wasp stings and to heal wounds. Its syrup made by grinding dried stem and leaves is widely used from the prevention of diabetes to treatment of stomach ache.	<i>Sushruta Samhita</i> : Plant is used in cancer and diabetes; root paste is used in septic wounds; root decoction is used in fever; leaves are used in menorrhagia; leaf juice is used in blood dysentery.
16.	<i>Cayratia carnosa</i> (Lam.) Gagnep.	Vitaceae, Climber Occasional on plains on thickets and on wayside of forests	Khatumbadi	Critically Endangered	Whole plant, Leaves, Bark.	Whole plant is used as diuretic, in tumors, neuralgia and splenopathy. Its climbers wrapped around the neck of frantic bullock and poultice of leaves are used to yoke sores of bullock. The bark extract shows the antiviral, antibacterial, antiprotozoal, hypoglycemic, anticancer and diuretic activity.	This is used in Ayurveda, Folk medicine for the treatment of ulcer, antiseptic, antidiarrhoeal, refrigerant and cough.
17.	<i>Cenchrus ciliaris</i> L.	Poaceae, a grass planted as a fodder and for erosion control in most warm arid region	Dhaman Gha,	Least Concern	Whole plant	The globular balls are made out of the paste of the plant is used in the treatment of ailments including 'body pain', menstrual disorders and urinary infections. It is given thrice a day with	In ayurveda it is reported to be lactagogue. Related species are recorded as being anodyne, diuretic, and emollient, and are folk remedies for kidney pain, tumors, sores and

						lukewarm water.	wounds.
18.	<i>Cleome viscosa</i> L.	Cleomaceae, an annual herb that grows up to a meter high	Beddhro	Endangered	Young twigs and Shoots	Shoot extract is antihaemorrhagic, Decoction of roots diuretic in dropsy, secondary syphilis; root infusion in piles, crushed roots in chronic gleans; plant juice astringent, useful in cuts and wounds, diuretic, used in dropsy and anasarca, Useful in diarrhoea, dysentery, nervous diseases and eye troubles.	Ayurveda medicine system documented this plant for rheumatic arthritis, hypertension, malaria, neurasthenia, and wound healing. No exact evidence for this formulation found.
19.	<i>Clerodendrum phlomidis</i> L.	Lamiaceae, It is a small shrub, 2-4 meter tall bearing opposite leaves and having woody rootstock	Tankaro, Arani	Least Concern	Flower, Leaves, Roots	The decoction of minced roots and leaves improves appetite and aids in proper digestion. It is also useful in diabetes and urinary tract infection.	<i>Charaka samhita</i> : It pacifies kapha (kaphaghna). Used to reduce swelling and inflammation (Shothahara). Warm leaves are used to relieve severe pain. It is useful for low digestive fire and improves digestive fire.
20.	<i>Cocculus hirsutus</i> (L.) Diels	Menispermaceae, Climber reaching several metre in length; young branchlets, densely pubescent, tomentose. Leaves yellowish-tomentose	Vagval, Asipal	Least Concern	Roots, Stem	The fresh sap of the stem and the roots are sun-dried, grinded and mixed with camel's milk. The solution is given once a day to treat intestinal worm infestations, Sun stroke, migraine, anorexia etc. It also possesses antimicrobial potential.	In ayurveda this plant is used for the treatment of fever, skin diseases, stomach disorders, urinary diseases and also as a sedative among many other uses.
21.	<i>Cocculus pendulus</i> (Forst.) Diels	Menispermaceae, A woody liane with stem up to 15 cm. in diameter at ground-level; young branchlets slender, puberulous	Karipat, Karipad	Endangered	Leaves	The tablets made of leaves paste is given twice a day to the patient having an issue of motion sickness, including car-sickness and sea-sickness, dizziness and headache.	Ayurveda validates this formulation and also documents that the leaves are used to treat several diseases like polyuria, fevers, piles and is said to possess aphrodisiac property.
22.	<i>Commelina diffusa</i> Burm. f.	Commelinaceae, Perennial herb with a scrambling growth habit, reaching to a length of 1 m.	Nanu Shishmulyu	Least Concern	Flower, Leaves	Leaves are boiled and grind with air-dried flowers and the mixture is given twice a day with milk to the individual to heal swelling, treatment of	The plant has been reported to be used for the treatment of various ailments like leprosy, sore throat, ophthalmia, burns, pain and infammation and also

						urinary tract infection and respiratory tract infections, diarrhea, enteritis, and hemorrhoids.	used as depressant, demulcent, emollient and laxative. The plant has also been used in fever, malaria, insect, bug bites, rheumatoid arthritis, gonorrhoea, influenza, and bladder infection
23.	<i>Commelina forskalaei</i> Vahl	Commelinaceae, A herb with a very prostrate habit, leaves simple, alternate, coriaceous and thick, strongly wavy at the edges and dark green	Motu Shishmuliyu	Least Concern	Whole plant	The plant extract is massaged locally/ taken orally with lukewarm water twice a day for 15 days to cure rheumatism and body swelling.	<i>Sushruta samhita</i> : it is used as bitter, laxative, anti-inflammatory, demulcent, emollient and depressant. It is used as diuretic and febrifuge. The paste of the plant is used to treat burns and juice of roots is used to treat indigestion.
24.	<i>Commicarpus verticillatus</i> (Poir.) Stand.	Nyctaginaceae, A perennial herb	Dhokariyar	Vulnerable	Leaves, Roots	The paste of leaves with camel's urine is used as an ointment in case of snake and scorpion bite.	Though ayurveda validates the cause of usage but there's no mention of camel's urine for the same. The other uses includes rat bite, cardiac ailments, urinary infections.
25.	<i>Commiphora wightii</i> (Arn.) Bhandari	Burseraceae, It is slow growing, much branched, and shrubby plant. It is 2 to 3 m high with silvery and paper like grayish or grayish-brown bark peeling off in small pieces	Guggal	Critically Endangered	Gum, Flower	Guggul gum resin is used for arthritis, lowering high cholesterol, "hardening of the arteries" (atherosclerosis), acne and other skin diseases, and weight loss. The decoction is given orally in case of arthritis, high cholesterol etc. or applied as an ointment in case of skin diseases, acnes.	Ayurvedic texts dating back to 600 BC recommend it for treating atherosclerosis.
26.	<i>Cordia perrottetii</i> Wt.	Boraginaceae, A shrub that grows to 7–10 m (23–33 ft) at maturity, but may be as tall as 15 m (49 ft)	Adbau Gundi	Vulnerable	Leaves	The decoction of the leaves is used for the treatment of cough, asthma, skin diseases, fever, and diarrhea.	Ayurveda system of medicine gives the exact use of the plant.
27.	<i>Crateva nurvala</i> Buch-Ham var. <i>nurvala</i>	Capparidaceae, an indigenous herb, extensively used in traditional medicines	Tarapan	Least Concern	Bark and Leaves	The bark of the plant is grinded and the powder is mixed with the 1 teaspoon of curd and given twice a day to cure kidney stones, urinary tract	In ayurveda the plant has been reported to be used in the treatment of various urinary problems including stones in kidney, ureters and bladder.

						infections and prostate related disorders.	Brief investigations on Varuna suggest it for its urinary, antiseptic and litholytic (stone breaking) actions.
28.	<i>Cucumis callosus</i> (Rottl.) Cogn.	Cucurbitaceae, A climber which is a weed of cultivated fields	Kotimbda vel	Least Concern	Fruits	Fruits are edible and have cooling effect on stomach. Also, Fruit are dried and grinded, boiled with cow's milk and applied to the head has been efficacious to prevent insanity, strengthen the memory and remove vertigo.	Ayurveda has shown the significance of this plant in medicinal properties such as analgesic, anti-inflammatory, anti-oxidant, free radical scavenging.
29.	<i>Cucumis prophetarum</i> L.	Cucurbitaceae, is a dioecious and prostrate or climbing perennial vine (climber)	Indriyal	Least Concern	Fruit and Seeds	Fruits are edible. Fruit juice is given once a day during micturition. The dried seeds are powdered and two teaspoon is given with water as immunity booster and also has been effective for common flu, fever, headache and cough.	There is an evidence of this plant in ayurveda for the mentioned uses.
30.	<i>Cyperus difformis</i> L.	Cyperaceae, Erect annual tufted plant (herb) of 50 cm high, roots fibrous, stem triquetrous, solid, and glabrous.	Chiyo	Least Concern	Tuber and Leaves	The decoction made out of the mixture of tubers and leaves have long been used and play a promising role for treatment of inflammation, pain, fever, wounds, boils and blisters, stomach and bowel disorders, cure spasms, diarrhoea, dysmenorrhea and menstrual irregularities. One tablespoon with lukewarm water twice a day is given.	Ayurveda validates this medicinal herb traditionally used to treat various clinical conditions at home such as diarrhea, diabetes, pyresis, and inflammation, malaria, and stomach and bowel disorders.
31.	<i>Dalechampia scandens</i> L. var <i>cordofana</i>	Euphorbiaceae, A trifoliolate climber, Bracts are leaf-like, up to 4 cm long, more or less shallowly 3-lobed, heart-shaped at the base; margin sawtoothed.	Char Val	Least Concern	Leaves and Roots	The crushed fresh leaves and roots are vesicant and are applied thrice a day to stubborn ulcers, wounds etc.	There is an evidence of this plant in ayurveda for the mentioned uses.
32.	<i>Dipteracanthus patulus</i> (Jacq.) Nees	Acanthaceae, Pubescent herbs. Leaves, broadly	Kali Ghavani	Critically Endangered	Roots, Leaves and Stem	Extracts of root, leaves, and stem of this plant are widely	While validating the given herbal formulation, the plant

		ovate, apex acute, base truncate, pubescent; petiole				used in the treatment of Snake bite, wounds, scabies, anti-inflammatory, and ulcers. The paste made out of the extract is applied twice a day on the affected part of the body and shows the ramification in two days of its application.	also have been actively used in the treatment of gonorrhea, syphilis, eye sore, renal infection, cough, wounds, scalds, toothache, stomach-ache and kidney stones.
33.	<i>Echinochloa colonum</i> (L.) Link	Poaceae, an annual (rarely perennial) grass, 30-100 cm high. It is green to purple, tufted and shortly stoloniferous.	Sanvadhya Sau,	Least Concern	Seeds	Seeds are nutrient dense and support for heart health, immune system, healthy digestion, Lose weight, Good for diabetic patients.	<i>Sushruta Samhita</i> : The tuber of the plant is said to possess antiemetic values and act as a sedative in dyspeptic disorders particularly in vomiting during pregnancy.
34.	<i>Ehretia laevis</i> Roxb.	Boraginaceae, A moderate-sized, deciduous tree with smooth, grey bark. Leaves 7-14 cm long, elliptic, obtuse or acuminate, entire, membranous when young, hard when mature.	Kajiyari Jo Zad	Data Deficient	Bark	The paste made by grinding the bark with pestle and mortar is applied to the affected area in case of ulcers and headache.	In ayurveda this plant has been documented to treat respiratory system diseases (e.g., asthma and cough), gastrointestinal tract infections (e.g., jaundice, diarrhea, ulcers, dysentery, liver diseases), endocrine system diseases (e.g., diabetes mellitus), microbial infections (e.g., diphtheria, scabies, ringworm, gonorrhea, syphilis and venereal diseases).
35.	<i>Euphorbia caducifolia</i> Hains.	Euphorbiaceae, subtropical succulent shrub species of flowering plant.	Thor	Least Concern	Leaves	A handful of leaves are sun-dried, crushed and a decoction made out of it is given twice a day (1 tablespoon) in case of breathing disorders including asthma, bronchitis, and chest congestion.	<i>Charaka Samhita</i> : It is also used for mucus in the nose and throat, throat spasms, hay fever, tumors, and to combat vomiting.
36.	<i>Ficus benghalensis</i> L. var. <i>benghalensis</i>	Moraceae, a large, fast growing, evergreen tree that has been widely introduced across tropical and subtropical areas of the world.	Vad Jo Zad	Least Concern	Bark and Leaves	The powdered bark is given with water twice a day to diabetic patients. The milky juice extract from leaves is used to treat ulcer protective, leprosy and fever, inflammations.	In ayurveda this plant is used in the treatment for wounds, skin diseases, eye diseases, leucorrhoea, diabetes and diarrhea.
37.	<i>Grewia tenax</i> (Forsk.) Fiori	Malvaceae, Sub erect to erect shrub. Flowers	Gangati	Least Concern	Leaves and Roots	The mixture of both leaves and roots are properly grinded with	<i>Grewia tenax</i> is explained by Charaka and Sushruta. It has

		white (rarely yellowish white), solitary (rarely paired) on 1-2 cm long peduncles, 2-2.5 cm across; petals bilobed at the apex.				water and is useful in bone setting and fractures.	blocking action, useful in bleeding disorders such as menorrhagia, ulcerative colitis etc.
38.	<i>Grewia tiliaefolia</i> Vahl var. <i>tiliaefolia</i>	Malvaceae, A tree reaching 8 m (26 ft), it is found in monsoon and intermediate forest.	Dhman Jo Zad	Endangered	Stem and Bark	The extract of bark and stem is used for the treatment of wounds, urinary infection and skin diseases.	<i>Sushruta Samhita</i> : Bark-antidysenteric Stem bark—semen coagulant Plant— used in fractures. Antirheumatic, anti-inflammatory, mild laxative, diuretic, diaphoretic, fungistatic
39.	<i>Grewia villosa</i> Willd.	Malvaceae, A coarse-leaved shrub	Luskejo Zad	Least Concern	Bark and Roots	The bark is crushed and infused to help treat boils, abscesses, and swelling. The root also has been used for abdominal pain.	In ayurveda the plant is taken internally it is often used as a remedy for diarrhoea and dysentery, for example, whilst externally it is applied to wounds, cuts, ulcers, irritations etc.
40.	<i>Hibiscus ovalifolius</i> (Forsk.) Vahl	Malvaceae, Shrub produces white and pink flowers.	San Bhindo	Critically Endangered	Leaves	The leaves are used in the treatment of dysentery and bilious, blood and throat disorders.	Other than the given formulation this plant also has been reported to be efficacious to treat jaundice, heart related diseases and liver disorders.
41.	<i>Indigofera tinctoria</i> L.	Fabaceae, Suffrutescent herbs, to 1.5 m tall; stem erect, appressed-pubescent. Leaves pinnately 5-13-foliolate; leaflets opposite.	Nili Gari, Gudi,	Least Concern	Whole Plant	The decoction is given thrice a day (1 tablespoon) in the treatment of fever, liver disorders, rheumatoid arthritis. Leaves paste is also effective in dying the grey hair.	Ayurveda documents the various parts of the plant are useful for promoting growth of hair, chronic bronchitis, asthma, ulcers, and skin diseases, in gastropathy and in epilepsy.
42.	<i>Ipomoea coptica</i> (L.) Roth.	Convolvulaceae, The plant is a vine (climber) that creeps on the floor or twines on neighboring plants. The plant is highly branched from the base. The principal axis are 50 to 90 cm	Fotiyar	Least Concern	Whole Plant	Cold infusion (plant soaked in water for 8-12 hours) given in dizziness and intoxication. Herb also used in chest complaints in children.	The formulation is synchronized with the documentation in ayurveda. Also the plant boiled in oil has found to be efficacious in the treatment of Rheumatism, epilepsy, leprosy and ulcers.

43.	<i>Maytenus emarginata</i> (Willd.) D. Hou	Celastraceae, an evergreen tree.	Vikalo, Vigo	Vulnerable	Leaves	The leaves of the plant are found to be analgesic and anti-inflammatory and have been actively used for the treatment of inflammatory diseases such as rheumatoid arthritis, gastritis, ulcers and gastrointestinal disorders.	The plant is also very popular and well known for its vermifuge, toothache, cooling effects; purify blood, fever, asthma, rheumatism, and gastrointestinal disorders.
44.	<i>Melanocenchrus jacquemontii</i> J. and S.	Grasses, a natural homogenous group of plants belongs to one of the largest family i.e. Poaceae.	Vekar	Vulnerable	Leaves	The leaves are grinded with warm water and the paste is applied twice a day in cuts and wounds. The effect is seen within three days of the application.	Though the exact formulation is not available in the ayurveda literature but the plant has reported to be used in wounds healing.
45.	<i>Melhania futteyporensis</i> Munro ex Mast.	Malvaceae, Perennial herbs or shrubs, herbaceous parts usually densely.	Adbau Khapat	Critically Endangered	Leaves	The leaves are soaked in warm water for 4 hours and are wrapped with coconut oil in the affected area with muslin cloth for 3 hours day in case of inflammation and wounds.	The herbal formulation is validated by the ayurvedic system of medicine.
46.	<i>Momordica dioica</i> Roxb.	Cucurbitaceae, is a perennial, dioecious, cucurbitaceous climbing creeper (commonly known as kakrol, spiny gourd or teasle gourd).	Kantoliyal	Endangered	Fruits, Leaves and Tuberous Roots	The aqueous extract of the fruits, leaves and roots possess very good anti-diabetic activity and is having high margin of safety.	The other uses of the plant includes: Toasted root or its powder is used to treat bleeding piles. In headache, its tubers are used with honey. Root juice relieves inflammation.
47.	<i>Moringa concanensis</i> Nimmo.	Moringaceae, A tree with Petals 5, white, with purple streaks, oblong-obovate, 1.5 x 0.5 cm, and unequal. Fertile stamens 5; filaments 4-6 mm, pubescent; anthers 2 mm; staminodes declinate.	Sargave Jo Zad	Endangered	Leaves	The leaf paste is used for treatment of skin tumor, tiredness, to reduce blood pressure, aphrodisiac, jaundice, eye care, diabetes and bloat.	As per ayurvedic documentation the other uses of this plant includes: anticancerous, antibacterial, antifungal, analgesic, and anti-inflammatory type of activities.
48.	<i>Mukia maderespatensis</i> (L.) M. Roem.	Cucurbitaceae, Climber or trailer to 2.5 m. from perennial woody rootstock; stems roughly bristly-hairy.	Ankhfutmani	Vulnerable	Leaves and Roots	The syrup of the leaves and roots are used in stomach ache, anti-ulcer, anti-inflammatory, antipyretic, and diuretic.	Ayurveda has documented this plant for its antibacterial and antifungal properties.

		Leaf-blade sagittate, hastate, triangular, ovate or broadly ovate.					
49.	<i>Pentatropis spiralis</i> (Forsk.) Decne	Asclepiadaceae, A flowering and fruiting climber.	Dhodheji Val,	Endangered	Leaves	Leaf paste is used for external application in inflammation and skin issues.	<i>Charaka Samhita</i> : The plant has been effective as analgesic and anti-inflammation uses.
50.	<i>Peristrophe bicalyculata</i> (Retz.) Nees	Acanthaceae, A perennial herb, stems several-angled, erect to 1.50 m high	Lasi Adhedi	Critically Endangered	Leaves and Stem	The leaf and stem extract is used for external application in snake and scorpion bite and the decoction is given once a day (2 teaspoons empty stomach) to cure cough and cold.	<i>Charaka Samhita</i> : The herb is used for its anti-bacterial property (tuberculostatic), snake poison, in bone fracture, sprain, fever, cold, and cough and for ear and eye treatments.
51.	<i>Phoenix sylvestris</i> (L.) Roxb.	Arecaeae, A graceful palm tree, 10-16 m tall with a large crown and rough trunk covered with persistent leaf bases. Leaves 3-4.5 m long, greyish-green.	Khajuri Jo Zad	Endangered	Fruit	The fruits are crushed and they juice is mixed with lemon, water, curd and tamarind extract to prepare a tonic which is given 2 tablespoon twice a day in the treatment of backache, vomiting, vertigo and unconsciousness.	The ayurveda doesn't validate the exact formulation but the plant has been documented for this usage. It is also been efficacious in the treatment of constipation, fever, skin infection, wounds.
52.	<i>Pithecellobium dulce</i> (Roxb.) Bth.	Leguminosae, A spreading tree which may grow as high as 15 meters, with bark peeling in large thin flakes.	Goras Amali	Least Concern	Bark, Leaves, Seeds	Bark extracts are used for chronic diarrhea, dysentery, constipation and tuberculosis. Extract of leaves is employed as a remedy for indigestion and to prevent spontaneous abortion and for gall bladder ailments and to treat both open and closed wounds. Ground seed is used for treating ulcers.	The plant has also been documented for the treatment of gum ailments, toothache, and hemorrhage in the ayurvedic system of medicine.
53.	<i>Premna resinosa</i> Schau.	Lamiaceae, Shrub, up to 2-3 m tall; young branches whitish, somewhat pubescent to glabrous.	Nidhi Kundher	Least Concern	Leaves	The tonic prepared from the leaf extract is given once a day to the patient showing the symptoms of bronchitis, respiratory illness and convulsions of the rib cage.	This plant is also used in the treatment of musculoskeletal pain.
54.	<i>Prosopis cineraria</i> (L.) Druce	Fabaceae, a deep-rooted, perennial and multipurpose tree that provides useful fodder for livestock in the drier areas of India.	Kandhi, Kando	Data Deficient	Bark and Leaves	The bark extract and leaf paste is used to cure many diseases such as ailments like leprosy, dysentery, asthma, leucoderma, dyspepsia and earache.	<i>Sushruta Samhita</i> : It is also used for the treatment of vertigo and as a brain tonic. A paste of bark is applied to scorpion sting.

55.	<i>Prosopis juliflora</i> Sw. (DC.)	Fabaceae, Shrub with bark brown, fissured. Spines straight, paired. Compound leaf, leaflets 8-20 pairs, 10 m high, bark deeply wavy.	Gando Baval	Least Concern	Stem and Bark	To overcome oral and periodontal infections, aqueous stem and bark extracts of <i>P. juliflora</i> has been used to eradicate bacterial infections from the periodontal space and oral cavity.	While <i>Charaka Samhita</i> has validated the efficacy of the given formulation, it has also been reported that the plant contains anti bacterial, antifungal, anticancer, antioxidant, antimicrobial activity.
56.	<i>Pupalia lappacea</i> (L.) Juss.	Amaranthaceae, Perennial herb up to 1 m tall, much branched, swollen at nodes; densely tomentose; leaves opposite, ovate-elliptic to oblong or even orbicular, tomentose	Gadar Bhurat	Least Concern	Leaves	The leaf decoction is highly recommended in the treatment of wounds, bone fractures, boils, cough, toothache, fever and malaria.	In ayurvedic medicine the other uses of this plant includes: diarrhea, urethra pain, leucorrhoea and many other disorders.
57.	<i>Rhynchosia minima</i> (L.) var. <i>minima</i>	Leguminosae, a perennial herbaceous plant with slender stem, creeping or climbing.	Mogariyal	Least Concern	Root	The finely grinded paste of root is applied twice a day in the affected region in case of skin allergies, itching and swelling.	Ayurveda system of medicines validates the formulation and the usage of this plant for the given diseases.
58.	<i>Rivea hypocrateriformis</i> Choisy	Convolvulaceae, Climbing shrub, Twining subshrubs, stem white silky-pubescent. Leaves 3-4 x 3-6 cm, cordiform, apex obtuse, base cordate, subcoriaceous; petiole to 6 cm.	Fang val	Endangered	Leaves and Young Shoots	Leaves and young shoots are eaten as a vegetable and roots are given after parturition. Cooked leaves of this plant are utilized as vegetable curry.	Ayurvedic also documents the use this plant to prevent fertility in women.
59.	<i>Salvadora oleoides</i> Decne.	Salvadoraceae, a multipurpose tree species which grows in the arid zones of India. The species is of immense commercial value like in food industry and herbal industry etc.	Mithi Zar	Data Deficient	Leaves	The leaves are soaked in boiling water for an hour and the slurry made out of it is mixed with milk and is given once a day in the treatment of various ailments like piles, tumors, bronchitis, cough, rheumatism, fever, conjunctivitis.	<i>Charaka Samhita</i> : The root contains steam-distillable oil, which is responsible for decreasing dental caries.
60.	<i>Sarcostemma acidum</i> (Roxb.) Voigt	Asclepiadaceae, Shrub: Flowers are white on	Sandhiyaval	Least Concern	Roots	The root paste acts as antidote for snake-bite and rabid dog	This plant is also used in treatment of respiratory

		sessile umbels at the end of branches. Pedicels are 6.0-8.0 mm long, slender and pubescent.				bites.	ailments like common cold, mental diseases, sinusitis and rhinitis.
61.	<i>Sclerocarpus africanus</i> Jacq.	Asteraceae, Annual or perennial herbs; Morphology Leaves: Leaves alternate or sometimes opposite near the base of the plant, simple; Leaves: Leaves alternate.	Kochar, Bid	Least Concern	Leaves	Thick slurry of the leaves soaked in water is mixed with refined sugar and tamarind and given 1 tablespoon twice a day to cure inflammation, skin diseases, common cough and cold.	The plant is also anti-carcinogenic as documented in ayurveda.
62.	<i>Securinega virosa</i> (Roxb.) Pax and Hoffm	Euphorbiaceae, Shrub	Shini	Least Concern	Leaves	The aqueous extract of the leaves is used to treat dysentery, diarrhea, and cholera, stomach problems (gastritis, ulcers, and pain). The patient is given the extract (1 tablespoon) twice a day.	Ayurveda validates the given formulation and also documented this plant to treat uterine diseases, menstrual problems, infertility, venereal diseases, hernia, and intestinal complications.
63.	<i>Solanum albicaule</i> Kotschy ex Dunal	Solanaceae, Shrub	Bhoy Ringni	Least Concern	Leaves	The leaves are soaked in warm water and dried in sunlight for three days. It is then grinded in pestle mortar mixing it with mustard oil and camphor. The paste is applied externally to cure warts and tumors.	Though the exact given formulation is not available in ayurveda but it validates the utilization of the plant for the given disease.
64.	<i>Solanum incanum</i> L.	Solanaceae, is a herb or soft wooded shrub up to 1.8 m in height with spines on the stem, /stalks and calyces and with velvet hairs on the leaves. Flowers pale to deep blue, mauve or purple.	Ubhi Ringni	Least Concern	Roots	The roots are grinded into a powder, mixed with honey and been given 1 teaspoon twice a day with honey and lukewarm water in issues of sore throat, stomach-ache, head-ache, painful menstruation, liver pain, malaria, fever and common cold.	The plant has also been used to treat hypertension, stomach problem, asthma, diabetes, common cold and pain pneumonia and rheumatism.
65.	<i>Tamarindus indica</i> L.	Fabaceae, the tree is a long-lived, large evergreen, and generally grows wild. A mature tree may attain a	Ambali Jo Zad	Least Concern	Fruit	The decoction made out of the fruits and honey is given thrice a day to treat wound healing, abdominal pain, diarrhea, dysentery, parasitic infestation,	<i>Charaka Samhita</i> : The plant is also well documented for its utilization in treating pain, joint inflammation, sore throat, constipation, and jaundice,

		maximum height of 30 m.				fever, malaria and respiratory problems.	wounds, as an acid refrigerant.
66.	<i>Tephrosia purpurea</i> (L.) Pers.	Fabaceae, Perennial erect or decumbent herbs or subshrubs, up to 50 cm tall.	Vado Sarpankho	Least Concern	Roots and Leaves	The powdered mixture of dried roots and leaves is further mixed with black pepper, camel's milk. The formulation is given twice a day to cure live diseases and has been found to be efficacious.	According to Ayurveda, the plant is anthelmintic, alexiteric, restorative, and antipyretic. It is used in the treatment of leprosy, ulcers, asthma, and tumors, as well as diseases of the liver, spleen, heart, and blood.
67.	<i>Tephrosia uniflora</i> Pers. <i>petrosa</i>	Fabaceae, a semi-erect perennial herb, up to 1 m tall, stem velvet-hairy, hairs silky. Flowers are pink, pea-flower shaped.	Sarpankhi	Least Concern	Leaves	The aqueous extract from fresh leaves is given once a day (early morning, empty stomach) to cure indigestion and various stomach problems.	According to Ayurveda, plant is digestible, anthelmintic, alexiteric, antipyretic, alternative, cures diseases of liver, spleen.
68.	<i>Tinospora cordifolia</i> Roxb.	Menispermaceae, a herbaceous woody liane, annual or perennial Ayurvedic plant.	Gaduji Val	Least Concern	Roots	The juice extract from the dried roots is highly significant as immunity booster and to cure fever, jaundice, chronic diarrhea, dysentery.	The plant has an importance in traditional ayurvedic medicine used for ages in the treatment of bone fracture, pain, asthma, skin disease, poisonous insect, snake bite, eye disorders.
69.	<i>Tribulus terrestris</i> L.	Zygophyllaceae, an annual herbal plant.	Akanthi	Least Concern	Roots and Fruits	The fruit juice and powdered roots are mixed together with asafetida, honey, carom seeds, fennel, coriander powder and water. The slurry is efficacious to treat kidney and gall bladder stones.	As per Ayurveda, helps in eliminating and treating kidney or urinary stones. Both roots and fruit of the plant are used in treating stones. But the exact given formulation is not been documented in ayurveda.
70.	<i>Trichodesma amplexicaule</i> Roth	Boraginaceae, is an erect, spreading, branched, annual herb, about 50 centimeters.	Undh Fuli	Vulnerable	Leaves and Roots	The paste made out of the roots and leaves are externally applied in case of snake bite and external swelling of the limbs.	While validating the given formulation, the ayurveda system of medicine has also reported the plant to be used in the treatment of Irritable Bowel Syndrome, rheumatoid arthritis, dysmenorrhea, snake poisoning and localized swelling.
71.	<i>Vachellia leucophloea</i> (Roxb.) Willd.	Fabaceae, A moderate-sized tree, upto 12m.	Hirmo, Haramu	Least Concern	Bark	Bark extract is used for external application in case of snake bite, applied on forehead during high fever, and it is applied in	The plant is also used as an astringent, a bitter, a thermogenic, a styptic, a preventive of infections, an

						nostril during running and bleeding nose.	anthelmintic, a vulnerary, a demulcent, an expectorant, an antipyretic, an antidote for snake bites and in the treatment of bronchitis, cough.
72.	<i>Vachellia nilotica</i> (L.) Del. ver. <i>Indica</i>	Fabaceae, A large spreading multi-stemmed shrub or small upright (i.e. erect) single-stemmed.	Deshi Baval	Least Concern	Bark	The bark extract is used to treat nausea, burns and wounds, stomachache and diarrhea.	As per ayurveda evidence, this plant has anti-microbial, anti-plasmodial and antioxidant activity and used for treatment of human immunodeficiency virus, hepatitis C virus and cancer. It is useful for treatment of venereal diseases.
73.	<i>Vachellia senegal</i> (L.) Willd.	Fabaceae, A low branching shrub or small tree to 7 m high (maximum 15 m). The tree flowers during the rainy season and loses its leaves during the dry season.	Kher, Gorad	Least Concern	Bark and Roots	The gum extracted from the bark of the tree is dissolved in water and the solution is used in stomach ache, cholesterol problems, and skin diseases.	Other than the documented usage the plant has also been actively used in medication for throat and stomach inflammation and as a film-forming agent in peel-off skin masks as per ayurveda system of medicine.
74.	<i>Vernonia cinerascens</i> Sch.-Bip.	Asteraceae, Laxly branched sub-shrub, usually less than 1.5 m tall. Stems several, stiffly woody, covered in dense grey, appressed, T-shaped hairs.	Tatadio	Least Concern	Leaves	The leaf decoction is used in fever, sore throat, stomach infection.	In ayurveda the plant has found to be effective in the treatment of fever, localized swelling, renal calculi, wounds, skin diseases and elephantiasis.
75.	<i>Zizyphus nummularia</i> (Burm F.) W. and A.	Rhamnaceae, is a shrub up to 6 metres (20 ft) or more high, branching to form a thicket.	Chania Bor	Vulnerable	Leaves and Fruits	The juice extract from leaves and fruits is given twice a day to treat fever, gum inflammation and cough-cold and fever.	<i>Charaka Samhita</i> : used for cold, diarrhea, dysentery, indigestion, inflammation of gums and tonic.

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Determinants of Saving in Rural Saving and credit cooperatives in Sodo Zuria Woreda , Wolaita Zone , Southern Ethiopia

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Abstract- It is undisputable fact that savings is of great value to a nation's growth and development. Mobilizing both domestic and international savings is necessary society can proceed into 'self-sustaining economic growth The primary purpose of this study is to investigate the determinants of saving SACCOs members in sodozuriaworeda , wolaita zone in Ethiopia. The data for the study was obtained in the woredaSACCOs using purposive and randomly sampling selected 398SACCOs members seven SACCOs. The empirical analysis, using multiple regression model shows that age, training ,family size ,income, market distance and expenditureof SACCOsmembership statically significant at 1% and 5% raise SACCOs member savings. Therefore, these factors have to be considered in designing strategies aimed at improving the saving pattern of SACCOs member Linear regression analysis result indicates that amount of loan utilization has a positive relationship with saving Since in case of SACCO's, all members have to save some amount of money in advance to get loan The loan has significant influence on the improvement of SACCO's, all members. Thus unplanned expenditures tend to take the bulk of people savings than the planned expenditures. The study therefore recommended for government policies to be geared towards subsidizing the cost of higher savings. Also sensitization programs on SACCO's, should be intensified to enable many people to enroll on the program

Index Terms- Saving ,SACCOs, linear regression and multiple regression

I. INTRODUCTION

Savings represent the portion of income not spent today. That portion is mainly accumulated to serve as a future investment, future consumption, and/or as a way to protect against future contingencies. At the macro level, domestic savings in the form of capital formation are recognized as compelling for economic growth, considering that they increase capital stock thereby boosting the economy to generate future higher incomes [3]. It is worth noting that have stressed the prominent role played by

domestic savings rather than foreign debt in boosting domestic investments, hence enhancing the country's economic growth.

Succeeding to enhance national economic growth through domestic savings requires more than public savings and capital formation. It also needs to considerably increase private savings, particularly household savings to release substantial resources that would steer up economic growth through financing domestic investments. It is in this line that in the macroeconomic framework for identifies private saving as an important driver that will boost both domestic investments and GDP growth .To raise private savings and household savings, in particular, it is important to investigate the fundamentals that determine household savings. Unfortunately, in developing countries, the existing empirical literature related to the latter is lopsided.

Moreover, their social coverage is restricted and the credit and insurance markets are not well developed and civilized. Thus, these countries mostly face saving allocation problems and have difficulties to develop productive investments. The serious problem confronting poor countries is high gap in savings and investment. Because of this high gap, these countries mostly faced challenges to finance investments needed for growth from their domestic saving It is also not surprise to see these countries to finance their investment in the short run partly through domestic economy .The determinants of saving differ from rural region. In rural areas, the marginal propensity to consume is more rather than the marginal propensity to save which seems to be vice-versa in "Households" saving is important to insure financial security of households and serves as insurance at the time of shocks. But given the differences in the demographic, social, economic environment and other factors of the households, there should be substantial variation in the household saving performance. The ratio of domestic saving to the gross domestic product (GDP) indicates the poor performance saving in Ethiopia. For example, (GDP) from 2010 to 2015 on average was 19.3, which indicates the poor performance saving in Ethiopia [4].which is below the average saving growth rate of the sub-Saharan African countries which is 30% of their GDP.

What pushes or pulls rural people in regional level to save? Although research has shown saving by rural SACCO,s people in

little is known about the factors that influence saving and assets accumulation. Despite no previous studies were conducted on the issue in the study woreda and still many households are suffering from constraints related to low economic empowerment. Therefore, this study tried to investigate the determinants of saving its degree and magnitudes of rural SACCO,s the study area

II. OBJECTIVE OF THE STUDY

The general objective of the study was to analyses determinants of saving in Rural saving and credit cooperatives in Sodo Zuriya Woreda

Specific Objectives

1. Find out influence of demographic and economic factors in saving rural SACCOs
2. Identify challenges faced members saving rural SACCOs in the study area
3. Analysis determinants of saving rural SACCOs in the study area
4. Investigate effect of loan accesses in saving rural SACCOs in the study area

III. RESEARCH METHODOLOGY

Description of Study Area

Sodo Zuriya woreda is one of the 16 woreda Administrations of Woliata zone in the Southern Region in Ethiopia, Located 300 kilometers south of Addis Ababa it has a latitude and longitude of [6°50'N 37°45'E](#). Based on Census conducted by the [Central Statistical Agency](#) of Ethiopia [1]. Sodo Zuriya woreda, which is study area, found between Damot Gale and Sodo city administration in Sodo zuriya woreda, its total population number was 114, 673. The climate is stable, with temperature variation between 24 and 30 °C during the day and 16 to 20 °C at night, all year round.

Research Design

Research design is the plan of action that links the philosophical assumptions to specific methods research design forms the blue-print or maps that details how the researcher collect data that is relevant to address the research questions.

The research can be classified in to three as descriptive, and exploratory. Descriptive research sets out to describe & to interpret what it is. The major purpose of descriptive research is describing the state of affairs as it exists at present. Explanatory research is conducted when we encounter an issue that is already known and have a description of it. Exploratory research is a type of research conducted because a problem has not been clearly defined. Its purpose is to gain background information and better understand and clarify a problem. This gives adequate information for the researcher about saving in rural SACCO,s

Data Source and Method of Data Collection

The analysis of this paper is based on a SACCO,s survey conducted in the study sample of 398 saving members was interviewed from seven rural kebele saving SACCOs .A random sample method was used by probability proportion to size from the selected kebele; with each kebele's list of members used as the

sampling frame. A detailed and structured interview schedule has been prepared and used for all SACCOs in selected kebeles. The study has utilized primary and secondary, qualitative and quantitative data from different sources.

Sample Size Determination

Sample Size Sample size is the number of items that are selected from the universe to constitute the sample, using a simplified formula provided by Yamane (1967), although it is possible to collect data from the whole population, the study covered only 398 respondents from seven kebeles. The sample size was considered to represent characteristics of the whole population and bring good results at the analysis stage.

$n = \frac{N}{1+N(e)^2}$ Where n = the required sample size

N = Total number of rural household saving

e = the level of precision

$$n = \frac{3922}{1+3922(0.05)^2} = \frac{3922}{9.85} = 398$$

Sample technique

The study use both random and purposive sampling procedure. SACCOs of saving members were picked randomly for reducing bias. In addition, individuals with vital information including leaders were selected for further relevant information. Thus individual SACCO's members are the basic sampling units in the study area.

Method of data analysis

Two types of data analysis was used descriptive statistic and econometric model of multiple logistic regressions was used to analysis of data collected from rural saving SACCOs in order to attain the objectives of the study. The data analysis is conducted by using STATA software.

Multiple regression

Multiple regression model aims at constructing relationships among a single dependent or response variable and more independent or predictor variables, and is one of the more widely used methods in data analysis.

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \epsilon$ Where: $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8$ are coefficients.

Y = rural saving SACCO,s

X_1 =Age , X_2 = Gender, X_3 = Education, X_4 = Training, X_5 = Family size, X_6 = Income

X_7 = market distance , X_8 = loan accesses

IV. RESULTS AND DISCUSSION

In this section, results obtained using statistical tools such as mean, percentage, standard deviation and frequency distributions are presented and discussed to examine factors affecting rural SACCOs saving in the study areas.

Table 4.1 Distribution of sample respondents by age group

No	Age group	Frequency	Percentage	Mean annual
1	15-25	77	19.3	2860
2	26-40	179	45	5150
3	41-55	98	24.6	4392
4	Above 55	44	11.1	2810
		398	100	

Source: Own survey result, 2022

Distribution of sample heads by age

In this study the age group is classified as (15 - 25), age group (26 – 40), (41-55) and above 55 years’ age. There were 77(19.3%) young, 179(45 %) productive age, 98(24.6%) become old age 44 (11.1%) old age member respondents. In this study it was assumed that as age increases household would acquire knowledge and experience through continuous learning and the level of responsibility to manage the family and the need to accumulate assets for tomorrow becomes high. But the study proved the above that is as age increases at level of old the amount savings become decreases. In productive age saving amount was decrease during old age.

Table 4.2 Distribution of family member

No	Family size	Frequency	Percentage	Mean
1	1-4	120	31	6152
2	5-8	132	33	3918
3	9-12	95	23.5	2917
4	Above 12	51	12.5	2610

Distribution of sample by family size

Table 4.2 reveals that 120(31%) of the respondents has family size ranges from 1 to 4. The mean annual saving was 6152 , the family size range 5-8 members 13(33 %) of respondents has annual mean saving was 3918, the respondents has the family members range from 9 to 12 has 95(23.5%) their mean annual saving has 2917 and above 12. Member of family size 51(12.5%) annual saving has 2610.this result indicated that As the members’ family size increases, the number of persons to be fed obviously increases and the amount of savings decreases by Birr 2234 from first and second category family size group. The difference between third family size groups and fourth family size group 307 birr this implies, share available income to consume. Therefore, respondent who have large family size save less money than those who have less family size.

Table 4.3: Distribution of savings by Gender

N	Sex	frequency	Percentage	Mean annual saving	T value	P value
1	male	264	66.3	5109	2.16	0.036
2	female	134	33,7	3816		

total	398	100
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Source: Own survey STATA output, 2022

Distribution of savings by Gender

In table 4.3 total respondent 66.3 percentage male respondent annual saving was 5109 and 33.7 percentage of female respondent annual saving was 3816 the results shows male household saving more than female households. The t - test (t - value) of sex distribution members of the difference between male and female household annual savings is statistically significant at 5 percent confidence The mean annual savings of female and male members were Birr 5109 and Birr 3816 respectively. The mean amount of savings of male is exceeds by 1293 than female. This indicates male save more than female. Therefore, participating male activities could be increase saving and improves the performance of rural households.

Distribution of educational status

Table 4.4 Distribution of respondents by their educational status

No	Education level	Frequency	Percentage	Mean annual saving
1	No education	102	25.5	2921
2	1-4	113	28.5	3005
2	5-8	96	24	3612
3	9-12	54	13.5	3710
4	Above 12	33	8.5	4293
		398	100	

Source: Own survey result, 2022

Educational status

Sample members’ education status helps them not only to understand how to make money but also to prudently and profitably handle cash in financial institutions, which are found in nearby areas. The survey results revealed that 102(25.5 %) of the respondents were illiterate, 113 (28.5 %) were grade 1-4, 96 (24%) were grade 5-8, 54 (13.5 %) were grade 9-12, and 33 (8.5 %) of them have college Diploma and above. This indicate almost 56.8 % or more than half of survived respondents have low level education and this have great effect influence on the performance of household saving

Table 4.5 the effect of loan access rural SACCO,s

No	Source of income	Frequency	Percentage
1	Agriculture	150	37.6
2	Livestock and Agriculture	133	33.4
3	Off farm	116	29
4	Total	334	100

Source: Own survey result, 2022

The effect of loan access rural SACCO,s

Annual income is the other crucial factor in determining the wellbeing of improving the members saving. The table 4.5 above showed that (37.6 %) of the respondents obtain an annual income from agriculture, (33.4 %) from livestock production and agriculture (29%) of the annual income from off-farm. Agriculture and livestock production are important income sources for the sample respondents, however, off farm activity is relatively important source of income in rural SACCOs.

The amount of income represents the amount of annual income of the household from different activities, such as, agriculture, off-farm, livestock production and others. The higher the amount of annual income might reflect households' strategy of improving its agricultural production and productivity to secure the household basic needs and gradually to change the household members' life style. It was hypothesized that, household which have higher amount of annual income can save more than those who have low income and have positive correlation with performance of saving.

Table 4.6: challenges faced members in saving rural SACCOs

Challenges	frequency
percent	
Perception of borrowing is risky	41
10	
Perception of high interest rate	56
14	
Far distance from cooperatives	29
7.2	
Lack of awareness creation/extension services	92
23	
Limited amount of borrowing	99
25	
Challenges in Members failed to repay back loans on time	21
5.4	
Lack of capital and office furniture's	23
5,5	
Lack of awareness creation	10
2.4	
Lack of professional leaders	27
6.6	
Total	398
100	

Source: Own survey result, 2022

Challenges faced rural SACCOs members in saving performance

The study revealed that Perception of borrowing is risky respondents are 10% , Perception of high interest rate are 14 % respondents ,Far distance from cooperatives 7.2 % respondent, Lack of awareness creation/extension services 23% respondent , Limited amount of borrowing 25 % of respondent, Challenges in Members failed to repay back loans on time 5.4%, of respondent, Lack of capital and office furniture's 5.5% of respondent , Lack of awareness creation 2.4% of respondent and Lack of professional leaders 6.6% of respondent's. Reported that the main problem or challenge's facing saving of rural SACCOs are limited amount

of borrowing, lack of awareness creation, perception of high interest rate and Perception of borrowing is risky.

Table 4.7 model specification test

Saving	Coef.	Std. Err.	z	P> z
hat	1.358605	.4417423	3.08	0.002

hatsq	-.0564692	.0490464	-1.15	0.250
cons	-.394415	.7712902	-0.51	0.609

Source: Own survey result, 2022

If the model is properly specified, variable hatsqs shouldn't have much predictive power except by chance. Therefore, if hatsq is significant, then the link test is significant. In this study, link test reports reveal that the model is correctly specified. Because linear predicted value (hat) is significant with p-value 0.002 in the model and linear predicted value squared (hatsq) is insignificant with p-value 0.686 at 1% degree of freedom in the model

Table 4.8 multiple regression model

Saving	Coef.	Std. Err.	t	P> t
Age	.8249931	.2147153	3.84	0.000
**				
edu	52.6635	40.5018	1.30	0.194
training	10.05232	4.190735	2.40	0.017
**				
family size	-193.2423	51.59888	3.75	0.000
**				
gender	-46.25622	45.70189	-0.10	0.919
income	.2818932	.0694639	4.06	0.000**
mktdist	.3901446	.1512951	2.58	0.010**
Loanacc	4.91545	1.193166	4.12	0.000
**				

Significant level 5% **

Source STATA output, 2021/22

Determinants of Saving Rural SACCO's members Analysis

The regression equation above has established that taking all factors into account Savings as a result of the findings shows that taking all other independent variables at zero, a unit decrease in family size the rural SACCO's members saving 196 birr. If family size is much large households cannot save much amount of money than having small family size. Family size is also a major cause of fewer saving.

The coefficient of rural SACCO's member's income was statistically significant and positively related to savings. Results show that one Birr increase in income tends to raise household savings by 0.281 Birr because households' capacity to save increases with rise in income level. Marginal propensity to save (MPS) for member saving equation is indicates that portion of total income is saved per year.

The regression results of the study also show that rural SACCO's member's savings were affected by age. Considering the age we conclude that the amount of money saving has a positive coefficient and significant at 1%, as expected, indicating

that a one percent increases in age of rural SACCO's members savings by 0.336 Birr.

As age of SACCO's, members increases by 1 year when all other thing constant it will result in a raise in rural SACCO's savings by .824 Birr. It is expected that, saving by the adult age member would be increase with age as beyond retirement age diminished. This shows that the members lessen their savings, as they grow old. This confirms with the life cycle hypothesis of savings, which claims that a person would be expected to save up to a point and then start dissaving as he grows old.

The findings show that use of the loan has significant influence on the improvement of rural SACCO's members saving by 4.91 birr. This shows that the members who have borrowed from the financial institution a invested in business activity chances of achieving improvement of household saving. This implies that household members is decreased borrow credit for the use of other non-productive purposes like domestic use and purchasing home equipment instead of injecting the borrowed amount into business in order to expand it. The marginal effect reveals that, the use of borrowed loans on other issues instead of directing into businesses may decrease saving of household.

The regression result reveals that market access of rural SACCO's members was positively significant to saving. Results show that one percent increase market access for rural SACCO's members tends to raise savings by .390 Birr this result indicated that business entity has market access which improve profit of the entity that enhance saving

The regression result of coefficient of training access of rural SACCO's members was significant and positively related to savings. The finding shows that one percent increase training access for rural SACCO's members tends to raise savings by 10.05 Birr indicated that business entity training access which improve entrepreneur skill rural SACCO's members to work hard.

Table 4.9 Post diagnostic test of multicollinearity

Variable	VIF	1/VIF
Loan	1.00	1.00
Mean VIF	1.00	

Source: STATA output, 2021/22

Multicollarity test

The problem is essentially due to lack of sufficient information in the sample to allow efficient estimation of individual parameters. Multicollinearity of explanatory variables was tested via VIF (variance inflation factor). The test result indicates that the mean value of VIF was 1, which is less than 5 and signifying no multicollinearity problem.

Table 4.10 linear regression effect of loan on saving

Saving	Coef.	Std. Err.	t	P> t
Loan access	.0338148	.0058228	5.81	0.000
Cons	431.1316	15.86589	27.17	0.000

Significant at 1% level **
 Source: STATA output, 2021/22

4.4 The Effect of Loan access on saving on SACCO's, members

The regression analysis result indicates that amount of saving has a positive relationship with saving variables (table 4.10). Since in case of SACCO's, all members have to save some amount of money in advance to get loan saving has a positive relationship with all other variables. The finding shows that use of the loan has significant influence on the improvement of SACCO's, all members saving by 0.338 birr. This shows that the members who have borrowed from the financial institution an invested in business activity chances of achieving improvement of saving. This implies that SACCO's members is increased borrow credit for the use of business activity.

V. CONCLUSION AND RECOMMENDATIONS

CONCLUSION

The purpose of this paper is to identify the determinants of rural household saving in woliata zone Sodo zuriy wored southern, nation, national, people regional, state of Ethiopia, using the data available from the household survey for the year 2021/22. Different characteristics of rural household were analyzed based on the data collected from the sample respondents. The characteristics were categorized in to two as demographic and socio economic. Demographic characteristics result of the study showed that savings is determined by gender of household, age of household ,family size of household, socio economic characteristic house hold income, amount of loan borrowed and market access of household were statistical significant at 1% and 5% level. In this study cross sectional data were collected from 398 sample rural household from the study area using survey questionnaires.

In this study it was assumed that as age increases household would acquire knowledge and experience through continuous learning and the level of responsibility to manage the family and the need to accumulate assets for tomorrow becomes high. But the study proved the above that is as age increases at level of old the amount savings become decreases. In productive age saving amount was decrease during old age. that the main problem or challenge's facing saving of rural SACCOS are limited amount of borrowing, lack of awareness creation, perception of high interest rate and Perception of borrowing is risky.

Annual income is the other crucial factor in determining the wellbeing of improving the members saving .The table 4.4 above showed that (37.6 %) of the respondents obtain an annual income from agriculture, (33.4 %) from livestock production and agriculture (29%) of the annual income from off-farm. Agriculture and livestock production are important income sources for the sample respondents, however, off farm activity is relatively important source of income in rural household Therefore, the next section forwards the necessary recommendations which are suggested for financial institutions, government and policy makers in designing suitable domestic resource mobilization, identified in this study.

RECOMMENDATIONS

Based on the result obtained, it is recommended that rural household members should be encouraged and enlighten on the need for savings. Also institutions that are involved in development projects need to increase their support to improve

the business environment of the rural household populations. Such decisions include supporting through revolving funds since rural households are more effective in mobilizing funds with low default rate. This will enable them to expand their production output and increase their savings thereby stimulating the rural economy.

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Agromorphological Study Of Jute Mallow (*Corchorus Olitorius L.*) Accessions In Nigeria

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Abstract- *Corchorus olitorius* L. (West African sorrel) is a fibrous flowering plant in the genus *Corchorus* with a series of cataloging. It is known as a favorite vegetable in virtually every home in Nigeria. The 11 accessions collected from NIHORT and IAR&T, Ibadan, Nigeria, and Thirty- two parameters were considered for both the qualitative and quantitative. Data collected were subjected to statistical analysis using R model version 2.15.3 to ascertain the degree of variation. Variation was recorded in most of the parameters while few parameters exhibit similarities. Plant height, number of leaves, stem circumference, leaf area, node length, and leaf width were significantly different at 95% probability level. The correlation coefficient value ranges from -0.93 to -0.99. variation in germination percentage did not affect the general growth and yield of the plant. The results also revealed that the node length cannot be considered for taxonomic purposes similarly, the number of seeds increases as the pods' number increases. The leaf morphology showed that three types exist in Nigeria ('Amugbadu', 'Oniyaya', and 'Eletiehor'). Late early and late flowering was observed in Nigeria cultivars. The plant height increases with an increase in stem circumference, while the leaf length is related to the plant height and peduncle however, the number of leaves per plant is associated with the leaf width. Likewise, the leaf area is correlated with the leaf width. Conclusively, NG/OA/JUN/09/001, NG/SA/DEC/07/0403/, NHGB/09/147 are the best for higher production while NHC0-2 and NHGB/09/147 are the best in leaves and seed/pod production. Also, early and late maturity exist among the Nigerian jute cultivars. For food security and subsistence farming, NHC0-2 should be considered for it has a shorter period of growth and higher morphological yield. Some of the parameters may be genetic while others are either environmental or genetic.

Index Terms- Agro-morphology, Jute mallow, Variation, Correlation, and Cultivars,

I. INTRODUCTION

Jute Mallow or West African sorrel is an annual, herb, and flowering plant in the genus *Corchorus* belonging to the family Malvaceae, and of recent Sparrmanniaceae. It has been grouped into several classes such as Capparaceae, Cistaceae, Papaveraceae,

and Tiliaceae (Whitlock *et al.*, 2003, Simmons, 2003). However, there is a difference of opinion regarding the number of valid species (Jennifer, 1990 and Makinde *et al.*, 2009). Yet, the presence of wilder *Corchorus* species in Africa leads to larger genetic diversity with *Corchorus olitorius*, and the wild types are considered important genetic resources for biotic and abiotic stress tolerance and fine fiber traits (Maity *et al.*, 2012). It is endowed with higher fiber contents and highly perishable vegetables, also one of the main fiber crops in the world and specifically in the Indian subcontinent (Basu *et al.*, 2004) It has many local names in Nigeria, 'Ewedu' in Yoruba, 'ahihiara' in Igbo, and 'malafiya' or 'rama' in Hausa.

It produces best during hot rainy weather and grows well on sandy loam soils, 1,2or marshes. *C. olitorius* L. is most frequently cultivated as a vegetable in Nigeria and tropical Africa is its main derivation (Roy *et al.*, 2006 and Makinde *et al.*, 2009). However, *C. olitorius* cultivars can exist both as early and late flowering with diversity in plant habit and leaf shape.

Large morphological and physiological variation exists among the leaf of *C. olitorius* found on farmers' plots in Nigeria (Nath and Denton 1980) and distinct types based on variation in leaf shapes were separated from local cultivars at NIHORT, Nigeria (Denton, 1997). Apart from the variation in the leaves, considerable variation in other morphological traits still exists within the various local morphotypes (Akoroda, 1985). The two most common types of *Corchorus olitorius* in Nigeria are 'Amugbadu', which grow tall with large finely serrated leaves that are oblong, and 'Oniyaya', which is widely branched with broad, deeply and irregularly serrated (*Corchorus incisifolus*) leaves and highly mucilaginous. In Cameroon and other West African countries, numerous local types are varying among others in height, stem colour, leaf, and fruit shape. 'Oniyaya' in Cameroon is more deeply lobed than those found in Nigeria though there are overlaps. A large, broad-leaved accession from Cameroon with a shorter swallowtail that is commonly cultivated near Yaoundé is called Greant de Bertoua. Its leaf tips are rounder than those of 'Amugbadu', the most common one in Nigeria, which resembles the Cameroonian Ewondo (Pal *et al.*, 2006). There are several other minor local morphotypes, for example, 'Eletiehor' with small ovate leaves like the ear of a hare, oblong and with fine

serration, and ‘Etieku’ with a leaf shape like the ear of a rat. Another popular local type is the ‘Yaga’ (Makinde et al., 2009). The genus *Corchorus* is highly diversified in benefits such as economic (Chattopadhyay et al., 2004, and Indian Jute Industries Research Association) IJIRA), health (James Duke, 1983; Hillocks, 1998, and Pal et al., 2006), pharmaceuticals (medicine), cosmetics and paints industries. Another benefit of jute is that it can also be intercropped with food crops and vegetables such as yam, groundnut, watermelon, okra, tomato, and many more (NIHORTPROTA Nigeria, 2002).

Because jute is a very important vegetable in this part of the world, inadequate attention is given to its improvement. Hence, it is a necessity to establish variability in the vegetable for selection of accessions for breeding purposes.

II. MATERIALS AND METHODS

Eleven accessions of jute were collected from NIHORT and IAR&T, Ibadan, Nigeria. Before sowing, the seeds were carefully examined morphologically and pre-germinated in Petri-dishes to determine their viability. The seeds were treated with hot water to break the dormancy before planting in a woven cotton bag for 10 minutes at 100°C water. The pre-warmed seeds were dipped in cold water to stop heating action and the seeds were spread to dry. Adequate care was taken to prevent seed injury (Ohio State University, 2012). Peat was mixed with alluvial soil from the University of Ilorin dam bank to lower the soil PH to between 5.1 and 6.8; the planting bag was filled with rich potting soil and wetted before sowing. The seeds were sown on topsoil, separating them by at least one inch. The seeds were covered with the thinnest possible layer of soil. The potted bags were then placed in the screen house and the soil was kept moist by watering twice daily as jute requires more water until it reaches a height of 6-8 inches. The seeds planted in small polythene bags in the screen house were later transplanted into the polythene bags (16.5 by 15.5 inches) in an open field in five replicates per accession at the soil depth of 1-

Table 1: Mean number of days to maturity, plant height at maturity, stem circumference, and length of stipule for *C. olitorius* accessions studied

Accession	Number of days to emergence	Mean Number of days to maturity	Mean plant height at maturity (cm)	Stem circumference (cm)	Mean length of stipule (cm)
NG/OA/JUN/09/001	3	171	100.10	2.9	1.3
NG/SA/DEC/07/0403	5	171	98.02	3.0	1.2
NHGB/09/147	3	167	99.10	2.5	1.1
NG/SA/DEC/09/0403	5	194	80.00	2.2	0.9
NG/AA/06/12/177	3	167	79.50	2.2	0.9
NHGB/09/145	3	171	78.70	2.4	0.6
NHC _o -2	4	188	100.50	2.7	1.1
NG/OA/02/11/008	3	181	63.00	2.3	0.9
NG/To/02/12/179	3	194	120.00	2.6	0.9
NG/AA/SEP/09/173	4	176	105.04	2.9	0.9
NG/To/02/12/180	3	167	78.90	2.6	1.3

2cm in a randomized complete block design. This was laid at 20cm within and 60cm between the rows, in such a way that all the accessions were exposed to the same atmospheric condition. The polythene bags were perforated to avoid waterlogging and prevent fungi growth. The bags were attached with a corresponding label indicating the date of planting and accession number of the plant. Twenty seeds of each accession were planted in each of the polythene bags. The seedlings were thinned to two seedlings per bag on the 15th day after emergence to reduce competition. Weeds were removed on regular basis from the seedling stage to maturity to minimize competition between the grown plants and the weeds. Harvesting of seeds was done manually.

A total of thirty-one parameters were considered for all the eleven accessions planted. The morphological characters scored include Number of days to emergence, Percentage germination, Height of plant, Number of leaves per plant, Leaf Area of the plant, Leaf length, Leaf Width, Petiole length, Length of peduncle per flower, Node length, Leaf Index, Number of nodes per plant, Number of valves per capsule, Number of branches), Number of Seeds per capsule, Number of pods per plant, Number of days to flowering, Number of days to pod formation, Number of days to maturity, number of pods per plant, Stem circumference of the plant, Length of stipule, Length of pod per plant, Pod circumference, Weight per 100 seeds, Weight of pods per plant, Plants growth pattern, Pod shape, Seeds coat colour, Stem colour, Days to germination. The collected morphological data were subjected to statistical analysis using ‘MASS PACKAGING’ 2013. R version 2.15.3.

III. RESULTS

Mostly, all the growth traits showed variation in the accessions although some signified similarities (Table 1). The percentage germination also showed variation and similarities in all the accessions studied (Figure 1).

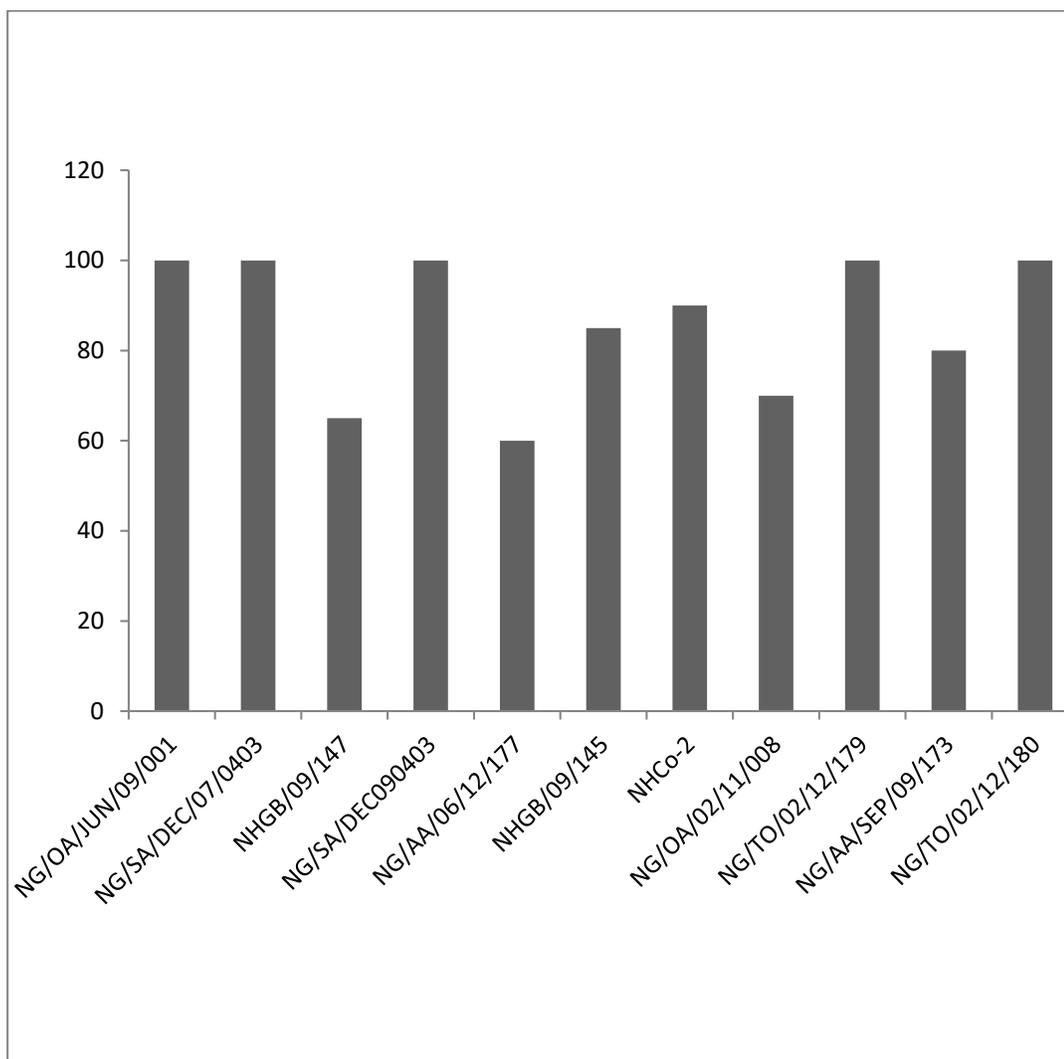


Figure 1: Histogram of percentage seed germination of *Corchorus olitorius* accessions

Table 2: Qualitative characters of Nigeria *C. olitorius* L. accessions

Accession	Branching pattern	Stem colour	Leaf serration	Leaf shape	Venation
NG/OA/JUN/09/001	Less branched	Dark green	Biserrate	Acuminate, broad	Pinnate
NG/SA/DEC/07/0403	Less branched	Dark green	Biserrate	Acuminate, broad	Pinnate
NHGB/09/147	Less branched	Yellowish green	Serrulate	Acuminate, ovate, oblong, lanceolate, broad	Pinnate
NG/SA/DEC/09/0403	Less branched	Yellowish green	Biserrate	Acuminate, small	Pinnate
NG/AA/06/12/177	Heavily branched	Dark green	Serrulate	Acuminate, ovate, oblong, small	Pinnate
NHGB/09/145	Heavily branched	Dark green	Serrulate	Acuminate, ovate, lanceolate, oblong, small	Pinnate

NHCo-2	Less branched	Dark green	Biserrate	Acuminate, broad	Pinnate
NG/OA/02/11/008	Less branched	Dark green	Serrulate	Acuminate, ovate, lanceolate, oblong, small	Pinnate
NG/To/02/12/179	Heavily branched	Dark green	Serrulate	Acuminate, ovate lanceolate, broad	Pinnate
NG/AA/SEP/09/173	Heavily branched	Yellowish green	Serrulate	Acuminate, ovate lanceolate, broad	Pinnate
NG/To/02/12/180	Heavily branched	Yellowish green	Serrulate	Acuminate, ovate, lanceolate, broad	Pinnate

Table 3: Leaf morphology of *Corchorus olitorius* accessions

Accession	Length of the petiole (cm)	Leaf length (cm)	Leaf width (cm)	Leaf index	Leaf area (cm ²)	Node length (cm)	No. of nodes/plant
NG/OA/JUN/09/001	1.7	8.7	5.0	1.74	24.52	1.7	66.2
NG/SA/DEC/07/0403	2.5	9.8	5.4	1.81	28.48	2.8	75.0
NHGB/09/147	2.1	8.6	7.0	1.23	26.04	2.2	67.4
NG/SA/DEC/09/0403	1.8	5.9	5.5	1.07	17.24	1.5	97.2
NG/AA/06/12/177	1.5	4.5	3.1	1.45	12.00	2.1	141.6
NHGB/09/145	1.2	5.5	3.2	1.72	15.04	2.7	113.2
NHCo-2	2.1	8.9	9.5	0.94	44.16	2.4	66.6
NG/OA/02/11/008	1.7	6.7	3.9	1.72	20.80	2.4	99.0
NG/To/02/12/179	1.8	9.2	4.8	1.92	33.72	2.8	87.2
NG/AA/SEP/09/173	2.1	9.0	4.9	1.84	30.96	2.9	149.4
NG/To/02/12/180	1.6	8.3	4.5	1.84	30.16	3.7	127.4

Table 4: Selected flower characters and pod characters among the *C. olitorius* L. accessions

Accession	No. of days to flowering	No. of days from flowering to podding	Peduncle length (cm)	No. of days of sowing to podding	Pod length (cm)	Pod circumference (cm)	No. of pods /plant	Pod shape	No. of valves/ pod
NG/OA/JUN/09/001	51	5	0.2	55	3.9	2.1	222	Slightly curve	5.5
NG/SA/DEC/07/0403	61	12	0.4	72	3.9	1.9	203	Straight	6.3
NHGB/09/147	40	11	0.2	50	4.5	2.2	110	Slightly curve	5.0
NG/SA/DEC/09/0403	50	5	0.2	54	2.4	2.0	159	Straight	5.3
NG/AA/06/12/177	61	2	0.2	62	3.5	1.9	273	Slightly curve	6.3

NHGB/09/145	38	13	0.3	50	3.9	2.1	256	Straight	5.0
NHCo-2	41	10	0.3	50	4.9	2.1	284	Straight	5.2
NG/OA/02/11/008	49	7	0.2	51	4.4	2.3	173	Slightly curve	5.6
NG/To/02/12/179	48	6	0.3	53	4.1	2.0	260	Straight	5.0
NG/AA/SEP/09/173	49	7	0.3	55	4.3	2.1	100	Slightly curve	6.0
NG/To/02/12/180	44	10	0.3	53	5.2	2.2	219	Straight	5.8

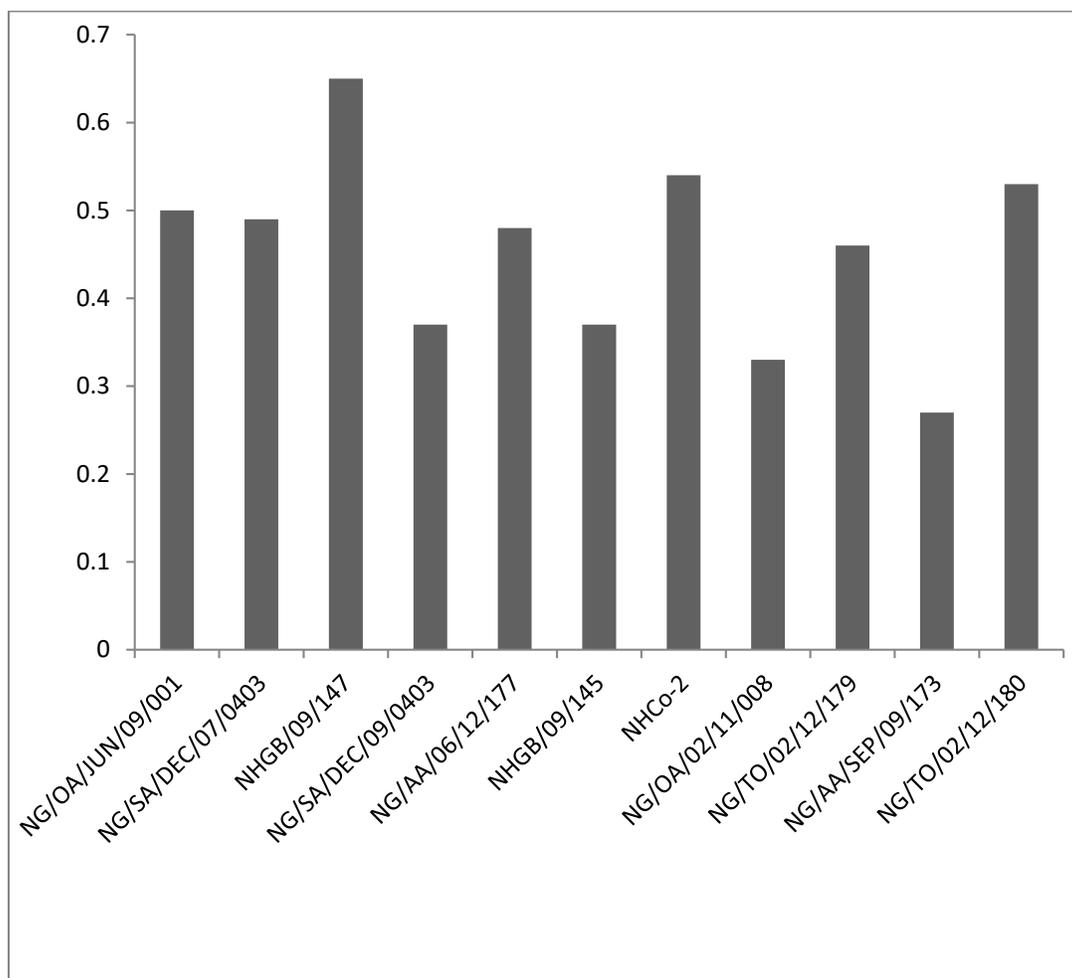


Figure 2: Mean weight per pod for each of the *Corchorus olitorius* L. accessions

Table 5: Seed characters and of Nigeria *Corchorus olitorius* L. accessions

Accession	No. of seeds/pod	wt./100seed
NG/OA/JUN/09/001	93.2	0.2
NG/SA/DEC/07/0403	96.8	0.1
NHGB/09/147	113.4	0.2
NG/SA/DEC/09/0403	89.8	0.2
NG/AA/06/12/177	86.0	0.1
NHGB/09/145	82.4	0.1
NHCo-2	132.6	0.1
NG/OA/02/11/008	76.2	0.1
NG/To/02/12/179	78.8	0.1
NG/AA/SEP/09/173	105.8	0.1
NG/To/02/12/180	112	0.1

Table 6: Results of statistical analysis for Leaf, Plant height, and node length using R

Parameters	Plant height	Number of leaves	Stem circumference	Leaf area	Node length	Leaf width
Residual standard error	0.5752	2.919	3.48	3.304	2.473	3.466

Multiple R-squared	0.996	0.303	0.009184	0.1068	0.4995	0.01734
Adjusted R-squared	0.9905	0.2255	-0.1009	0.007547	0.4439	-0.09185
F-statistic	182 on 11	3.912 on 1	0.08342 on 1	1.076 on 1	8.982 on 1	0.1588 on 1
p-value	2.349e-08	0.07934	0.7793	0.3267	0.01503	0.6996
Correlation coefficient		-0.93	-0.99	-0.95	-0.97	-0.95

Legend: model is significant in all these parameters. Residual error was at 9 degrees of freedom and p-value at 5% probability level

IV. DISCUSSION

Most of the quantitative & qualitative characters studied showed differences. Though only six characters were significantly different among the cultivars. There was no disease-causing organisms' occurrence on or within the plant and its seed this could be as a result of the hot-water treatment before planting, this corroborates with the findings of Sally, 2002 and Emongor *et al.*, 2004. The highest germination percentage was 45.45% on the 3rd day, 36.36% on the 5th day, and the least was 18.18% on the 4th day (Figure 1). Despite variation recorded in the percentage germination, the rate of growth and the yield were not affected. However, the delay in germination might be a result of other factors such as water availability to the seed testa, heat, etc. meaning that the germination rate does not determine the proportion of development and output in *C. olitorius* L. studied. Node length and leaf area are positively correlated, but not strong enough. Node length per plant throughout the growth period increased in NG/AA/06/12/177, whereas in NHC0-2 it decreases and was almost constant in NG/AA/SEP/09/173, but fluctuation was experienced in others, though some cultivars had similar node length this cannot be used in taxonomic classification (Table 2 and 3). Results also showed that the higher the pod production the higher the number of seeds per pod (Table 4). The number of seeds per capsule is directly correlated with the number of loculi and their length (Table 5). The number of pods is directly proportional to the number of seeds produce. Furthermore, the pod weight is directly correlated with the seed weight. NG/OA/JUN/09/001 and NHC0-2 are correlated with the plant height. There was an increment in the number of pods in the first 3 months in

NG/To/02/12/179 and NG/AA/SEP/09/173 while in NG/SA/DEC/07/0403, NG/AA/06/12/177, and NG/OA/02/11/008 reverse was the case.

Based on the leaf morphology (Table 2 and 3) all the accessions belong to *C. olitorius* though there was high variability in size, branching, and shape of its fruit and leaves. NG/OA/JUN/09/001, NG/SA/DEC/07/0403, NG/SA/DEC/09/0403 and NHC0-2 fit to 'Oniyaya', while NHGB/09/147, NG/To/02/12/179, NG/AA/SEP/09/173, and NG/To/02/12/180 are 'Amugbadu'. This is in line with (Pal *et al.*; 2006) work, while NG/AA/06/12/177, NHGB/09/145, and NG/OA/02/11/008 belong to 'Eleti ehoro'. This is in agreement with the work of (Makinde *et al.*; 2009).

The stem circumference is positively correlated with the plant height. In NG/AA/06/12/177 the stem circumference decreases with an increase in plant height. The variation recorded in the stem colour may be environmental or genetically inclined. The length of the peduncle and the leaf length are highly correlated. In addition, the leaf length is also correlated with the plant height.

Variation in the number of leaves and leaf width are highly and positively correlated, thus the higher the number of leaves the smaller the leaf width. Leaf area and leaf width have the same intercept and are directly correlated. Petiole length in all the cultivars studied varies and maybe as a result of genetics among other factors, this agrees with Nath and Denton, 1980 findings.

Both early and late flowering was observed however, NHGB/09/147, NG/To/02/12/179, NG/AA/SEP/09/173, and NG/To/02/12/180 exhibit only early flowering and also had the widest pod while others exhibit both early and late flowering. This

corroborates with the work of Makinde *et al.*, 2009. Variation, in this case, may be genetic, but cannot be without factors such as environmental.

In the study, the accessions experienced variation in the length of stipule, but similarity still occurs in some. The analysis of variation for the mean number of days of flowering, peduncle lengths, and the number of days from flowering to podding also indicates variation that could be of genetic importance among the accessions studied. However, the colour and shape of the flower, calyx, and sepals were similar. NA/SA/DEC/07/0403 exhibits rapid growth throughout the growth period. This corroborates the findings of (Akoroda, 1985) which says that apart from the variation in the leaves, considerable variation in other morphological traits still exists within the various local morphotypes.

V. CONCLUSIONS

The research work showed that the yield is directly proportional to vegetative growth, as indicated by the various measurement of the leaf which is directly correlated with vegetative growth. The variation may be connected with the environment and genetic makeup of the accessions studied. The genetic variation serves as a tool in the selection of accession for crop production in the locality of the study therefore; NHC0-2 should be considered if the crop is to be improved upon in the locality. NG/SA/DEC/07/0403 can be considered for late pod production, but not leaf production. NHGB/09/147 can be cultivated for its highest weight of pod, the shortest period of pod production, and maturity; this indicates that the accession is the best for consumption and subsistence farming. NHC0-2 and NHGB/09/147 can be bred to give higher yields in pod, seed, and leaves. Though most of the accessions studied have a considerable podding period, their differences in yield are an important factor for selection therefore, NHC0-2 is the best morphologically.

VI. RECOMMENDATIONS

Farmers should be encouraged to use NG/OA/JUN/09/001, NG/SA/DEC/07/0403, and NHGB/09/147 for cultivation in the locality of study. These improved seeds should be made available to the farmers. More work should be done on how the genotype can be used in assessing the phylogenetic relationship among related accessions.

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Implementation of Minimum Service Standards (SPM) in the Field of Tuberculosis Health Services in Demak District

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Abstract- Productivity employee Becomes the center of attention to increase performance that can give influence to efficiency and effectiveness organization. Achievement of work targets field of Health in Thing this refers to the SPM that has been set. According to Edward, the achievement of performance targets could be influenced by the variables of communication, resources, disposition, and structure bureaucracy, which 4 variables the Becomes guidelines discussed in the study. The type of research used in this research is research descriptive by using a qualitative approach, carried out by taking a portrait of the social situation which is then examined through. Research results show that the variables of communication, resources, disposition, and structure of bureaucracy give influence to quantity and quality performance of officer tuberculosis services in applying standard minimal service to society.

Index Terms- Minumum Service Standards (SPM), Implementation, Tuberculosis Health Services

I. INTRODUCTION

Based on Minister of Health Regulation (Permenkes) Number 4 of 2019 concerning Standards Technical Fulfillment of Basic Service Quality at Minimum Service Standards in the Field Health. Service health sued to implement the provisions of Article 6 paragraph (6) of the Regulation Government Number 2 of 2018 concerning Minimum Service Standards.¹

Minimum Service Standards (SPM) in the health sector are used as a benchmark for the performance of health services organized by the regions to ensure and support the implementation of authority. So that in this case the management of the Puskesmas can be measured by the achievements that have been determined by the SPM related to the quality of services provided to the community.

about quality service, then one _ factor important necessary _ noticed is related with performance, where effort enhancement Health services can be measured through enhancement performance with notice quantity and quality achievements good in Duty individual nor organization. So that the service outcome The health center that will be achieved if performance conducted with good is enhancement degrees health Public can be fulfilled.²

Productivity employee Becomes the center of attention in the effort to increase influencing performance _ efficiency and effectiveness organization. More analysis _ concentrating on performance will emphasize two factors main that is motivation from employees and abilities from an employee for work. Siriyei's research shows that several factors influence the low achievement of Minimum Service Standards (SPM) in the Health sector, including training, workload, teamwork, availability of funds, facilities and infrastructure factors, and the planning process.³

one _ type of mandatory service _ that apply standard minimum service is tuberculosis health services. TB cases in Central Java province rank third with the highest number of TB cases after West Java and East Java from all provinces in Indonesia. TB cases in Central Java in 2017 reached 42,272 cases consisting of 23,500 cases (55.59%) in men and 18,772 cases (44.41%) in women. One of the strategies for achieving SPM at the provincial level is that all programs and activities must support the achievement of SPM for Provincial Health. There are 12 indicators of SPM achievement, all of which are targeted at 100%. The province's performance achievement for health services for people with suspected TB in 2018 reached 88.41%, in 2019 it reached 81.01 %, and in semesters 1-20-20, it reached 32.71 %. These achievements indicate that health services have not been carried out optimally.^{4,5}

The role of organizational performance, in this case, is important to support the achievement of the established health sector SPM targets, to strengthen the implementation of community health efforts to achieve the goal of increasing the community's health status. It is necessary to conduct a study on the performance of tuberculosis service workers to improve the quality of the roles and functions

of the SPM in the field of Health and as a socialization material for the Demak Regency government in implementing health service standards at the Demak Regency Health Center.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

The type of research used in this research is research descriptive by using a qualitative approach, carried out by taking a portrait of the social situation which is then examined through. The data collection method uses the condition method natural with primary data sources and secondary data sources.⁶ The unit of analysis of this research is the working group of Puskesmas in Demak Regency. The research population was the working group of the puskesmas holding the tuberculosis program, laboratory officers, and health promoters in Demak Regency.

III. RESULTS

In the framework of implementing the SPM in the health sector, a Technical Standard for the Application of SPM is prepared which explains the operational steps for achieving SPM in the Health Sector at the Provincial/Regency/City level as a reference for local governments by taking into account the potential and capabilities of the region. SPM will also function as an instrument to strengthen the implementation of Performance-Based Budgeting. Law Number 23 of 2014 also mandates local governments to prioritize regional spending to fund mandatory government affairs related to basic services as stipulated by the SPM (article 298). The allocation of the Special Allocation Fund (DAK) to the regions will be based on regional needs for the achievement of SPM targets. Regions with less resource capacity will be a priority in the allocation of DAK.⁷

The things mentioned above will make all elements unite to improve together towards achieving the SPM targets, including the fulfillment of health human resources, especially at the Puskesmas level according to Permenkes Number 43 of 2019 concerning Community Health Centers. Puskesmas as a first-level health service facility will be the leading unit in the effort to achieve SPM targets.⁸

The achievement of the low SPM target greatly affects the achievement of Minimum Service Standards in the Health Sector. One of the areas affected by the high number of TB cases as one of the targets for achieving SPM is Demak Regency. Demak Regency is one of the areas in Central Java that has not yet reached the predetermined target for health services for people suspected of TB. Based on the 2016 Health Service SPM achievement data for basic health services from 12 indicators, 2 indicators do not meet the target, namely the coverage of infant visits 98.41% (target 99.80) and the discovery of new patients with smear-positive TB 30.71% (target 100%).⁹

Patient discovery is the first step in the implementation of TB services. Patient discovery activities consist of the screening of suspects, diagnosis, determination of disease classification, and patient type. The guidelines for the TB patient discovery strategy are as follows:¹⁰

1. The discovery of TB patients is done passively with active promotion. Screening of suspected patients is carried out in the health service unit, supported by active counseling, both by health workers and the community to increase the scope of finding suspected TB patients.
2. Examination of contacts of TB patients, especially those who are smear-positive and the families of children suffering from TB who show the same symptoms should be examined for sputum
3. Active house-to-house discovery is not considered cost-effective

Based on the agreement on the FGD of tuberculosis experts chose the discovery of suspected tuberculosis patients in the form of coughing up phlegm for more than 2 weeks whose cause could not be explained. whereas in children there is a history of contact with patients diagnosed with tuberculosis as a sub-indicator of finding tuberculosis patients. The difference between finding suspects in children from adults is that the method for finding suspects in adults is not applicable when applied to children. This method of finding suspected tuberculosis patients in children has not been accommodated in the existing tuberculosis control policies.

Demak Regency has 27 Puskesmas units spread over 14 sub-districts in Demak Regency, of the 27 Puskesmas units that have implemented health services based on the established SPM, only 1 puskesmas unit has achieved the SPM target on the percentage of TB suspects with a percentage of achievement of 106%.¹¹

NAMA PUSKESMAS	JUMLAH PENDUDUK	Tahun 2019										CDR	CNR
		Sasaran Suspek	Capaian Suspek	% Capaian Suspek	Capaian BTA +	Capaian BTA -	Capaian Anak	Capaian Ekstra Paru	Target Total Kasus	Capaian Total Kasus			
PUSKESMAS BONANG I	57.916	618	336	54%	63	0	1	115	65	56,8	112,2		
PUSKESMAS BONANG II	45.305	484	314	65%	32	5	4	90	42	46,9	92,7		
PUSKESMAS DEMAK I	31.609	338	257	76%	62	0	2	63	64	102,4	202,5		
PUSKESMAS DEMAK II	37.192	397	257	65%	34	10	1	74	45	61,2	121,0		
PUSKESMAS DEMAK III	33.148	354	155	44%	24	9	2	66	26	39,7	78,4		
PUSKESMAS DEMPET	53.870	575	345	60%	41	0	0	107	42	39,4	78,0		
PUSKESMAS GAJAH	25.472	272	287	106%	36	6	3	0	50	45	89,3	176,7	
PUSKESMAS GAJAH 2	18.354	196	165	84%	14	13	7	2	36	36	99,2	196,1	
PUSKESMAS GUNTUR I	41.542	444	235	53%	24	2	3	0	82	29	35,3	69,8	
PUSKESMAS GUNTUR II	36.646	391	291	74%	24	1	0	0	72	25	34,5	68,2	
PUSKESMAS KARANG TENGAH	63.767	681	265	40%	32	18	1	2	126	53	42,0	83,1	
PUSKESMAS KARANGANYAR I	31.379	335	240	72%	46	18	6	0	62	70	112,8	223,1	
PUSKESMAS KARANGANYAR II	39.821	425	291	68%	37	2	3	2	79	44	55,9	110,5	
PUSKESMAS KARANGAWEN I	41.771	446	156	35%	17	8	4	0	83	29	35,1	69,4	
PUSKESMAS KARANGAWEN II	49.353	527	326	62%	33	10	12	2	98	57	58,4	115,5	
PUSKESMAS KEBONAGUNG	40.849	436	243	56%	34	6	2	0	81	42	52,0	102,8	
PUSKESMAS MIJEN I	27.461	293	193	66%	13	10	2	1	54	26	47,9	94,7	
PUSKESMAS MIJEN II	23.844	255	194	76%	22	15	3	1	47	41	87,0	172,0	
PUSKESMAS MRANGGEN I	66.700	712	425	60%	43	1	14	0	132	58	44,0	87,0	
PUSKESMAS MRANGGEN II	54.047	577	243	42%	27	6	14	2	107	49	45,8	90,7	
PUSKESMAS MRANGGEN III	73.377	784	272	35%	26	7	21	2	145	56	38,6	76,3	
PUSKESMAS SAYUNG I	57.767	617	165	27%	27	8	0	2	114	37	32,4	64,1	
PUSKESMAS SAYUNG II	49.757	531	191	36%	25	5	15	0	98	45	45,7	90,4	
PUSKESMAS WEDUNG I	42.252	451	381	84%	40	39	22	4	84	105	125,7	246,5	
PUSKESMAS WEDUNG II	30.892	330	314	95%	11	62	3	2	61	80	131,0	259,1	
PUSKESMAS WONOSALAM I	45.062	481	197	41%	12	31	0	0	89	43	48,3	95,4	
PUSKESMAS WONOSALAM II	32.273	345	308	89%	44	2	3	1	64	50	78,3	154,9	
TOTAL	1.151.421	12.296	7.066	57%	843	285	150	26	2.277	1.304	57,3	113,3	

Figure 1. Demak Regency TB Indicator achievement report 2020

Data above shows 26 Puskesmas units have not reached the SPM target in 20-20 with the lowest percentage of TB suspects achieving 27%. This shows that the local government and the health office as institutions in charge of health services need to be more serious in paying attention to improving SPM achievements, especially services for people suspected of TB in the Demak Regency.

The process of implementing service activities is not only carried out by a team of TB service officers, but also coordinates with midwives, nurses, and lab staff. Activities are also usually carried out in conjunction with Posbindu and Posyandu activities as well as closer monitoring of the community through village midwives. The results of the study related to the obstacles experienced during the implementation of service activities, from Puskesmas A complaining about the actions of the community that was less supportive of the service program, while Puskesmas B complained about the demographic conditions of the Puskesmas area which made it difficult for officers to reach the entire community in the Puskesmas working area.

A. Implementation variable of SPM in the field of Health

Interview results deep show that most _ officer implementing SPM in the health sector for tuberculosis services has not yet known about technical program implementation. Meeting level service is delivered only one time by head service when beginning program release.

Communication has not been running properly, there is no further discussion of the results of the socialization by the program-related services. The communication between the manager and the Puskesmas executor has been conveyed only once, technically the program has never been conveyed, so that we Puskesmas as implementers in the field are confused...and the SPM program this there is under shade government area, so that difficult for us to provide control over the program.(Informan)

The results of in-depth interviews with informants at Puskesmas A stated that at the beginning of 2017 the implementation of TB services at the Puskesmas was carried out with limited Puskesmas resources, both manpower, and finance. However, with the enthusiasm and persistence of the head of the Puskesmas and the Puskesmas officers, the service implementation can be passed well. Rewards are given not in the form of material but with thanks and doing activities together, for example holding a meal together. The triangulation informant also conveyed the same thing. Excerpts from interviews with informants at Puskesmas A are revealed in the narrative

Human resources and infrastructure are met, and equipment is also complete, entries there are also human resources, yes, they must be fulfilled, because these human resources affect the effectiveness of our work...the available funds are also sufficient, some are from the BOK..and when the rewards are in the form of thanks, motivation, and usually there is also a meal together.(Informan)

Data from in-depth interviews with informants related to workloads show that the workload received by Puskesmas A and Puskesmas B in 2021 is increasing, Puskesmas A which in 2020 has achieved the target has also experienced a high workload buildup, addition to, In addition, the existence of multiple positions also affects the achievement of SPM achieved, this dual position is experienced by members of the TB service team who do not only focus on TB services but also other services. Meanwhile, Puskesmas B, which has not yet reached the target in 20-20, revealed that Puskesmas B will continue to work hard to achieve the set SPM targets. Even so, both Puskesmas A and Puskesmas B are required to continue to innovate in dealing with the problems faced by each Puskesmas. As quoted from the interview in the narrative in the box below:

Our target has been achieved last year, but because this year the workload is getting higher, we can only keep trying, right, because there are many double positions and double jobs, so the obstacle is that there are many human resources holding program..(Informan)

According to Huey and Wickens, identification of workload transitions is important to examine the effect of variations on employee performance, because the workload has important implications for many jobs, especially when employees are faced with various levels of workload.¹²

Data from in-depth interviews with informants related to structure bureaucracy shows that both Puskesmas A and Puskesmas B have non-routine supervision, supervision is usually done when there is a TB cadre meeting, but the conditions are different. When Puskesmas B complains about the *job description* given to nurses because team members who work as nurses also have activities other than the focus on TB service activities organizational performance becomes hampered. Conversation review with the informant attached in the box:

Supervision must be there, it's just not routine, the Department also always conducts monitoring and evaluation, giving guidance too, so if our job description is appropriate, there are already experts in the team, there are nurses, TB programmers, and lab analysts. It is following the qualifications and performance of each...(Informan)

According to Farouhi, through the organizational structure, operational activities and activities within the organization can be accounted for through the authority that has been determined. So in this case the organizational structure is a manifestation of systematic thinking.¹³

B. Discussion

An instrument for the community to exercise control over government performance in public services in the health sector. The achievement of the low SPM target greatly affects the achievement of Minimum Service Standards in the Health Sector. One of the areas affected by the high number of TB cases as one of the targets for achieving SPM is Demak Regency. Demak Regency is one of the areas in Central Java that has not yet reached the predetermined target for health services for people suspected of TB. Based on the

2016 Health Service SPM Achievement data for basic health services from 12 indicators, 2 indicators do not meet the target, namely the coverage of infant visits 98.41% (target 99.80) and the discovery of new patients with smear-positive TB 30.71% (target 100%).¹¹

There are 3 (three) sub-indicators of TB disease control that can be used as SPM indicators:¹⁴

1. Discovery indicators; the discovery of a suspected TB patient in the form of coughing up phlegm for more than 2 weeks whose cause cannot be explained. While in children there is a history of contact with patients diagnosed with TB
2. Handling indicators; success rate 90% with a minimum cure rate of 85%
3. Surveillance indicator; the level of validity of recording and reporting according to standards.

Demak Regency has 27 Puskesmas units spread over 14 sub-districts in Demak Regency, of the 27 Puskesmas units that have implemented health services based on the established SPM, only 1 puskesmas unit has achieved the SPM target on the percentage of TB suspects with a percentage of achievement of 106%.¹⁵

The process of implementing service activities is not only carried out by a team of TB service officers, but also coordinates with midwives, nurses, and lab staff. Activities are also usually carried out in conjunction with Posbindu and Posyandu activities as well as closer monitoring of the community through village midwives. The results of the study related to the obstacles experienced during the implementation of service activities, from Puskesmas A complaining about the actions of the community that was less supportive of the service program, while Puskesmas B complained about the demographic conditions of the puskesmas area which made it difficult for officers to reach the entire community in the puskesmas working area.

Communication variables in the implementation of SPM in the health sector for tuberculosis services show that executor activity not yet whole get information related SPM policy, community user no service yet get clear information about the program and technical implementation by comprehensive, content information submitted not yet could be understood by the public with clear.

Convenience access is a factor important in implementation policy. Likewise with some theory implementation delivered by experts disclose that communication is part important in implementation policy. Program information can be is known to target users through communication. The executor could carry out the program with good if supported by an effective communication process.

This thing under theory presented by George C. Edward III, that policy could be held with good if occur effective communication between-group program implementers and with group target (target group).¹⁶ Requirements first for implementation effective policy is executor doing decision continued policy to personnel executor.

Human resources are still a problem in policy implementation, in this case, it is similar to the research on the PSC (Public Safety Center) 119 Innovation Information System Analysis with the Pieces Method at the Boyolali District Health Office conducted by Dwi Nurulita. get information, but performance is not optimal, information is not necessarily relevant, economical, supervision is good and the system is safe and efficient but human resources are still lacking, services provide good benefits but lack socialization to the community.¹⁷

The results of the interviews above show that the budget resources for the puskesmas unit are sufficient because the puskesmas has allocated its budget. However, the puskesmas unit has difficulties in operational budgeting because there is no additional budget from the Office so what happens is that the program implementation has not been running optimally, and operational cost difficulties have hampered the implementation of activities in the field.

According to Mazmanian and Sabatier in their theory, the success of implementation depends on the size of the allocation of financial resources for the policy. Financial resources are a crucial factor for every. social program. Each program also requires staff support to carry out administrative and technical work and monitor the program, all of which cost money.¹⁸

The results of the analysis of resources in the implementation of SPM in the health sector in Demak Regency are required to increase the fulfillment of the quality and quantity of HR implementing the puskesmas unit. The fulfillment of human resources is needed to reduce the high workload, supported by training to improve the ability of officers in handling emergencies. The resource factor is closely related to other factors, with sufficient human resources supported by good quality, the main tasks and functions can be carried out properly.

The results showed that the organizational structure as outlined in the SOP (Standart Operational Procedure) was accepted and carried out well by the implementing team, because of intense socialization carried out by the manager, sufficient support from personnel was the capital to carry out the task well. Limited human resources are an inhibiting factor in the implementation of SOPs. A lack of human resources will hinder the process of implementing activities.

The results of the discussion, show that the bureaucratic structure and SOPs influence each other with other factors. Clear SOPs are very important in correct operational actions so that program implementation can run as expected. The results of the analysis of the bureaucratic structure in the implementation of SPM in the health sector in Demak Regency, clarity of SOP is very important, clear work procedures, officers' understanding of the steps taken makes it easier to handle emergencies in the field, so handling errors can be minimized.

IV. CONCLUSION

From the results of the analysis, it can be concluded that the implementation of SPM in the health sector for tuberculosis services in Demak Regency has not been running according to the expected goals, the targets and program implementation are not running optimally. The results of the implementation of the SPM program in the health sector are less effective and efficient because there is a gap in the role of the team caused by a lack of coordination and communication from the beginning of planning, and resource

readiness has not been fulfilled, incompatibility of main tasks and functions, as well as technical socialization of activities and SOPs, have not been received by the implementer. Puskesmas units and there has been no evaluation action after the program has been implemented, so the team has difficulty in providing improvements to the results of program implementation.

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The Influence Of The Role Of Leaders, Work Safety, Work Experience, Organizational Climate, Work Ability And Perception On Work Commitment

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Abstract- Work commitment is an important issue that is busy being discussed at this time. Nurses who have a high commitment to the organization will show greater effort in carrying out their duties. The purpose of this study was to determine the direct and indirect effects and the magnitude of the role of leadership, work safety, work experience, organizational climate, work ability and self-perception of the commitment of nurse work. The type of research used is quantitative research using a cross sectional research design. The population in this study were all nurses at the Cijantung Military Hospital, which numbered 110 people. The sampling method uses total sampling technique. Data collection is done using a questionnaire. The results that the researchers got there influence the leadership role of 17.49%, work safety at 18.70%, work experience of 19.03%, organizational climate of 11.47%, work ability of 5.31% and self perception of 12, 18% of nurses' work commitments. The leadership role, work safety, work experience, organizational climate, work ability and self perception contribute to work commitment of 84.18% while 15.82% is explained by other variables not examined. The suggestion in this study is that it is expected that the management of Cijantung Military Hospital will change the system of forming new work policies, for example training, further study, good communication, attention and appreciation or other patterns so as to stimulate nurse work experience to foster high commitment at the work agency.

Index Terms- Work, Commitment, Nurse, Hospital

I. INTRODUCTION

Human resources (HR) play an important role in dealing with the changes that occur and are valuable and most important assets owned by an organization or company, because the success of the organization is largely determined by the human element. One form of good corporate planning is in changing the use of quality human resources. Human resources who have an important role in a company are the people who provide energy, creativity and talent. They have the task of directing where the company must go to be more advanced, develop the company to be bigger, and achieve high productivity for the company. Therefore, companies must strive to maintain potential human resources so as not to have an impact on the turnover of nurses. The importance of the role of HR in competitive advantage is a factor that encourages organizations to be concerned about HR issues [1] [2].

Entering the current era of globalization, competition between companies is getting tougher, because companies are not only faced with domestic competition but also abroad. Facing these situations and conditions, companies must determine their management strategies and policies, especially in the field of Human Resources (HR). HR management is currently a necessity and is no longer an option if a company wants to develop and HR is an asset that must always be developed [3].

The needs and desires of all nurses or nurses as human resources must also be supported by the company or organization so that the nurse or nurse can be motivated to show their best performance and feel satisfied with the results of their work. Work is more than just activities that are limited to arranging paper, writing program code, waiting for customers, or driving a truck. Every job requires some kind of interaction or relationship between coworkers, superiors, following organizational rules and policies, meeting performance standards, accepting work conditions that are often less than ideal, and others [4].

Hospital is a service organization that has specificity in terms of human resources, infrastructure and equipment. Basically the hospital is a collection of various service units. In the health service system in the hospital, besides doctors, nurses and nurses have a very important position. Nurses are the spearhead of whether or not health services are provided to patients, because for 24 hours the nurse always interacts with the patient. The core services of activities in the hospital are mostly carried out by nurses and are the largest number of professionals in the hospital. In providing nursing care, a nurse has a very big responsibility for the patient and for the organization in which he works. Good service cannot be separated from the commitment of nurses to provide good service to patients and also a commitment to their organization .

Hospitals as one of the agencies categorized as service providers are required to have speed of service, friendliness, effectiveness of action and comfort for patients and visitors which are factors of success in hospital management. Advances in knowledge and technology in the health sector have a major impact on improving the quality of nursing services. Nursing services carried out by professional nurses, in carrying out their duties, can work independently and can also work together with other professions. Nurses are the largest health human resource that provides health services in the form of nursing care in hospitals. The nursing team is at the forefront of its role which cannot be ruled out from all forms of hospital services. This is because the nursing team performs nursing services for 24 hours continuously for the patient. Nurses are required to be able to provide first aid to patients responsively without complaining about the conditions and conditions of work. Such demands make nurses one of the elements of a hospital that really needs behaviors from work commitment indicators [5].

Work commitment means a condition that describes the nurse siding with an organization and its goals and intends to maintain its membership in the organization. Commitment to the organization is an attitude that describes the level of individuals taking sides and engaging with the organization they are in and do not intend to leave it. Nurses who have a high commitment to the organization will show maximum effort in performing their duties. Nurses who have a commitment to the organization are believed to be able to dedicate their time, energy, and more talents to the organization, compared to nurses who are not committed [6].

Work commitment is an important issue that is being discussed at this time. Work commitment as a nurse's personal cognitive, emotionality, and behavior that leads to organizational goals. The existence of a high sense of commitment to the organization will display a trusting attitude towards the values of the organization, try their best for the sake of the organization, and have the determination to remain part of the organization. Nurses with high work commitments generally have good attendance and performance records, demonstrate a desire for loyalty to company policies, have lower turnover rates and have high productivity, satisfaction and work motivation. Thus, it is hoped that this can increase public confidence in health services and be a good way to improve the health status of the community itself Mulyono (2013); [7].

Hospital nurses are required to be committed to have the willingness and ability to develop skills and knowledge in an effort to provide quality services to patients. Besides, a nurse is required to be able to provide friendly, polite, and skilled services so as to reduce patient complaints. In addition, better service quality, must be supported by having nurses with a high level of discipline, nurses who have good work capabilities are needed in order to carry out full service, professional and uphold ethics and prioritize patient safety. The performance of nurses as a consequence of community demands for the need for excellent service or high quality service results in a high workload and targets for complete work completion. To be able to achieve its goals, the hospital will definitely expect its nurses to behave accordingly and even exceed the requirements in the hospital [8].

Based on the secondary data that the researchers got, the work commitment of nurses at the Tk. IV Cijantung is currently low. From the expected achievement, that is, 80% of nurses do not violate work, for 3 consecutive years this hope has not been achieved, even further away from this achievement figure. In 2015, only 78.4% of nurses did not commit work violations, in 2016 only 74.8% of nurses did not commit work violations, even in 2017 it only reached 71.3% of nurses who did not commit work violations. The low commitment of nurses if this is not immediately resolved, it is feared that it will have an impact on the crisis of nursing services which will endanger the safety of patient health, the quality of hospital services will decline so that it is directly proportional to the poor image of the Tk Hospital. IV Cijantung. The purpose of this study was to determine the direct and indirect effects as well as the magnitude of the role of the leadership, work safety, work experience, organizational climate, work ability and self-perception on nurses' work commitment.

II. METHODS

Type of research uses quantitative research methods with research design cross sectional. Exogenous variables and endogenous variables are measured at the same time. This study uses a questionnaire or questionnaire instrument or method. A questionnaire or questionnaire is a number of written questions that are used to obtain information from the respondent in the sense of a personal report, or things that are known according to the needs of the researcher.

This research was conducted at the Tk. IV Cijantung in January-February 2019. The research population is the entire research object or object under study. The population in this study were all nurses at the Tk Hospital. IV Cijantung, amounting to 110 people. The sampling technique uses the total population, so all members of the population are used as research samples.

Sampling was determined using inclusion, non-inclusion and exclusion criteria. The inclusion criteria consisted of nurses at the Tk Hospital. IV Cijantung who are willing to become respondents. The non-inclusion criteria in this study consisted of non-nurses at the Tk. IV Cijantung who are willing to become respondents. Meanwhile, the exclusion criteria in this study were respondents who did not complete the questionnaire.

In this study, data analysis used the approach using the *Partial Least Square (PLS) PLS smart software*. PLS is a model equation *Structural Equation Modeling (SEM)* based component or a variant (*variance*). PLS is an alternative approach that shifts from based SEM approaches *covariance* -based to variant-. Covariance-based SEM generally tests causality / theory while PLS is more of a *predictive model*. The reflexive model assumes that the construct or latent variables affect the indicator (the direction of the causality relationship from construct to indicator or *manifest*). In fact, latent variables can also be formed by indicators that are formative (the direction of the causality relationship from indicator to construct). The path analysis model for all latent variables in the PLS consists of three sets of relationships: (1) The *inner model*, which specifies the relationship between latent variables (*structural model*), is measured using the *Q-Square predictive relevance* with the formula $Q^2 = 1 - (1 - R^2)$ (1- R^2), (2) *Outer model* that specifies the

relationship between latent variables and their indicators or manifest variables (*measurement model*), measured by looking at *convergent validity* and *discriminant validity*.

Convergent validity with a value of *loading* 0.5 to 0.6 is considered sufficient, for the number of indicators of latent variables ranging from 3 to 7 and *discriminant validity*, it is recommended that the AVE value is greater than 0.5 and also by looking at (3) *Weight relation* where the case value of the variable latency remains estimated. Without losing generalizability, it can be assumed that the latent variables and indicators or manifest variables at the scale *zero means* and *unit variance* so that the location parameter (constant parameter) can be omitted in the model. If the T-statistic > 1.96, it can be concluded that there is a significant effect, but on the contrary, if the T-statistic < 1.96, it can be concluded that it has no significant effect.

III. RESULT

Table 1
Characteristics of Respondents, 2019

	Characteristics	Amount	Presentation (%)
Age	25 - 35 Year	88	80,0
	> 35 Year	22	20,0
length of working	3 - 5 Year	58	52,7
	> 5 Year	52	47,3

Table 1 shows that most of the respondents aged 25 - 35 years were 88 (80.0%) respondents. Based on the length of work it shows that most of the respondents who worked 3 - 5 years were 58 (52.7%) respondents.

The work commitment variable in this study was measured through 15 statement items with an assessment of 1-5, so that the questionnaire scores ranged from 15-75 and the actual scores ranged from 36-75. The leadership role variable in this study was measured through 15 statement items with a rating of 1-5, so that the questionnaire scores ranged from 15-75 and the actual scores ranged from 35-74. Work safety variables in this study were measured through 15 statement items with a score of 1-5, so that the questionnaire scores ranged from 15-75 and the actual scores ranged from 35-74. The work experience variable in this study was measured through 15 statement items with a score of 1-5, so that the questionnaire scores ranged from 15-75 and the actual scores ranged from 35-74. The organizational climate variable in this study was measured through 15 statement items with a score of 1-5, so that the questionnaire scores ranged from 15-75 and the actual scores ranged from 36-75. The workability variable in this study was measured through 15 statement items with a score of 1-5, so that the questionnaire scores ranged from 36-75 and the actual scores ranged from 85-124. Self-perception variables in this study were measured through 15 statement items with a score of 1-5, so that the questionnaire scores ranged from 15-75 and the actual scores ranged from 35-74.

The indicators for constructing the latent variable constructs of all variables have shown good results. In addition, all constructs have loading values greater than 0.50 so that the test criteria for measuring indicators are declared valid. The measurement results by comparing the square root value of Average Variance Extracted (AVE) for each construct with the correlation between the construct and the square root value of AVE in this research model, and the AVE value above 0.50. So it can be concluded that the measurement evaluation model has good discriminant validity. Another method shows that the square root value of AVE is greater than the square root of average variance extracted (AVE) value for each construct, so it can be concluded that the evaluation of measurement models has good discriminant validity.

In addition, the R-square value of the role of the leader contributes to work safety by 76.07%, while 23.93% is explained by other variables not examined. The role of leadership and work safety contributes to work experience by 75.56% while 24.44% is explained by other variables which are not examined. The role of leadership, work safety and work experience contributed to the organizational climate by 83.27% while 16.73% was explained by other variables which were not studied. The role of leadership, work safety, work experience and organizational climate contributed to work ability by 74.91%, while 25.09% was explained by other variables not examined. The role of leadership, work safety, work experience, organizational climate and work ability contributed to self-perception by 89.94%, while 10.06% was explained by other variables that were not studied. The role of leadership, work safety, work experience, organizational climate, work ability and self-perception contributed to work commitment by 84.18% while 15.82% was explained by other variables which were not examined. The results of the outer model evaluation can be seen in Figure 1 below:

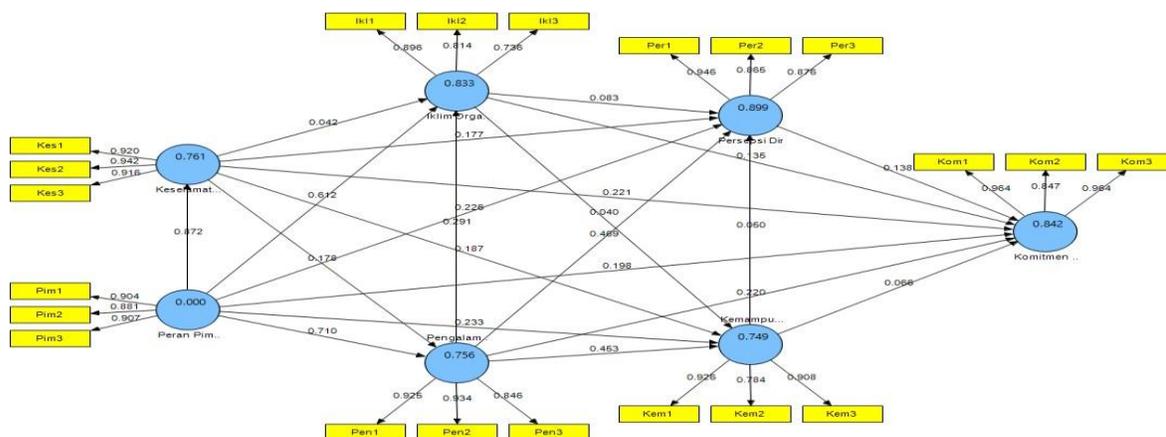


Figure 1. Output PLS (Loading Factors)

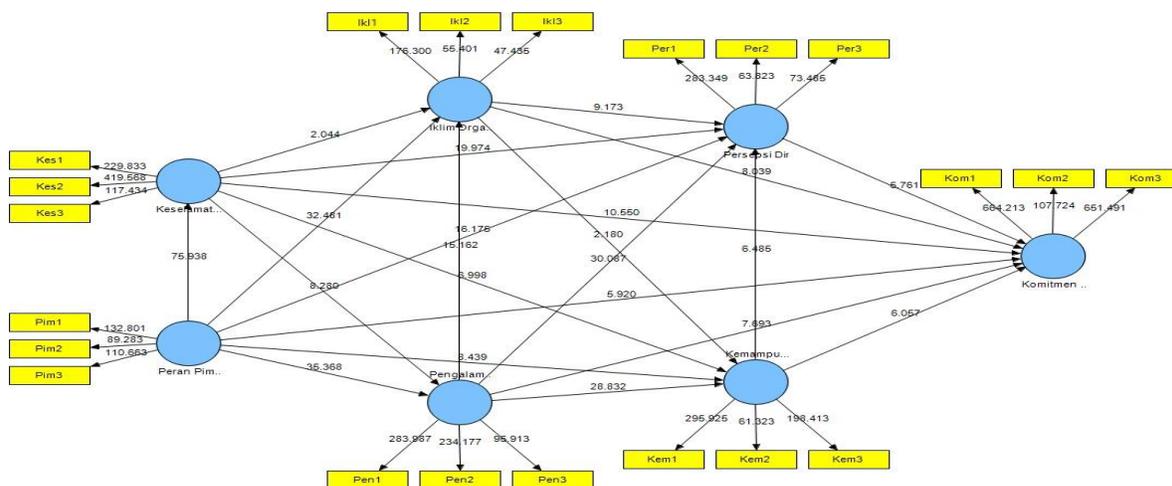


Figure 2. Output PLS (T-Statistik)

Figure 2 shows that the role of leadership has a positive effect on work safety, the test results show that there is a positive effect of 0.872208 and T-Statistics of 75.938388. The role of leadership has a positive effect on work experience, the test results show that there is a positive effect of 0.709518 and T-Statistics of 35.367539. The role of leadership has a positive effect on organizational climate, the test results show that there is a positive influence of 0.612140 and T-Statistics of 32.480709. The role of the leader has a positive effect on work ability, the test results show that there is a positive effect of 0.233064 and T-Statistics of 8.438630. The role of the leader has a positive effect on self-perception, the test results show that there is a positive effect of 0.226333 and the T-Statistics of 16.174697. The role of the leader has a positive effect on work commitment, the test results show that there is a positive effect of 0.198386 and T-Statistics of 5.920006.

Work safety has a positive effect on work experience, the test results show that there is a positive effect of 0.178092 and a T-statistic of 8.279749. Work safety has a positive effect on organizational climate, the test results show that there is a positive effect of 0.041815 and T-Statistics of 2.043718. Work safety has a positive effect on work ability, the test results show that there is a positive effect of 0.187222 and the T-Statistics is 6.997632. Work safety has a positive effect on self-perception, the test results show that there is a positive effect of 0.176882 and T-Statistics of 19.974073. Work safety has a positive effect on work commitment, the test results show that there is a positive effect of 0.220637 and T-Statistics of 10.549662.

Work experience has a positive effect on organizational climate, the test results show that there is a positive effect of 0.290655 and T-Statistics of 15.162353. Work experience has a positive effect on work ability, the test results show that there is a positive effect of 0.452865 and T-Statistics of 28.832409. Work experience has a positive effect on self-perception, the test results show that there is a positive effect of 0.468705 and T-Statistics of 30.087114. Work experience has a positive effect on work commitment, the test results show that there is a positive effect of 0.220099 and T-Statistics of 7.693188.

Organizational climate has a positive effect on work ability, the test results show that there is a positive effect of 0.039671 and T-Statistics of 2.180323. Organizational climate has a positive effect on self-perception, the test results show that there is a positive influence of 0.083191 and T-Statistics of 9.172949. Organizational climate has a positive effect on work commitment, the test results show that there is a positive effect of 0.134739 and T-Statistics of 8.038520. Work ability has a positive effect on self-perception, the test results show that there is a positive effect of 0.049911 and T-Statistics of 6.484911. Work ability has a positive effect on work

commitment, the test results show that there is a positive effect of 0.065713 and T-Statistics of 6.056941. Self-perception has a positive effect on work commitment, the test results show that there is a positive effect of 0.138471 and T-Statistics of 5.760779.

Table 2
Large Percentage of Influence Between Variables on Work Commitment Variables, 2019

Source	LV Correlation	Direct Path	Indirect Path	Total	Direct %	Indirect %	Total %
Leadership Role	0,881	0,198	0,683	0,881	17,49	0,97	18,46
Work safety	0,848	0,221	0,109	0,329	18,70	0,08	18,78
Work experience	0,865	0,220	0,141	0,361	19,03	0,07	19,10
Organizational Climate	0,851	0,135	0,014	0,149	11,47	0,004	11,47
Work ability	0,808	0,066	0,007	0,073	5,31	0,001	5,31
Self Perception	0,880	0,138		0,138	12,18		12,18
	Total				84,18	1,12	85,30

Table 2 states that the role of the leader directly and indirectly affects work commitment. The result of the parameter coefficient test between the role of the leader and work commitment obtained a direct effect of 17.49%, while for the indirect influence between the role of the leader on work commitment through work safety, work experience, organizational climate, work ability and self-perception, the score was 0.97%. Work safety affects directly and indirectly on work commitment. The results of the parameter coefficient test between work safety and work commitment obtained a direct effect of 18.70%, while for the indirect effect between work safety on work commitment through work experience, organizational climate, work ability and self-perception the value was 0.08%.

Work experience has a direct and indirect effect on work commitment. The result of the parameter coefficient test between work experience and work commitment obtained a direct effect of 19.03%, while the indirect effect of work experience on work commitment through organizational climate, work ability and self-perception was obtained with a value of 0.07%. Organizational climate affects directly and indirectly on work commitment. The result of the parameter coefficient test between organizational climate and work commitment obtained a direct effect of 11.47%, while the indirect effect between organizational climate on work commitment through work ability and self-perception was obtained with a value of 0.004%.

The ability to work directly and indirectly affects work commitment. The result of the parameter coefficient test between work ability and work commitment obtained a direct effect of 5.31%, while for the indirect effect of work ability on work commitment through self-perception it was obtained a value of 0.001%. Self-perception has a direct effect on work commitment. The result of the parameter coefficient test between self-perception and work commitment has a direct effect of 12.18%.

The value of each of the direct effects of these independent latent variables, if together shows conformity with the value of R Square, or in other words, it states that the variables of the role of leadership, work safety, work experience, organizational climate, work ability and self-perception are able to explain. work commitment variable is $(17.49\% + 18.70\% + 19.03\% + 11.47\% + 5.31\% + 12.18\% = 84.18\%$. Meanwhile, the indirect influence of the leadership role variable, work safety, work experience, organizational climate and work ability on the work commitment variable is $(0.97\% + 0.08\% + 0.07\% + 0.004\% + 0.001\%) = 1, 12\%$. So the total direct and indirect effect is 85.30%.

IV. DISCUSSION

1. The Influence of the Role of Leaders on Work Commitment

The role of leadership has a positive effect on work commitment, the test results show that there is a positive effect of 0.198386, while the T-Statistics value is 5.920006 and significant at $\alpha = 5\%$, the T-Statistical value is above the critical value (1.96) . The role of the leader has a direct effect on work commitment. The result of the parameter coefficient test between the role of leadership and work commitment has a direct effect of 17.49%.

The results of research conducted by Deddy J, et al. Obtained the results of the calculation of the path coefficient to support the hypothesis because it has a positive and significant effect between Leadership on Work Commitment [9].

Participatory leadership has a significant impact on employee commitment to the organization. These findings indicate that employees who work in hospitals are influenced by the leadership style of the hospital managers. Leadership style can improve employee performance and employee commitment to the organization. The strength of the relationship between leadership style and organizational commitment also tends to vary depending on the employee's position within the hospital.

According to the assumptions of researchers, the level of the role of the leader affects work commitment. After conducting more in-depth interviews, it is known that nurses perceive a good role as a dream which will immediately affect the commitment of employees to continue working in the hospital, nurses expect the hospital to develop their abilities and want to continue to develop in the workplace.

2. Effect of Work Safety on Work Commitment.

Work safety has a positive effect on work commitment, the test results show that there is a positive effect of 0.220637, while the T-Statistics value is 10.549662 and is significant at $\alpha = 5\%$, the T-Statistical value is above the critical value (1.96). Work safety has a direct effect on work commitment. The result of the parameter coefficient test between work safety and work commitment has a direct effect of 18.70%.

The results of research conducted by Deddy J et al. Obtained the results of the calculation of the path coefficient to support the hypothesis because it has a positive and significant effect between Occupational Safety and Health on Work Commitment [9].

Occupational safety and health are important things for the hospital, because the impact of accidents and occupational diseases is not only detrimental to employees, but also to the hospital, either directly or indirectly. Work safety means the process of planning and controlling situations that have the potential to cause work accidents through the preparation of standard operating procedures that become references in work. The active involvement of hospital management is very important for the creation of actions and safe environmental conditions. *Asafety work program* needs to be made by hospital management, as well as having a commitment to run this program for the sake of creating security in the work location.

According to the assumptions of researchers, nurses remain committed because of the high guarantee of work safety, such as; easiness in giving warnings on work equipment, availability of adequate work protection tools, and providing work insurance for nurses. Nurses work in a comfortable working environment, temperature and indoor air ventilation make nurses feel comfortable at work, and hospitals provide insurance and good health services to every nurse.

3. Effect of Work Experience on Work Commitment.

Work experience has a positive effect on work commitment, the test results show that there is a positive effect of 0.220099, while the T-statistic value is 7.693188 and significant at $\alpha = 5\%$, the T-statistic value is above the critical value (1.96). Work experience has a direct effect on work commitment. The result of the parameter coefficient test between work experience and work commitment has a direct effect of 19.03%.

Based on Afrilyan research (2017) work experience variables have a significant effect on organizational commitment. Work experience is that the longer a person works, the better his work ability will be, and the level of mastery of his job will be more fluent [10].

With experience, a person will be able to develop his abilities, so that it is hoped that he will feel at home to stay in the hospital, which in the end there is hope for him to be promoted. Work experience refers to how long a person has worked, how many types of jobs or positions have been carried out, and how many periods of work a person has been in for each of these jobs or positions. An employee who has more work experience will certainly better understand what to do when facing a problem that arises so that the organization will more easily achieve organizational goals because it is supported by employees who are experienced in their respective fields.

According to the researchers' assumptions, nurses are committed to work due to experiences that will be able to develop nurses' abilities, so it is hoped that they will feel at home in staying in the hospital, which in the end there is hope for them to be promoted.

4. Effect of Organizational Climate on Work Commitment Organizational

climate has a positive effect on work commitment, the test results show that there is a positive effect of 0.134739, while the T-Statistics value is 8.038520 and is significant at $\alpha = 5\%$, the T-Statistical value is above the value critical (1.96). Organizational climate has a direct effect on work commitment. The result of the parameter coefficient test between organizational climate and work commitment has a direct effect of 11.47%.

The results of this study are in line with Renaldi's previous research, which showed that the most significant factor contributing to organizational success was organizational climate on nurse commitment with P-value = 0.016; OR = 6,024; 95% CI (2,332-18,121). Climate also has an important function for the hospital. Climate provides orientation to humans regarding how to take action in certain situations.

The factor that affects work commitment is organizational climate. Increased workforce commitment is the responsibility of various parties in the hospital to provide tools, facilities, training and other work infrastructure, to achieve this all the roles of the hospital are needed to increase the enthusiasm of nurses in work where the form of job satisfaction will affect the nurse's work commitment. In itself, the form of nurses' work commitment can be seen from the work ethic displayed by nurses getting better and perceiving it as an obligation of midwives, good caring and discipline, taking the initiative to do so, through the work climate they create.

According to the assumptions of the researcher, one of the nurses is deeply loyal to him because his workplace has a work climate that makes the nurse comfortable at work, so that the nurse will not switch to another agency.

5. Effect of Work Ability on Work Commitment.

Work ability has a positive effect on work commitment, the test results show a positive effect of 0.065713, while the T-statistic value is 6.056941 and significant at $\alpha = 5\%$, the T-statistic value is above the critical value (1.96). Work ability has a direct effect on work commitment. The result of the parameter coefficient test between work ability and work commitment has a direct effect of 5.31%.

Based on Afrilyan (2017) research, the variable of ability has a significant effect on organizational commitment. Ability is the competence of an employee to integrate knowledge, skills and behavior in the process of thinking and acting to complete a task and responsibility properly.

According to the researchers' assumptions, the ability to get a high assessment will have an impact on the emergence of high organizational commitment as well. The ability is needed in every type of work, which determines someone is capable or unable to do the job.

6. Effect of Self-Perception on Work Commitment.

Self-perception has a positive effect on work commitment, the test results show that there is a positive effect of 0.138471, while the T-Statistics value is 5.760779 and is significant at $\alpha = 5\%$, the T-statistic value is above the critical value (1.96). Self-perception has a direct effect on work commitment. The result of the parameter coefficient test between self-perception and work commitment has a direct effect of 12.18%.

The results of this study are supported by research conducted by Dawley et al. (2018) which argues that POS (Perceived Organizational Support) has a very strong relationship to organizational commitment. Perceptions of organizational support have a positive effect on organizational commitment. This is indicated by the perception of employee organizational support so that employees have confidence about its value in organization so that it can contribute to the organization.

According to the researchers' assumptions, high perceptions will increase employee organizational commitment. Perceptions of high organizational support tend to increase employee organizational commitment so that employees feel they have an obligation to contribute and care about the welfare of the organization and assist the organization in achieving its goals.

V. CONCLUSION

The results of this study can be concluded that there is a direct or indirect influence on the role of leadership, work safety, work experience, organizational climate, work ability and self-perception on the work commitment of nurses at the Kesdam Jaya Cijantung Hospital in 2019. The variables that have the greatest influence on work commitment is a variable of work experience. If the work experience is good, it will increase work commitment. With experience, a person will be able to develop his abilities, so that it is hoped that he will feel at home to stay in the hospital, which in the end there is hope for him to be promoted. A nurse who has more work experience will certainly better understand what to do when facing a problem that arises so that the organization will more easily achieve organizational goals because it is supported by nurses who are experienced in their respective fields.

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How is Telemedicine in Health Services in Indonesia during the Covid-19 Pandemic?: Literature Review

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Abstract - Indonesia is one of the countries that have implemented telemedicine. Telemedicine is one of the strategies to prevent the spread of the Covid-19 virus which is applied to health services using electronic communication technology. Telemedicine is a health practice with the use of audio, visual, and data communications, including care, diagnosis, consultation, and treatment as well as medical data exchange and remote scientific discussion. The existence of advantages and disadvantages as well as regulations related to telemedicine in Indonesia is the background of researchers in researching telemedicine in health services in Indonesia to be able to know the description of the use of telemedicine in health services in Indonesia. This research is in the form of a literature review by referring to several journals and scientific articles as secondary data. The results show that the use of telemedicine in Indonesia has a positive impact on health services. However, the implementation of telemedicine in Indonesia still needs improvement, among others, infrastructure distribution, the strength of stakeholders in forming regulations, and the readiness of health workers.

Index Terms - telemedicine, Covid-19, technology

I. INTRODUCTION

Acute respiratory syndrome coronavirus 2 (SARS-CoV2) is the seventh type of coronavirus found in humans. This syndrome was first discovered in Wuhan, Hubei Province, China in December 2019. Since then this virus has spread throughout the world, recorded on 20 May 2020 as many as 4,806,299 people were infected and 318,599 people died (1). On January 30, 2020, the World Health Organization (WHO) declared SARS-CoV2 a Public Health Emergency of International Concern (PHEIC) due to the significant increase in new confirmed cases in various countries (2). In Indonesia, the first positive case was reported on March 2, 2020. Cases of the SARS-CoV2 virus, known as Covid-19, have continued to increase to date (3). This has led to the emergence of a government regulation on Large-Scale Social Restrictions (PSBB) which was first issued in March 2020 and has been re-enacted several times in areas prone to the Covid-19 virus. The impact of this regulation on the health care sector is the emergence of technology-based health services to minimize face-to-face contact and is one of the implementations of physical distancing strategies. (4).

Technology-based health services are considered to be able to overcome the dilemma of the current health care system which needs to maintain the capacity to provide services not only for Covid-19 patients but also for patients suffering from acute illnesses while protecting doctors, nurses, and other health workers from exposure to the Covid-19 virus. (5). Technology-based health services are an innovation in the development of health services throughout the world, including Indonesia, known as E-health (6). E-health services are more commonly known as telemedicine. Indonesia is one of the countries that has implemented telemedicine. Telemedicine is one of the strategies to prevent the spread of the Covid-19 virus which is applied to health services using electronic communication technology. Telemedicine is a health practice with the use of audio, visual, and data communications, including care, diagnosis, consultation, and treatment as well as medical data exchange and remote scientific discussion. Telemedicine consists of several forms, namely online consultation, screening, and chatbot (7).

In the results of the survey on the application of telemedicine, it was found that patients were willing to do telemedicine, but several obstacles were found, namely, patients felt that health services without using telemedicine were services that were easy to access, patients felt more satisfied when meeting face to face with health workers or doctors, patients were not used to it. with telemedicine and cannot use it (8). The advantage of telemedicine is that it is a solution for patients to get health services amid the Covid-19 virus pandemic, besides that telemedicine services are known to be cheap, easy to access and provide comfort to patients. Meanwhile, telemedicine health workers can make services more effective and efficient in terms of monitoring, evaluation, and education (3). In Indonesia, telemedicine services have been introduced since 2012, then to increase the implementation of telemedicine during the pandemic, the medical council issued Regulation Number 74 of 2020 concerning clinical authority and medical practice through telemedicine in Indonesia (9). The existence of advantages and disadvantages as well as regulations related to telemedicine in Indonesia is the

background of researchers in researching telemedicine in health services in Indonesia to be able to know the description of the use of telemedicine in health services in Indonesia.

II. IDENTIFY, RESEARCH, AND COLLECT DATA

The research method used in this research is a systematic study Literature Review reviewed from several journals related to the topic of the application and use of telemedicine in health services. Journals were searched using Google Scholar using the keywords " telemedicine in Indonesia", " telemedicine solutions ", and " telemedicine". Articles are separated according to inclusion criteria, namely articles in Indonesian and English, and published in the period from 2015 to a maximum of 2022, pdf document type, and free of charge. The sources used in carrying out this literature review approach are books, journals, articles, and others. The filtering system in this literature review uses PRISMA flow diagrams.

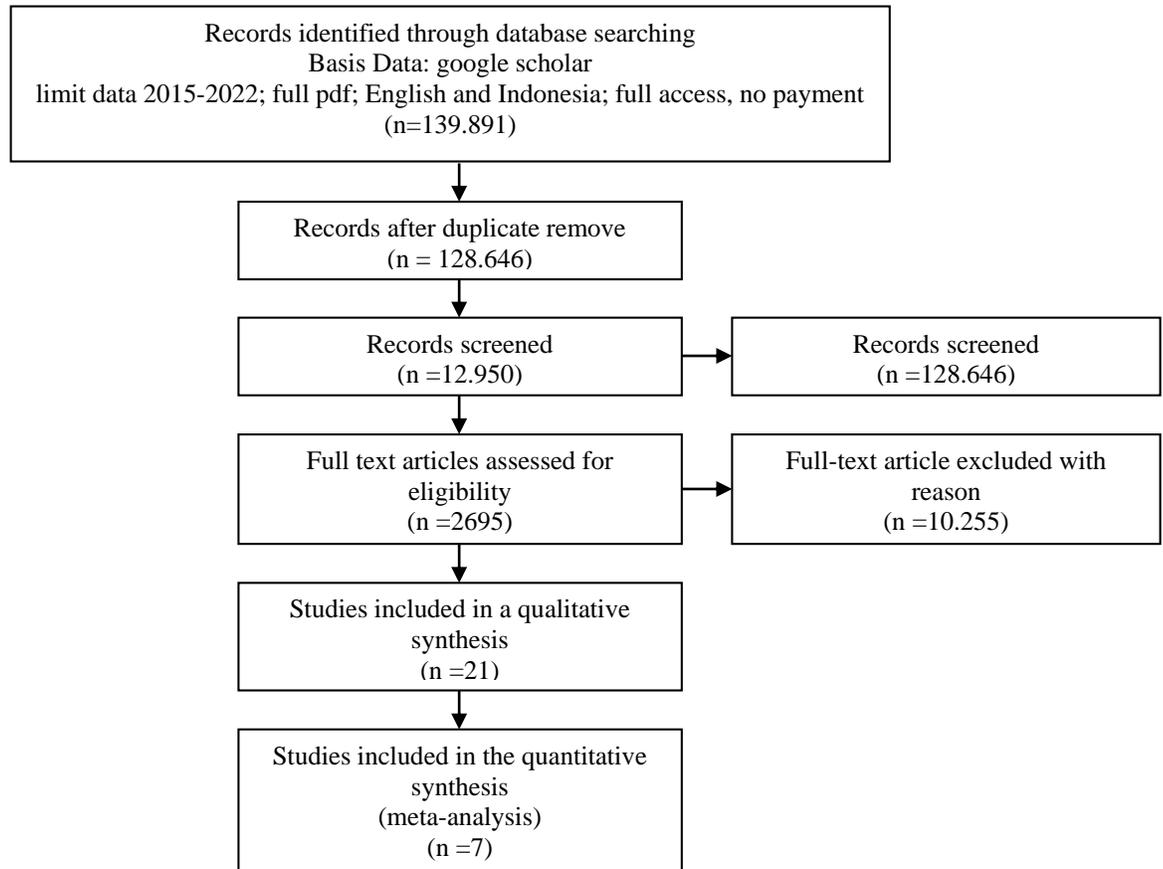


Figure 1. PRISMA Flow Diagram

III. RESULT

In collecting articles about the use of telemedicine in health services in Indonesia during the Covid-19 pandemic, the authors conducted a search using keywords that had been compiled, and after that, a selection was made and 2,695 articles were generated and then re-selected according to meta-analysis obtained 7 articles. . Articles that have been selected, again carried out a descriptive approach by covering the discussion requirements, namely an overview of the use of telemedicine in health services in Indonesia during the Covid-19 pandemic. Based on a literature review conducted on 8 sources from national and international articles, the results can be seen in table 1.

Table 1. Overview of 7 National and International Article Sources

No	Writer	Year	Title	Results
1	Muslimin Machmud, Abdullah Masmuh,	2020	Artificial Intelligence In The Public Health Sector:	It was found that during the restriction of public activities during the Covid-19 pandemic, the Indonesian government

	Cahirudin Nasirin, Salahudin, Tawakkal Baharuddin, Andi Ernie		The Use of Telemedicine In Indonesia During Covid-19	in this case the Ministry of Health made a breakthrough in providing health services to the community while still complying with health protocols through Artificial Intelligence as a medium of information and communication. The government uses this technology through telemedicine services as an application used by health services. The use of telemedicine also affects the prevention and spread of the Covid-19 virus in Indonesia.
2	Carolina Kuntardjo	2020	Dimensions of Ethics and Telemedicine in Indonesia: Enough of Permenkes Number 20 the Year 2019 As a Frame of Telemedicine Practices in Indonesia?	implementation of telemedicine still has many obstacles in terms of ethics and law. The development of telemedicine is not in line with the regulations made. From an ethical point of view, which refers to the bioethical principles of beneficence, non-maleficence, autonomy, and justice, the practice of telemedicine makes it possible to endanger patient safety because doctors do not directly examine patients. The doctor-patient relationship is also fading. On the other hand, this will also endanger the position of doctors who carry out telemedicine because currently there are more and more malpractice demands
3	Rashid Bashshur, Charles R. Doarn, Julio M. Frenk, Joseph C. Kvedar, and James O. Woolliscroft.	2020	Telemedicine and the Covid-19 Pandemic, Lessons for the future	In this study, it was found that the Covid-19 pandemic had a dilemma for health care facilities. Health care facilities are required to provide the best service by maintaining physical distance and contact. The use of telemedicine as a tool to provide health services shows that telemedicine is effectively able to prevent the spread of the Covid-19 virus by maintaining a distance between doctors and patients.
4	Jay Portnoy, Morgan Waller, RN, BSN, and Tania Elliott.	2020	Telemedicine in the Era of Covid-19	In this study, the use of telemedicine still has several obstacles, but telemedicine services are a solution that provides health services during the Covid-19 pandemic. Online resources are used in terms of promoting telemedicine services in health facilities so that people can know more about the benefits and uses of telemedicine services.
5	Muhammad Abdul Kadir	2020	Role of Telemedicine in Healthcare during the COVID-19 Pandemic in the Developing Countries	The COVID-19 pandemic is a public health emergency of concern worldwide. The use of telemedicine services plays an important role in reducing the spread of the virus, providing efficiency in professional health care time, and reducing mental health problems. Many developing countries already have cellular and internet network coverage. Although this is limited in some areas of developing countries, the provision of virtual healthcare/ telemedicine can be applied. However, in general, people in developing countries do not understand telemedicine and its benefits.
6	Adhi Bahtiar, Adis Imam Munandar	2021	Stakeholder analysis on policies for the use of telemedicine in dealing with Covid-19 in Indonesia	The number of actors involved makes the three main actors in the category of definitive stakeholders, namely the Ministry of Health of the Republic of Indonesia, the Covid-19 Handling Task Force, and the Indonesian Medical Council (KKI) become the main determinants of telemedicine policies, both in suppressing the spread of Covid-19 and changing faces. national health service. Its role in formulating, implementing, and managing

				telemedicine implementation, including its training and supervision, will be vital to the future success of the service.
7	Salesika, Rico Januar Sitorus, Rizma Adlia Syakurah	2021	Use of Telemedicine as Information Technology for Alternative Solutions to Prevent the Spread of COVID-19: Literature Review	Telemedicine services during the COVID-19 pandemic are one of the alternative solutions to reach all regions. Telemedicine has a positive impact on public health. Telemedicine is increasingly in demand by users because it can facilitate medical personnel and users who need health services during a pandemic. Telemedicine allows it to be applied in Indonesia to improve the quality of health services.

IV. DISCUSSION

The use of telemedicine by medical personnel and patients can make services effective and efficient, both in monitoring, evaluating, and educating during this pandemic. With a variety of telemedicine methods, patients can report their symptoms and get advice and direction regarding their illness. In foreign countries, telemedicine has been used in handling cases of pulmonary, musculoskeletal, and neurology (3) As an effort to prevent the spread of COVID-19, the government in Indonesia is actively urging the public and medical personnel to use startup results in the form of telemedicine as a remote or online public health service application between hospital and patients. However, in its implementation, several challenges arise such as technological capabilities, data security and patient privacy, laws and regulations, usage guidelines, and individual patient problems themselves. The use of telemedicine in Indonesia is one of the strategic policies to minimize physical contact between doctors and patients to control the spread of the COVID-19 virus. The government in this case is referred to as one of the definitive stakeholders who play a major role in taking steps to make the implementation of telemedicine successful, that stakeholders have great power, authority, and interest to determine various telemedicine parameters, such as services, tariffs, supervision, and the telemedicine business model so that they face the world of health and the government's strategy in suppressing the spread of the COVID-19 virus can be successful and useful. Telemedicine has also been used as a health service solution during the COVID-19 pandemic and is strongly correlated with government and startup calls (4)

Policies on telemedicine contribute to the implementation and implementation of telemedicine in Indonesia. However, the implementation of telemedicine in Indonesia still has many ethical and legal obstacles (10). In Indonesia, the legal basis for implementing telemedicine is as follows:

- Law No. 29 of 2004 concerning Medical Practice
- Law Number 11 of 2008 concerning Information and Electronic Transactions
- Law Number 44 of 2009 concerning Hospitals
- Government Regulation Number 46 of 2014 concerning Health Information Systems
- Government Regulation Number 47 of 2016 concerning Health Service Facilities
- Minister of Health Regulation No. 269 of 2008 concerning Medical Records.
- Minister of Health Regulation Number 2052 of 2011 concerning Practice Permits and Implementation of Medical Practices
- Minister of Health Regulation Number 36 of 2012 concerning Medical Secrets

The development of telemedicine is not in line with the regulations made. From an ethical point of view, which refers to the bioethical principles of beneficence, non-maleficence, autonomy, and justice, the practice of telemedicine makes it possible to endanger patient safety because doctors do not directly examine patients. The doctor-patient relationship is also fading. On the other hand, this will also jeopardize the position of doctors who perform telemedicine because currently there are more and more demands for malpractice. Minister of Health Regulation Number 20 of 2019 concerning the Implementation of Telemedicine among Health Service Facilities is not sufficient as a guideline for implementing telemedicine in Indonesia, because the rules contained in it are not detailed enough (10). The implementation of telemedicine in Indonesia still has several obstacles and obstacles, including (11) :

1. Development of communication infrastructure, especially the internet network, which has not been evenly distributed in Indonesia, especially in remote areas.
2. Availability of hardware and software, which is still expensive.
3. Human resources, both in terms of quality and quantity.
4. The technological gap between urban and remote areas.
5. Inadequate regulations to regulate the use of digital formats.
6. Authentication, privacy, and data security cannot be fully guaranteed while improving data security systems will increase costs.
7. Service financing system for telemedicine service providers.
8. It is feared that the accuracy of the data sent is not of good enough quality so that it affects the process of diagnosis and therapy
9. The doctor-patient relationship as well as between health workers that is not carried out directly will reduce the quality of the relationship.

Telemedicine technology is theoretically useful for equitable distribution of health services in all regions, especially in Indonesia. However, it takes a good infrastructure aspect to implement it. The first aspect is telecommunication network connectivity and the second is the availability of equipment to access telemedicine evenly throughout the region. This is because Indonesia is a vast country and there are still many remote areas that do not have internet access (12). Following Nasution's research, (13) the geographical condition of an area is a challenge in itself to reach its connectivity where the transmission of the COVID-19 Virus is not only exposed to urban areas but also rural areas. Therefore the range of internet connectivity must reach rural areas. The use of web services must also be improved because this system is very supportive of telemedicine applications in processing medical images.

During the Covid-19 pandemic, visits to health care facilities will increase the risk of transmitting the Covid-19 virus to patients who are not infected with the Covid-19 virus. This is because the symptoms of Covid-19 vary. Many of the Covid-19 sufferers are asymptomatic, mildly symptomatic, asymptomatic, and pre-symptomatic. Accurate Covid-19 testing tools are needed as well as health service solutions that can minimize the prevention of the Covid-19 virus (14). The use of telemedicine is a solution related to health services that minimize the prevention of the Covid-19 virus and is one of the efforts to implement physical distancing. This is supported by the role of the Indonesian government in implementing telemedicine in Indonesian health care facilities. These stakeholders include the Ministry of Health of the Republic of Indonesia, the Covid-19 Handling Task Force, and the Indonesian Medical Council (KKI) which are the main determinants of telemedicine policies, both in suppressing the spread of Covid-19 and changing the face of national health services (4).

In one of the hospitals in Indonesia that implement telemedicine, several factors influence the use of telemedicine such as cultural/traditional factors, educational background, and family. So in the short term, it still takes time to be able to implement the system because some people still choose to consult with doctors face-to-face. But in the long run, these 7 telemedicine systems will be accepted by many people because they have many uses and benefits that can be obtained (15). This is inseparable from the diversity of culture, ethnicity, language, and geographical conditions of the Indonesian state (16).

In the field of Research and Innovation, BPJS Kesehatan wrote that the use of telemedicine services became the National Health Insurance Scheme (JKN). Telemedicine is used for patients referred back (PRB) and pregnancy can be included as a form of health service in the JKN scheme. The costs and payment schemes being piloted are very important enablers to support telemedicine services that are compliant with WHO recommendations (17). To support all of this, it is necessary to prepare Health Workers in managing telemedicine itself. Education and training are needed to use information and communication technology in these fields. The use of telemedicine in Indonesia requires readiness from all aspects, one of which is infrastructure. Indonesia as a developing country is not yet ready with the infrastructure to link information between organizations that are one of the supporters of telemedicine implementation. The readiness of health workers in Padang, Indonesia is still below the average with the highest mean of only 0.35 in the societal readiness dimension, which is one of the measurement dimensions used to see readiness related to the socio-cultural of the Indonesian people (18).

CONCLUSION

The application of telemedicine in Indonesia is a solution for health services in Indonesia, especially in the face of the Covid-19 pandemic. Through the use of telemedicine, health services are increasingly effective and make it easier for people to access health services without having to go to a hospital or clinic. However, on the one hand, the use of telemedicine in Indonesia still has several obstacles, including related to regulations that have not fully accommodated the application of telemedicine, preventing doctors/health workers from taking malpractice actions, protecting patient privacy and the costs of telemedicine services that have not been detailed. In addition, the diversity of culture, language, ethnicity, and geographical location of the Indonesian state is also a challenge in the use of telemedicine. People, especially in rural areas, are not familiar with telemedicine, its benefits, and how to use it. This of course cannot be separated from the role of infrastructure in several regions in Indonesia which has not been evenly distributed and the level of education of the Indonesian people. The role of health workers and the readiness of health workers are also the main focus of the implementation of telemedicine in Indonesia. Education and training of health workers in the use of telemedicine need to be improved and pursued so that telemedicine services can become solutive and effective services.

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Activities in The Certificate of Occupancy Process That Often Experience Delays In Jakarta City, Indonesia

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Abstract- Certificate Of Occupancy of Buildings, hereinafter referred to as CO, is a document issued by a local government agency or building department that certifies the building's compliance with applicable building codes and other laws, and shows that the building is in a suitable condition for occupancy. The issuance of CO by the Regional Government after the building is completed in fact takes a long time to process CO. The purpose of this study is to identify CO process activities in high-rise buildings in the city of Jakarta, Indonesia which often experience delays. The research method is quantitative using survey data from experts in the CO process. The results of this study are a list of CO process activities in high-rise buildings in the city of Jakarta, Indonesia which often experience delays.

Index Terms- certificate of occupancy, the city of Jakarta, Indonesia, delay, certificate of occupancy process activities

I. INTRODUCTION

Based on the Presidential Regulation of the Republic of Indonesia number 91 of 2017 concerning the acceleration of business implementation, that the development of the number, distribution, scale, and efficiency of business activities are the main determinants of economic growth, job creation, poverty reduction and inequality between regions and between income groups. Whereas business licenses issued by ministries/agencies and local governments to start, implement and develop business activities need to be reorganized so that they become supporters and not vice versa become obstacles to the development of business activities. That in order to speed up and facilitate services for business, it is necessary to apply the use of information technology through an Electronically Integrated Business Licensing System (Online Single Submission). The high demand for "ease of doing business" globally calls for some policies, which impede the processing of relevant transactions like the issuance of building permit, to be acted upon by the government (Challiz De Lima et al., 2018). Based on the Law of the Republic of Indonesia number 11 of 2020 concerning Job Creation Article 24 Amendment to Law Number 28 of 2002 concerning Buildings Article 37 Paragraph 1, the use of buildings is carried out by the owner and/or user of the

building after the building has obtained a certificate of occupancy (CO).

The Certificate of Occupancy (CO) corresponds to a certificate or approving resolution issued by the building department that certifies that the work carried out is true to the building permit granted and therefore has faithfully complied with the law, applicable building codes, as well as the General and Local Ordinances, the certificate allows the construction or building to be inhabited or used as was previously determined (Andrés Covarrubias, Claudio Mourgues & Paz Arroyo 2016).

Based on Jakarta Capital Special Region (DKI Jakarta) Governor Regulation number 129 of 2012, the completion time for a CO for buildings with more than 8 floors is 30 working days or the equivalent of 42 calendar days. Meanwhile, based on data from the DKI Jakarta Department of Investment and One Stop Integrated Services (DPMPTSP) in 2018 & 2019, the CO issued is with the following distribution :

Table 1.1 CO Data Published in 2018 and 2019

Year	Number of CO	CO Completion Time					
		<42 days	%	>42 days & <365 days	%	>365 days	%
2019	134	27	20.15%	60	44.78%	34	25.37%
2018	121	20	16.53%	71	58.68%	43	35.54%

Source : DPMPTSP of DKI Jakarta

It can be seen from Table 1.1 that the completion of the CO process in accordance with DKI Jakarta Governor Regulation number 129 of 2012 is only 20.15% (2019) and 16.53% (2018). The completion time of the CO process is still not in accordance with DKI Jakarta Governor Regulation number 129 of 2012. This is certainly a poor performance in public services related to licensing and shows that it is not easy to get CO on time.

II. CO PROCESS IN JAKARTA, INDONESIA

Departing from the problem of CO which often experiences delays, the formulation of the problem in this research is what activities in the CO process often experience delays and are critical activities?

Based on the Law of the Republic of Indonesia Number 11 of 2020 concerning Job Creation Article 24 Amendment to Law Number 28 of 2002 concerning Buildings Article 37:

- a. Paragraph 1: Utilization of the building is carried out by the owner and/or user of the building after the building has obtained a certificate of occupancy.
- b. Paragraph 2: The certificate of occupancy as referred to in paragraph (1) is issued by the Central Government or Regional Government in accordance with their respective authorities based on a statement of function feasibility submitted by the construction management or supervision service provider to the Central Government or Regional Government in accordance with their respective authorities through an electronic system administered by the Central Government, based on the norms, standards, procedures, and criteria set by the Central Government.
- c. Paragraph 3: The statement of function feasibility as referred to in paragraph (2) is issued after the final inspection stage as referred to in Article 36B paragraph (4) letter d which states that the building meets the technical standards of the building.

The sequence of the building construction process from planning to building use in the city of Jakarta, Indonesia is illustrated in Figure 2.1. The CO process is carried out after the construction has been completed or the building has been completed. After the CO is issued by the local government, the building is feasible and legally valid to be used by the building owner.

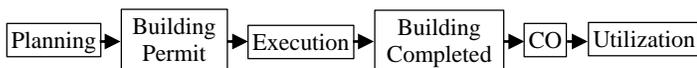


Figure 2.1 The Sequence Of The Building Construction Process
Source : Law of the Republic of Indonesia number 28 of 2002

The CO process begins with the building owner submits an application for CO by completing the CO requirement documents. The CO application document is one of the CO requirements based on DKI Jakarta Governor Regulation number 147 of 2018 which must be completed by the building owner. Then the document is verified by a technical officer assessing the CO process who is an employee of the DKI Jakarta Provincial Government. After the document is verified completely, then verification of the suitability of the document is carried out with the condition of the building on site by conducting on site inspection. If the document is in accordance with the building conditions on site, then the document is evaluated for conformity with the building permit (IMB) or technical standards and building codes. On site verification and evaluation is based on the Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number 27/PRT/M/2018. If there is a change in the building relative to the IMB, the building owner is required to pay a retribution and a fine precedes the IMB. After the building is declared to have complied with technical standards and building codes and has paid the retribution and fines precedes the IMB, the CO can be issued. The CO process is illustrated in Figure 2.2 as follows:

No.	1	2	3	4	5	6
Process	CO Application	Verification of CO Application Documents	On Site Verification and Evaluation	Retribution and Fines Process	CO Issuance	The Applicant Receives CO
Duration (days)		6	25	14	3	
CO Flow Chart						

Figure 2.2 CO Process

Source : CO Standar Operating Procedure DPMPSTP DKI Jakarta

From the explanation of the CO process activities above, then the verification of CO application documents, field verification, evaluation of CO application document data after field verification, the IMB retribution process and fines precedes the IMB and the CO issuance process is made more detailed. The results of the breakdown of the CO process activities are arranged in table 2.1 below:

Table 2.1 CO Process Activities

No.	CO Process Activities
1	Application of a CO application by a CO applicant
2	Verification of CO requirements documents
2.1	CO applicant data verification
2.2	Verification of land ownership data
2.3	Verification of building planning (PBG) / Building Permits (IMB) documents and attachment
2.4	Verification of City Plan Description (KRK) document
2.5	Verification of Building Layout Plan (RTLb) / Architectural Planning Drawings (GPA) documents
2.6	Verification of Space Utilization Principle Permit (IPPR) document
2.7	Verification of the original legalization of the Building Technical Experts Permit (IPTB)
2.8	Verify building name data
2.9	Verification of building function and/or usage data
2.10	Verification of the statement letter of the supervisory board coordinator for the CO application
2.11	Verification of the statement letter of willingness to build rainwater infiltration wells
2.12	Verification of supervisory board report
2.13	Verification of the as-built architectural drawing
2.14	Verification of the as-built structural drawing
2.15	Verification of the as-built mechanical, electrical and piping drawing
2.16	Verification of basement area data
2.17	Verification of the number of basement floors data
2.18	Verification of the building's ground floor area
2.19	Verification of the number of building floors data
2.20	Verification of Verifikasi the total building floor area data
2.21	Verification of building height data
2.22	Verification of building position data
2.23	Verification of the rainwater infiltration wells photo and the buildings views photos
2.24	Verification of fire safety recommendation data
2.25	Verification of lightning distribution installations inspections data by departement of labor and transmigration DKI Jakarta
2.26	Verification of lightning distribution installations periodic test data by departement of labor and transmigration DKI Jakarta
2.27	Verification of elevator installations inspections data by

No.	CO Process Activities
	departement of labor and transmigrasi DKI Jakarta
2.28	Verification of elevator installations periodic test data by departement of labor and transmigrasi DKI Jakarta
2.29	Verification of electrical work safety and health installations inspections data by departement of labor and transmigrasi DKI Jakarta
2.30	Verification of electrical work safety and health installations periodic test data by departement of labor and transmigrasi DKI Jakarta
2.31	Verification of using pressure vessels installations inspections data by departement of labor and transmigrasi DKI Jakarta
2.32	Verification of using pressure vessels installations periodic test data by departement of labor and transmigrasi DKI Jakarta
2.33	Verification of lifting and conveying equipment installations inspections data by departement of labor and transmigrasi DKI Jakarta
2.34	Verification of lifting and conveying equipment installations periodic test data by departement of labor and transmigrasi DKI Jakarta
2.35	Verification of steam boiler equipment installations inspections data by departement of labor and transmigrasi DKI Jakarta
2.36	Verification of steam boiler equipment installations periodic test data by departement of labor and transmigrasi DKI Jakarta
2.37	Verification of production and electric power equipment installations inspections data by departement of labor and transmigrasi DKI Jakarta
2.38	Verification of production and electric power equipment installations periodic test data by departement of labor and transmigrasi DKI Jakarta
3	Verification of CO requirement documents on site
3.1	Application of on site data verification
3.2	Approval of on site data verification
3.3	On site data verification : building function
3.4	On site data verification : use of space in buildings
3.5	On site data verification : utilization of space outside the building
3.6	On site data verification : the area of the ground floor of the building
3.7	On site data verification : basement area
3.8	On site data verification : total floor area of the building
3.9	On site data verification : the number of floors of the building
3.10	On site data verification : number of basement floors
3.11	On site data verification : building height
3.12	On site data verification : green area in parcels
3.13	On site data verification : building boundary distance
3.14	On site data verification : the distance from the building to the land boundary
3.15	On site data verification : distance between buildings
3.16	On site data verification : appearance of the building
3.17	On site data verification : layout in the building
3.18	On site data verification : balance, harmony and suitability with the environment
3.19	On site data verification : building structure system
3.20	On site data verification : fire hazard protection system
3.21	On site data verification : lightning protection system
3.22	On site data verification : electrical installation system
3.23	On site data verification : ventilation system
3.24	On site data verification : lighting system
3.28	On site data verification : rainwater management system
3.29	On site data verification : use of building materials
3.30	On site data verification : space for movement in buildings
3.33	On site data verification : vibration and noise conditions in buildings

No.	CO Process Activities
3.34	On site data verification : means of horizontal connection between spaces / between buildings
3.35	On site data verification : means of vertical connection between floors
3.36	On site data verification : completeness of infrastructure and facilities for building utilization
4	Evaluation of CO requirement documents against PBG/IMB and/or technical standards and building code
4.1	Improvement of the conformity of the CO requirements document in accordance with the conditions on site
4.2	Evaluation : building function
4.3	Evaluation : use of space in buildings
4.4	Evaluation : utilization of space outside the building
4.5	Evaluation : the area of the ground floor of the building
4.6	Evaluation : basement area
4.7	Evaluation : total floor area of the building
4.8	Evaluation : the number of floors of the building
4.9	Evaluation : number of basement floors
4.10	Evaluation : building height
4.11	Evaluation : green area in parcels
4.12	Evaluation : building boundary distance
4.13	Evaluation : the distance from the building to the land boundary
4.14	Evaluation : distance between buildings
4.15	Evaluation : appearance of the building
4.16	Evaluation : layout in the building
4.17	Evaluation : balance, harmony and suitability with the environment
4.18	Evaluation : building structure system
4.19	Evaluation : fire hazard protection system
4.20	Evaluation : lightning protection system
4.21	Evaluation : electrical installation system
4.22	Evaluation : ventilation system
4.23	Evaluation : lighting system
4.27	Evaluation : rainwater management system
4.28	Evaluation : use of building materials
4.29	Evaluation : space for movement in buildings
4.32	Evaluation : vibration and noise conditions in buildings
4.33	Evaluation : means of horizontal connection between spaces / between buildings
4.34	Evaluation : means of vertical connection between floors
4.35	Evaluation : completeness of infrastructure and facilities for building utilization
4.36	Improvement of building conformity to PBG/IMB and/or technical standards and building code
4.37	Technical approval of building conformity to PBG/IMB and/or technical standards and building code
5	The process of retribution and fines precedes permits for buildings non-compliance with IMB/PBG
5.1	Calculation of retribution and fines precedes permits
5.2	Approval for calculating levies and fines precedes permits
5.3	Issuance of retribution and fines precedes permits
5.4	Payment of retribution and fines precedes permits
6	CO issuance
6.1	CO printing
6.2	CO approval
6.3	CO issuance

III. RESEARCH METHODOLOGY

The policy analysis was constructed as a comprehensive review of the complete relevant policy framework from the provincial (or state) to the municipal level. The purpose of the policy

analysis was to understand the process of obtaining CO and eventually identify CO process activities. Another key component of this research is a survey to get validation from experts on the CO process activities in table 2.1 which often experience delays. The experts involved in the validation of activities in the CO process which often experience delays are as many as 5 people. Here are the expert data involved in the validation :

Table 3.1 Validation Expert Profile

No.	Expert Code	Gender	Last Education	Company	Position	Work Experience
1	P1	Man	Master	DKI Jakarta Provincial Government	Head of Service Division I DPMPSTP DKI Jakarta	22 years
2	P2	Man	Bachelor	Sanggrah Power Limited Company	Building Permit Consultant	21 years
3	P3	Woman	Master	DKI Jakarta Provincial Government	Head of Section for Building Execution Supervision of DKI Jakarta	13 years
4	P4	Man	Master	DKI Jakarta Provincial Government	Head of Service Section IB of DKI Jakarta DPMPSTP	12 years
5	P5	Woman	Bachelor	Agung Podomoro Land Limited Company	Legal Officer	11 years

The following figure 3.1 is a flow chart in the research process.

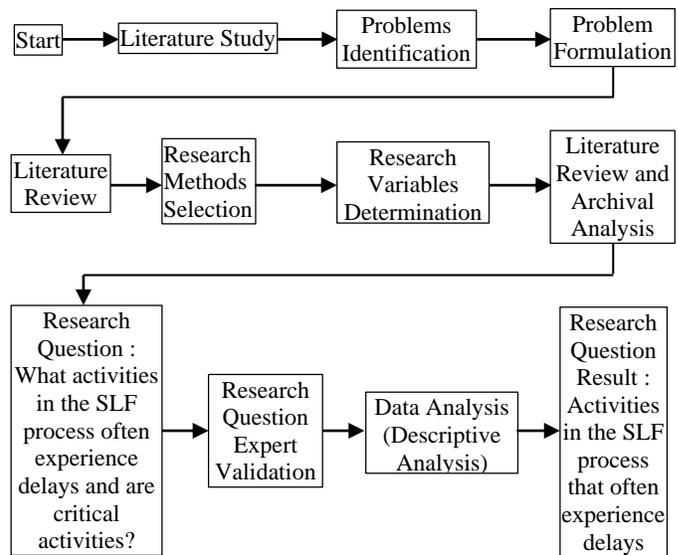


Figure 2.2 Research Process

IV. SURVEY RESULTS

From the survey, the activities in the CO process that often experience delays are shown in table 3.2 as follows :

Table 4.1 CO Processing Activities That Often Experience Delays

No.	CO Process Activities That Often Experience Delays
2.12	Verification of supervisory board report
2.13	Verification of the as-built architectural drawing
2.14	Verification of the as-built structural drawing
2.15	Verification of the as-built mechanical, electrical and piping drawing
2.16	Verification of basement area data
2.18	Verification of the building's ground floor area
2.20	Verification of Verifikasi the total building floor area data
4	Evaluation of CO requirement documents against PBG/IMB and/or technical standards and building code
4.1	Improvement of the conformity of the CO requirements document in accordance with the conditions on site
4.2	Evaluation : building function
4.3	Evaluation : use of space in buildings
4.4	Evaluation : utilization of space outside the building
4.5	Evaluation : the area of the ground floor of the building
4.6	Evaluation : basement area
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4.33	Evaluation : means of horizontal connection between spaces / between buildings
4.34	Evaluation : means of vertical connection between floors
4.35	Evaluation : completeness of infrastructure and facilities for building utilization
4.36	Improvement of building conformity to PBG/IMB and/or technical standards and building code
4.37	Technical approval of building conformity to PBG/IMB and/or technical standards and building code
5	The process of retribution and fines precedes permits for buildings non-compliance with IMB/PBG
5.1	Calculation of retribution and fines precedes permits
5.4	Payment of retribution and fines precedes permits

V. CONCLUSION

The conclusions of this study are as follows:

1. CO process activities that often experience delays are part of the verification of CO requirement documents, all evaluations of CO requirement documents for PBG/IMB and/or technical standards and building code and retribution and fines process

activities precede permits for buildings non-compliance with IMB/PBG.

2. From the results of this study, it can be continued with research on the causes of the CO process activities that often experience delays and solutions to these problems

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Nature Of Religious Groups' Engagement In Preventing Youth Radicalization In Mombasa County, Kenya

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Abstract- The world is increasingly faced with a threat of extreme violence which is preceded by radicalization processes. In Kenya there has been rapid growth of radicalization in the last two decades. In Mombasa, radicalization of youth has spread given the existing strong structural foundations. The objective of this study was to examine the nature of religious groups' engagement in preventing youth radicalization in Mombasa County, Kenya. The study adopted a conceptual framework informed by Relative Deprivation and Functionalism theories. A descriptive research design entailing mixed methods focusing on qualitative and quantitative research approach was used. The study was carried out in 3 constituencies of Mombasa County namely; Likoni, Kisauni and Mvita. The study population comprised of radicalized, de-radicalized and non-radicalized youth, police, chiefs and County commissioner, media personalities, civil society organizations representatives, village elders and religious groups. The sample size was 228 respondents comprising 100 non-radicalized youth, 10 religious groups, 42 village elders, sampled using simple random method and 50 de-radicalized youth and 3 radicalized youth sampled using snowballing. Finally, purposive sampling technique was used to get 6 chiefs, 3 parents of the radicalized youths, 3 anti-terror police officers, 1 County commissioner, 5 media personalities and 5 Civil Society Organizations representatives. Data was collected by both structured and unstructured questionnaire, Key informant interviews and Focus group discussions. Quantitative and qualitative analysis methods were used to analyze data. Quantitative analysis was used for closed ended items in the questionnaire; using the Statistical Package for Social Scientists (SPSS) version 28.0. Qualitative data analysis included responses to open ended questions in the focus group discussions and interview schedules. Analysis was done using the content and interpretive analysis technique. The relevant data was organized according to themes of the study objectives. The presentation of data was done through tables, figures and verbatim quotations. The study established that the nature of religious groups' engagement in prevention of youth radicalization in Mombasa County is multi-faceted. However, for it to be effective, it must recognize the public and community as stakeholders and partners in preventing youth radicalization. The finding of the study is significant in informing policy formulation and contribution to existing academic knowledge. The study recommended that

religious groups should adopt a multi-stakeholder approach in developing strategies aimed at preventing youth radicalization.

Index Terms- Radicalization, Religious Groups, Youth

I. INTRODUCTION

Religion is an influential part of cultural norms and values, intensely implicated in people and social notion of peace, since it tackles some of the most intense existential concerns of human life for example right/wrong, freedom/ inevitability, sacred/profane and fear/security (Gopin, 2000). Basically, religious institutions exert a lot of influence which can be used for peacemaking, reconciliation or prevention of vices.

From a global perspective, religious institutions have played a vital role towards pursuit of peace and social justice. The past few decades have seen increasing recognition of the significant role religious actor's play in peace and conflict. In a world in which the vast majority of people identify as religious, the religious peace-building field has evolved to consider ways in which people of faith can, should, and do have an impact on conflict, as both preventers and instigators (The Global Religious Landscape, 2012).

It is important to take cognizance of the fact that governments are increasingly considering the role of religion in various components of radicalization and in varying degrees and levels of effectiveness, recognizing that the religious sector can have positive roles in radicalization, especially on a local level (Mandaville & Nozell, 2017).

In Africa, the involvement of religious organizations in the fight for justice, humanitarian assistance and peacemaking has been prominent (Mawere & Marongwe, 2016).

In Kenya, the role religious groups and leaders in preventing radicalization cannot be underestimated. This is because radicalization in Kenya has religious aspects to it and that terror groups have had a degree of intentions to divide the country along religious lines and cause religious conflict. The attack at Garissa University saw the religious leaders coming together to condemn the attack, while demystifying the conflict between Muslims and Christians (Nzwili, 2015).

II. METHODOLOGY

Research Design

The study adopted a descriptive survey research design which was used to describe the effectiveness of religious groups' engagement in prevention of youth radicalization. Descriptive research designs are procedures in quantitative research in which questionnaires are administered to a small group of people (sample size) to identify trends in attitude, opinions, behaviors or characteristics of a large group of people called population (Creswell, 2008).

This design was preferred in this study because besides collecting and describing the relevant data for the study, it allowed the researcher to collect original information relating to the respondents experiences on religious groups' engagement to prevention of radicalization from the field using questionnaire and interview schedule and focus group discussion. The research design further provided the necessary detail and depth of data analysis to make findings relevant to practice.

Study Area

The study was carried out in Mombasa County. Mombasa was selected mainly because it has been the hub of terrorist activities in Kenya. The County situated at Kenyan Coast is one of the five counties that border the Indian Ocean and enjoys 65 Km² of the waters. It is the smallest County in the Country covering an area of 229.7 Km² with a population of 1,208,333. (Kenya National Bureau of Statistics, 2019). It is divided into six Sub Counties, namely: Mvita, Jomvu, Changamwe, Kisauni, Nyali and Likoni which are further divided into twenty locations and thirty-five sub-locations. Politically the sub-counties also form six constituencies which have been further sub-divided into thirty electoral wards. The study focused on Likoni, Kisauni and Mvita constituencies which consist of 5, 7 and 5 wards, respectively.

Study Population

According to Babbie, (2013) a population can be defined as the complete group of objects or elements relevant to a particular research project because they possess the information the research project is designed to collect and analyze. The study focused on 3 Sub-counties of Likoni, Kisauni and Mvita which have a total population of 696,459. Mvita boasts of a population of 154,171 while Likoni has 250,358 and Kisauni 291,930 (Kenya National Bureau of Statistics, 2019).

According to Lavrakas (2008), the target population should comprise an entire set of units of equally surveyable potentials and for which the survey data are used to make inferences. The population of Mombasa County is made up of a cross section of groups of people. However, the study was limited to the following categories; 188,093 youths which consisted of radicalized, non-radicalized and de-radicalized youths mostly targets and victims of acts of radicalization as well as the residents who are perceived to have been deradicalized, parents of the radicalized youths, 1 County commissioner, 19 chiefs, 426 village elders (County Commissioner's Office, Mombasa County, 2017), 3 Sub County anti-terror police unit (ATPU) officers, 35 media institutions and 55 civil society organizations, 35 religious groups from Christian and Muslim faiths.

Sampling Strategy and Sample Size Determination

Sampling is the process of selecting a number of individuals for a study to represent the larger group from which they are selected. In this study, purposive sampling technique was used in the selection of the 3 Sub Counties of Mvita, Kisauni and Likoni on the basis of prominence to radicalization activities. This was done to ensure that there is high probability of respondents having the required information for the study.

Mombasa county has a total youth population of 188,093 (Kenya National Bureau of Statistics, 2019). In this regard therefore the target population for the non-radicalized and deradicalized youth was more than 10000. The desired sample population was determined using Fishers formula for sample size determination (Fisher *et al.* as cited in Mugenda & Mugenda, 2010). The sample size was 384.

Simple random sampling technique was used to select 100 non-radicalized youths from across the 3 Sub Counties. The snowballing technique was used to sample 50 deradicalized and 3 radicalized youths. Snowballing was used given the security sensitivity of the topic of radicalization and with the fear that deradicalized individuals may suffer stigma, it was predicted that a good number of the target population would be reluctant to provide information for fear of being targeted. The researcher therefore adopted the snowball sampling technique to mitigate this challenge hence sample an initial small group of respondents and then the sampled participants propose additional possible respondents from their networks. The process continues until the level of saturation where there is no new information and the researcher is satisfied with the data collected. Basically, the snowball sampling enabled the researcher to access in-depth stories and key data from the respondents.

Simple random sampling technique was also used to select the final respondents for the study for the 10 religious groups. 42 village elders were also selected randomly from the villages that form the selected locations. The village elders were involved since they live in the study area and are conversant with the study topic. Finally, purposive sampling technique was used to select 3 anti-terror police unit officers from the 3 sub counties. The officers were selected because they are directly involved in the mitigation and investigation of radicalization and terror related cases. Purposive sampling technique was also used to select 5 civil society organization representatives, 5 media personalities, 1 county commissioner and 6 chiefs and 3 parents of the radicalized youth.

Data Collection

The research involved 2 types of data collection methods, primary and secondary data. In this study, 3 different tools were used for primary data collection; a questionnaire was administered to the non-radicalized and the deradicalized youths; an interview schedule was also used to collect data from the radicalized youth and their parents. Key Informant Interview was used to collect data from the Anti-terror police officers, chiefs, and civil society organization heads. Finally, the focus group discussion was used to collect data from the village elders and religious groups. This triangulation enabled the researcher to obtain a variety of information on nature and effectiveness of religious groups' engagement in prevention of youth radicalization in Mombasa

County. Secondary data was also reviewed as per the study objectives.

The study sought to find out if religious groups are involved in countering of digital propaganda. The findings are presented in Figure 1.

Data Presentation and Discussion
Countering Online Digital Propaganda

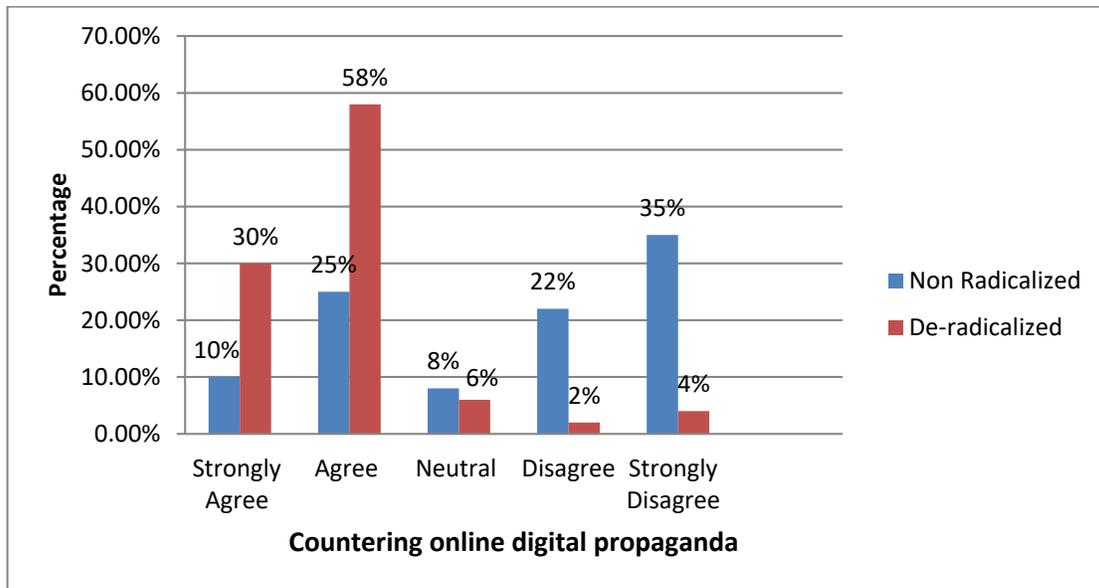


Fig 1: Countering Online Digital Propaganda
Source: Field Data, 2021.

Results in Figure 1 show that majority of the non-radicalized youth accounting for 35(35%) strongly disagreed and 22(22%) disagreed with the statement that religious groups’ counter online digital propaganda while 10 (10%) strongly agreed, 25(25%) agreed, and 8(8%) were neutral. On the contrary, majority of the de-radicalized youth accounting for 15(30%) strongly agreed and 29(58%) agreed that religious groups counter online digital propaganda, while 2(4%) strongly disagreed, 1(2%) disagreed and 3(6%) were neutral respectively. The radicalized youth affirmed that religious groups counter online digital propaganda and were quick to point out that more work needs to be done on this line.

Results from this study point to a mixture of reaction between the non-radicalized, radicalized and de-radicalized youth in Mombasa County on the role of religious groups in countering online digital propaganda to prevent radicalization. The non-radicalized youth reported that the religious groups do not counter online propaganda to prevent radicalization.

This finding resonates with that of one local administrator who reported that:

Religious groups may not be abreast with the technological changes thereby engaging the youth in countering online propaganda becoming a challenge for them. (KII with chief on 26/2/2021 at Likoni)

On the contrary, the de-radicalized and radicalized youth reported that the religious groups actively counter online propaganda to prevent radicalization.

In Kenya, the Council of Imams and Preachers of Kenya (CIPK) are engaged in designing counter narratives against

extremist content and empowering online actors to be vigilant (Ali, 2008)

Media Campaigns

The study sought to find out the impact of media campaigns by religious groups in preventing youth radicalization. The findings are presented in Table 1.

Table 1: Media Campaigns

Response	Non radicalized		De-radicalized	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Strongly Agree	60	60.0	18	36.0
Agree	31	31.0	18	36.0
Neutral	2	2.0	8	16.0
Disagree	4	4.0	4	8.0
Strongly Disagree	3	3.0	2	4.0
Total	100	100	50	100

Source: Field Data, 2021

Data in Table 1 show that most of the non-radicalized youth accounting for 60(60%) strongly agreed, 31(31%) agreed that religious groups using vernacular radio stations, TVs and other sources can dissuade youths from joining terror organizations while 4(4%) disagreed, 3(3%) strongly disagreed and only 2(2%) were neutral. On the other hand, majority of the de-radicalized youth accounting for 18(36%) strongly agreed and

the same number agreed respectively that religious groups using vernacular radio stations, TVs and other sources can dissuade youths from joining terror organizations while 4(8%) disagreed while 2(4%) strongly disagreed and 8(16%) were neutral. The radicalized youth confirmed that religious groups are involved in media campaigns to prevent youth radicalization. One of them shared his experience;-

Religious groups are constantly involved in media campaigns against radicalization. They mostly organize talks and other shows on radio Salam. This radio station is friendly to the religious groups and the station is also keen on prevention of radicalization programs (Interview with a radicalized youth on 12/11/2021).

Media personalities who gave views during the interview did confirm that print, radio and other media sources including booklets and bulletins exist. There is existence of partnerships between religious groups and the media. According to one of the interviewees:

The media especially radio carries out sensitization programs through debates involving panelists, seminars and radio talk shows. (KII with a media personality on 18/2/2021 at Mvita). This finding is in tandem with that of Badurdeen & Goldsmith (2018) who reported that the role of the media is vital in building bridges between and within different communities, in reducing the appeal for radicalization and violent extremist ideologies, and facilitating constructive discussions mitigating youth radicalization and recruitment.

The finding also corroborates that of Patterson (2015: 22) who aptly notes that in Kenya radical jihadist ideology has been increasingly disseminated through the radical publication of the *al-Misbah*, which is published by the Muslim Youth Centre (MYC) as well as the *Weekly Muslim News Update*. These publications use the Quran to inculcate a radical attitude as well as an avenue to criticize the Kenyan Government over a range of issues including perennial marginalization and economic disparities, political targeting through arbitrary police arrests and land issues (Mwinyihaj & Wanyama, 2011).

Interfaith Dialogues

The study further sought to find out the involvement of religious groups in inter-faith dialogues to strengthen the understanding of each other and recognize the importance of integrating religious identities. The findings are presented in Table 2.

Table 2: Inter-faith Dialogues

Response	Non radicalized		De-radicalized	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Strongly Agree	40	40.0	20	40.0
Agree	19	19.0	16	32.0
Neutral	4	4.0	1	2.0
Disagree	19	19.0	4	8.0
Strongly Disagree	18	18.0	9	18.0
Total	100	100	50	100

Source: Field Data, 2021.

From the findings presented in Table 2, most of the non-radicalized youths accounting for 40(40%) strongly agreed, and 19(19%) agreed that, inter-faith dialogues are held by religious groups to strengthen the understanding of each other and recognize the importance of integrating religious identities while 18(18%) strongly disagreed and 19(19%) disagreed. The rest accounting for 4(4%) were neutral. On the other hand, most of the de-radicalized youth agreed with the statement accounting for 20(40%) strongly agreed, 16(32%) agreed while 4(8%) disagreed and 9(18%) strongly disagreed. Only 1(2%) was neutral.

From the findings it is evident that interfaith dialogues in Mombasa County are held by religious groups to strengthen the understanding of each other and recognize the importance of integrating religious identities. This finding was supported by one of the religious groups during the focus group discussion who stated the following:

Religious groups from across the divide should hold crusades and other religious gatherings on awareness creation and sensitization on youth radicalization. (FGD with religious groups on 17/2/2021 at Mvita).

The religious groups, who participated in FGDs reported that they have partnerships such as; Inter Religious Council of Kenya (IRCK), Coast Interfaith Council of Clerics Trust (CICT) and Women Clergy. These different religious groups often come together to share their ideologies and strategies for preventing youth radicalization. Besides, they are involved in interfaith dialogues. The Supreme Council of Kenya Muslims (SUPKEM), Council of Imams and Preachers of Kenya (C.I.P.K), are also actively involved in inter religious dialogue.

On the contrary, a parent to one of the youth added his voice to the discussion by mentioning that interfaith dialogues have also contributed to radicalization.

Public debates and preaching has been going on especially among the Islamic faith. The comparative preaching on the streets has created more radicals from both Christian and Muslims hence worsening the efforts of prevention on radicalizations. (Interview with a Parent to a radicalized youth in Likoni 13/11/2021)

RAN (2019), indicates that interreligious dialogue is one of the main prevention tools in which religion and religious institutions may play a role. Interfaith initiatives hold tremendous potential for supporting dialogue across communities. They explain misunderstandings of scripture, develop peaceful counter-narratives, and promote critical and inclusive thinking in religious institutions. (United Nations Development Program, 2016).

Civic Education by Faith Based Organizations

The researcher sought to establish whether civic education provided by faith based organizations is effective in prevention of radicalization. The findings are presented in Table 3

Table 3: Civic Education by Faith Based Organizations

Response	Non radicalized		De-radicalized	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Strongly Agree	48	48.0	25	50.0
Agree	44	44.0	20	40.0
Neutral	3	3.0	3	6.0
Disagree	4	4.0	2	4.0
Strongly Disagree	1	1.0	-	-
Total	100	100	50	100

Source: Field Data, 2021.

From the results presented in Table 3, most of the non-radicalized youths accounting for 48(48%) strongly agreed and 44(44%) agreed with the statement that civic education provided by faith based institutions is effective in addressing prevention of radicalization. Whereas 4(4%) disagreed, 1(1%) strongly disagreed while 3(3%) were neutral. On the other hand, most of the de-radicalized youths accounting for 25(50%) strongly agreed while 20(40%) gave affirmation to the statement. Whereas 2(4%) disagreed, 3(6%) were neutral.

From the findings, it is reasonable to conclude that civic education provided by faith based institutions are effective in addressing prevention of radicalization among the youth in Mombasa County.

On the contrary one respondent during a key informant interview said that;- Inasmuch as education provided by faith based institutions are effective in addressing prevention of radicalization among the youth, it should not be lost that some religious groups and leaders take advantage of this situation to promote radicalization and religious extremism.

Some Imams are just too extreme in their understanding of Islam and its teachings. These extreme groups can radicalize the

whole Muslim community in a particular mosque. Their teachings boarder on religious intolerance and hate against non-Muslims. These teachings intoxicate the minds of the youths and breed extremism from the already radicalized youth. (CSO representative on 19/2/2021 at Mvita).

This assertion was supported by another respondent during the key informant interview who said:

The religious groups failed to concretely deal with youth radicalization at Masjid Musa and Masjid Sakina mosques leading to their closure in 2011. (KII with a police officer on 16/2/2021 at Likoni).

One of the youth also mentioned that from his experience;

Some religious groups have inadequate knowledge on radicalization and therefore lack content to give to the youths. Some of them become radicalized instead of preventing radicalization among the youth (Interview with a radicalized youth on 12/11/2021).

Stewart (2018) avers that building young people's resilience is a good start to prevent radicalization and violent extremism because it not only provides them with the ability to utilize the opportunities that exist but also gives them opportunity to create new ones. Consequently, they are less likely to conclude that violence is an option and when confronted with problems they manage them positively. There is evidence that this resilience can be built through formal and informal education as it can act as the vehicle for engagement even with the most vulnerable young people (Schomerus *et al.*, 2017).

The youth, in a study by Finn *et al.* (2016) highlighted the important role of religion as being both a source of education, as well as a means for positive community engagement to combat recruitment into extremist groups.

Engaging De-radicalized Youths

The study sought to find out whether religious groups were engaging with de-radicalized youth. The findings by the non-radicalized and de-radicalized group are presented on the Figure 2.

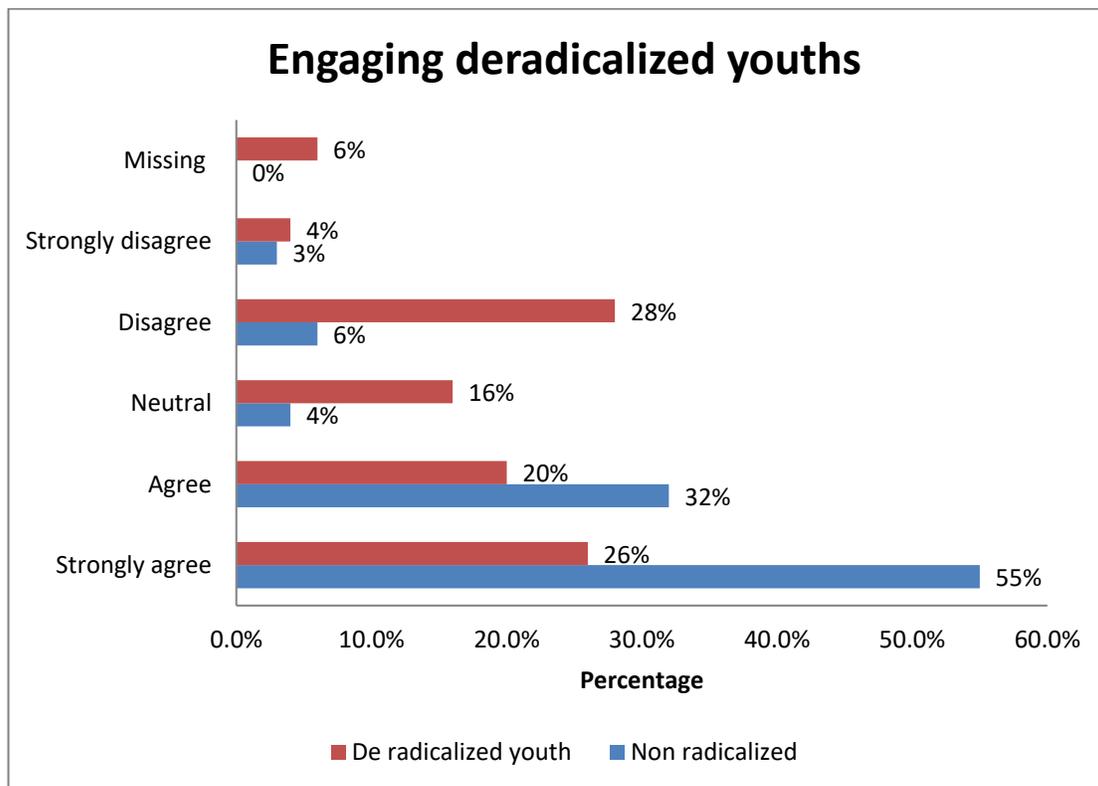


Figure 2: Engagement with De radicalized Youth
 Source: Field Data, 2021.

Results in Figure 2 show that most of the non-radicalized youth accounting for 55(55%) strongly agreed and 32(32%) agreed with the statement that religious groups were engaging with de-radicalized youth while 6(6%) disagreed and 3(3%) strongly disagreed. Only a paltry 4 (4%) were neutral. On the other hand, most of the de-radicalized youth accounting for 13(26%) strongly agreed and 10(20%) agreed with the statement that religious groups were engaging with de-radicalized youth while 14(28%) disagreed and 2(4%) strongly disagreed. Only 8(16%) were neutral. The de-radicalized youth who did not respond to the statement accounted for 3(6%).

From the findings it is reasonable to conclude that most of the youth, both non radicalized and de-radicalized agreed that religious groups were engaging with de-radicalized youth and religious authorities in Mombasa County.

A respondent had this to add;-

The religious groups work with de-radicalized youth, however there are some religious leaders within the groups that are police informers and therefore compromise the lives of the de-radicalized youth. (Interview with a radicalized youth on 12/11/2021).

The same statement was echoed by one of the respondents from the civil society during the key informant interview who said:

Some religious groups have it upon themselves to start counter narrative teachings both online and within the religious institutions. However, this has not picked up much because of the fear of victimization from both the radicalizers and the security agencies. (KII with a civil society representative on 19/2/2021 at Kisauni).

According to a police officer, most returnees are considered a security risk by the security agencies because they have military training. He noted that;-

Returnees have military training; some have been sent on mission and have become part of criminal groups which have been involved in murders of moderate clergy and government workers who they suspect to be informers. (KII with a police officer on 22/02/ 2021 at Kisauni).

The statement shows how vulnerable the religious groups are in their engagement with the de-radicalized youth and how the returnees are always on the lookout for people who may report them to the police. However, it also reinforces the findings by Nasser *et al.*, (2011) that defection does not necessarily equate to de-radicalization.

Ruteere & Mutahi (2018), contend that faith-based groups, community and rights organizations are well-placed to offer support to the de-radicalized and traumatized youth. However, they are themselves paranoid that engagement of this kind “could expose them to charges by the State that they are providing ‘material support’ to terrorists because of the expansive nature of the Prevention of Terrorist Act (2012).”

According to Gang (2020), religious and community leaders have been known to be a conduit for speaking to and educating families on the personal challenges they face with youth radicalization.

Religious Groups Led Activities Used in Prevention of Radicalization

The study sought to establish whether there were religious led activities used in prevention of youth radicalization. The results are presented in Table 4.

Table 4: Religious Groups Led Activities Used in Prevention of Radicalization

Response	Non radicalized	
	Frequency	Percentage (%)
Mentorship with parents and individual counseling sessions	48	48
Alternative livelihoods	30	30
Partnerships with non-state actors	10	10
Talk shows	7	7
Partnerships with state actors	5	5
Total	100	100

Source: Field Data, 2021.

Data in Table 4 shows that most of the non-radicalized youth reported that mentorship with parents and alternative livelihood programmes were the most common religious groups led activities used in prevention of youth radicalization accounting for 48(48%) and 15(30%) respectively. Partnerships with non-State actors, talk shows and partnerships with state-actors were reported by 10(10%), 7(7%) and 5(5%) of the non-radicalized youth respectively. On the other hand, most of the de-radicalized youth reported that alternative livelihood and mentorship with parents' programmes were the most common religious led activities used in prevention of youth radicalization accounting for 40(20%) and 15(30%) respectively. Partnerships with non-State actors, talk shows and partnerships with state actors were reported by 7(14%), 5(10%) and 3(6%) of the non-radicalized youth respectively.

From the findings, it is evident that there are several religious groups led activities used in prevention of youth radicalization in Mombasa County. However, mentorship with parents and alternative livelihood programmes are the most dominant. During the key informant interview, one of the respondents said:

Religious groups hold forums with youths and their parents, from which the youth get opportunities to converse about radicalization. These forums are always organized and facilitated in mosques and churches. Religious leaders use these forums to counter religious propaganda normally spread by religion extremists. (KII with media personality on 17/2/2021 at Likoni).

A parent to one of the youth observed that the religious groups offer mentorship with parents and individual counseling sessions for the both the parents and the youth. He went further to state that this has been a great support for parents whose children are vulnerable to radicalization and even those who are already radicalized or de-radicalized.

State actors, government officials and government agencies also actively partner with religious groups on several fronts. This was confirmed by the Mombasa county commissioner during the key informant interview. He said that:

As officials of the government of Kenya, we do vetting of religious leaders at the mosques to determine their orientation toward extremism and radicalization. We also stop scholarships offered to youth by suspicious organizations to forestall any ill motives of such scholarships. I also chair prevention of radicalization meetings together with other county government officials. Together with government officials at county level, we hold joint campaigns against radicalization with other stakeholders. (KII with the County Commissioner on 15/2/2021 at Likoni).

During the key informant interviews, the chiefs affirmed their support for the activities of religious groups on countering extremist narratives. For example, they reported that they often attend and participate in seminars held by religious groups on youth radicalization. As representatives of national government at local level, the chiefs often invite religious groups to *barazas* to dialogue on the importance of youth empowerment. According to the chief for Mvita:

Through partnership with religious groups and International organizations to help prevent youth radicalization, we have built a youth resource center in conjunction with a German based NGO in Mvita. (KII with a Chief on 26/2/2021 at Mvita).

Another chief interviewed also confirmed that, they partner with the Kenya Muslim alliance, NCIC, SUPKEM, Haki Africa, MUHURI and other civil society groups to create awareness and training among the youth and general public, as well as organize *barazas* to enlighten and sensitize youth. This was further affirmed by the village elders during the focus group discussion. They pointed out that some non- state actors such as Sauti ya Wanawake, Interfaith council, KECOSCE, LICODEP, Manyatta sports, Women groups and Nyali NGOs are engaged in partnership with Imams and pastors to create awareness and prevent radicalization.

Muslims for Human Rights (MUHURI) is a human rights and advocacy organization principally focused on the coastal region. It focuses on human rights among marginalized social groups and Muslim communities. They partner with police as well as influencing leaders at constituency and sub county levels (Ruteere & Mutahi, 2018).

Knowledge on International Terrorist Organizations

The study sought to find out if the youths had knowledge about International terrorist organizations. The findings are presented in Table 5.

Table 5: Knowledge on International Terrorist Organizations

Response	Non radicalized		De-radicalized	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Yes	84	84.0	46	92.0
No	16	16.0	4	8.0
Total	100	100	50	100

Source: Field Data, 2021

From the findings in Table 5, most of the non-radicalized youths accounting for 84(84%) confirmed that they know about International extremists groups while only 16(16%) of them were not aware of the existence of these groups. On the other hand, 46(92%) of de radicalized youths reported that they know about international terrorists groups while a paltry 4(8%) were not aware. Collectively, both groups reported that the main International terrorist groups which are known to them are Al-Qaeda, Al-Shabaab, ISIS, Bokoharam and Taliban. The radicalized youth in an interview also reported that they were aware of the international terrorist groups especially Al-Shabaab and Al-Qaeda.

From the findings it is clear that most of the youth in Mombasa County are aware of the existence of international terrorists groups.

According to Dahl and Zalk (2014), Muslim subjects who reported that one of their peers had traveled to Somalia were more likely to exhibit higher radicalization.

Frequency of Internet Access

The study sought to find out the frequency of youth access to the internet. The findings are presented in Table 6.

Table 6: Frequency of internet Access

Response	Non radicalized		De-radicalized	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Very Frequent	-	-	-	-
Frequent	81	81.0	38	76.0
Not too frequent	15	15.0	6	12.0
Not at all	4	4.0	3	6.0
No response	-	-	3	6.0
Total	100	100	50	100

Source: Field Data, 2021.

The study sought to find out the level of access to internet by the non-radicalized and de-radicalized respondents. Most of the non-radicalized youth accounting for 81(81%) frequently had access to the internet. On the other hand, respondents who did not have access to the internet too frequently accounted for 15(15%) while those who never had access at all were at 4(4%).The study further sought to find out the level of access to internet by the de-radicalized respondents. Results show that most of the de-

radicalized youth accounting for 38(76%) frequently had access to the internet. On the other hand, those who did not have access to the internet too frequently accounted for 6(12%) while the respondents who never had access at all were at 3(6%). The de-radicalized youth who did not respond to the item accounted for 3(6%). In an interview by the radicalized youth they confirmed that they have frequent access to the internet.

From the findings, it is clear that most of the non-radicalized, radicalized and de-radicalized youth in Mombasa County have access to the internet. More than ever before, the lives of young people are lived online. As access to the internet spreads, more people have the ability to use, and with the internet enabled devices such as phones, young people spend more time on the cyber space given the proliferation of social media sites, entertaining, consuming information and creating virtual communities. Terrorist organizations are also exploiting these easily available communication platforms to reach a broad cross section of communities to recruit, groom and facilitate radicalization to violent extremism (Alarid, 2016).

Although there is consensus that the internet alone is not a cause of radicalization and recruitment, it remains a catalyst or a facilitator into extremism (Meleagrou & Kaderbhai, 2017). The role of the internet in radicalisation and recruitment is well-described as a medium which ‘complements in-person communication’ and ‘not a substitute for in-person meetings’ with the ability to create more opportunities for radicalisation (Von *et al.*, 2013).

According to Weimann (2014), the internet provides radical recruiters a fertile ground for recruitment and facilitates interaction with people who cannot be reached through conventional means. Scholars have demonstrated that terrorist organizations use online social networks to identify potential recruits for recruitment, glorification and planning and information, target selection, training and fundraising (Mahmood, 2012).

III. CONCLUSION

This study concludes that the nature of religious groups’ engagement in preventing youth radicalization in Mombasa County is multi-faceted. The religious groups should adopt a multi-stakeholder approach in developing strategies aimed at preventing youth radicalization. Besides, they should proactively induct them on the same to enhance their capacity and preparedness in preventing radicalization.

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Arabidopsis phytochelatin synthase gene overexpression and accumulation of cadmium, arsenic in tobacco

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Abstract- To analyse the partition of heavy metals in various parts of transgenic tobacco plant, accumulation of Cadmium and Arsenic was measured in shoot and root of homozygous *A. thaliana phytochelatin synthase1*- transgenic tobacco lines and wild type controls. Under 50µM, 100 µM, 150µM Cd and As significant difference were observed between the wild type control and transgenic *N.tabacum* lines. Transgenic plants accumulated significantly increased accumulation of Cd (Cadmium) and As (arsenic) in shoots and roots compared to wild type control. The transgenic *N.tabacum* lines shows the noticeable enhancement in tolerance to Cadmium & Arsenic and also revealed enhanced accumulation of these heavy metals both in roots and shoots. The overall results clearly suggest that *Arabidopsis thaliana phytochelatin synthase1*-expressing transgenic tobacco lines exhibit higher-levels of Cadmium and Arsenic accumulation in both shoots and roots when compared to (WT) wild type control.

I. INTRODUCTION

Growing advanced technology, the pollution is the major problem due to different heavy-metals, like lead, copper cadmium, mercury, zinc, and others. These heavy metals are reaching the soil in different ways and living in it at a very high altitude, the metals are first absorbed by the plants and become food for animals and humans (Wei *et al.*, 2008). Pollution of soil layers by the heavy-metals is a major concern because lead, cadmium and zinc are often stick on with fertilizers (Vassilev *et al.*, 2002). But advanced conventional tillage technology requires significant investment and may lead to unintended consequences. In addition, these new technologies degrade soil profile and lead to biological degradation [Alkorta *et al.*, (2004); Ghosh and Singh (2005); Van Slycken *et al.* (2009)]. Many of these degradation methods cannot be used for soil cleaning when soil fertility is very important (Chaney *et al.*, 2007). Adequate restoration and protection of the soil environment polluted by heavy metals, requires their specification and repair. Current regulation and legislation body protecting the environment and public health issue at both international and national levels is based on the data revealing the chemical properties of natural events those that

reside in our food web (Kabata and Pendias, 2001). Although soil classification may provide insight in the heavy metal specification, the presence of bioavailability of nutrition and other minerals, to correct polluted soil by heavy metals which needs to include information of the source of contamination and basic chemicals, the environmental health issues due to these heavy metals. The possible measurements is an effective tool that enables decision makers to manage highly polluted areas in a cost effective manner, protecting public health and the ecosystem (Zhao and Kaluarachchi, 2002). The present investigation deals with the phyto-remediation technology by using the *Arabidopsis thaliana phytochelatin synthase1* gene and also deals with the accumulation of Cd and As in roots and shoots of transgenic tobacco lines and wild type controls.

II. MATERIALS AND METHODS

Arabidopsis thaliana phytochelatin synthase1 isolation and cloning

Total RNA, from 15-day-old *Arabidopsis* seedlings (ecotype Columbia) was isolated using the RNeasy plant mini kit (Qiagen) following the manufacturer's instructions. Two µg of total RNA were reverse transcribed using the SuperScript™ III First-Strand Synthesis System (Thermo Fisher Scientific). Two µl of cDNA was used to perform PCR using pfu polymerase employing forward and reverse primers, viz., 5'-GGATCCATGGCTATGGCGAGTTTA-3' and 5'-GAGCTCCTAATAGGCAGGAGCAGCGAG-3', specific to *Arabidopsis thaliana phytochelatin synthase1* coding sequence. The underlined regions in the primers depict BamHI and SacI restriction sites introduced for subsequent cloning purpose. Amplified fragments of 1470 bp was cloned at SmaI site of pBluescript KS (+) (Stratagene, USA), then transformed into *E. coli* Top10 cells and was sequenced using automated DNA sequencer.

Construction of binary vector containing *Arabidopsis thaliana phytochelatin synthase 1* and GFP expression cassettes

Arabidopsis phytochelatin synthase1 coding sequence was excised from BamHI and SacI sites of recombinant pBSSK (+) – *Arabidopsis thaliana phytochelatin synthase 1* vector and cloned between CaMV35S promoter and polyA terminator of *pCambia1302* hygromycin binary vector constructed earlier in our laboratory. The *pCambia 1302* binary vector contains expression unit of hyg (CaMV35S-hyg-polyA) which was used as a plant selection marker ([www. cambia.org](http://www.cambia.org)). The recombinant vectors, viz., *pCambia 1302-hyg- Arabidopsis thaliana phytochelatin synthase 1* were maintained in HB101 cells and was mobilized into *A. tumefaciens* strain LBA4404 by triparental mating (Lichtenstein and Draper, 1985) using the helper vector pRK2013 and the resulting binary vector was designated as *pCambia 1302-hyg Arabidopsis thaliana phytochelatin synthase 1*.

Expression of *Arabidopsis thaliana phytochelatin synthase 1* gene in Tobacco plants for their functional validation.

Preparation of tobacco explants:

Seeds of tobacco were treated with 0.1% tween 20 for 5 min and then washed with sterile water later, these seeds were surface sterilized with 0.1% Mercuric chloride and 2% sodium hypochlorite for 5min each followed by sterile distilled water thrice. The seeds were kept for germination in MS basal media at 25° C. After 10-15 days leaf disc of 0.5cm were dissected from mature leaves and inoculated on to Petri dishes containing MS basal media and incubated at 24° C in dark condition for two days before infecting with *Agrobacterium*.

***Agrobacterium*-mediated transformation and regeneration of tobacco transgenic plants**

Single colonies from sub-culture plants *Agrobacterium tumefaciens* with *Arabidopsis thaliana phytochelatin synthase 1* gene constructs were inoculated into 50ml of YEP broth and grown for 24hr at 28° C in an orbital shaker set 200rpm. The cells were pelleted at OD₆₀₀ 1.0 and resuspended in MS basal media. Leaf disc collected aseptically from invitro grown tobacco plant were placed in *Agrobacterium* suspension and shaken gently for 15min in orbital shaker set at 200rpm at 28° C. Later, the explants were placed on sterile Whatmann filter paper to blot excess bacteria from the explants and to reduce the overgrowth. The explants were then co-cultivated for two days on co-cultivation medium. After 48hr the explants were washed thrice with a

solution of Cephotaxime 250mg/lit for one hr. Later, the explants were transfer to selection media containing hygromycin 50mg/lit.

Analysis of transgenic lines under cadmium and arsenic

Homozygous transgenic tobacco line expressing *Arabidopsis thaliana phytochelatin synthase 1* of T3 generation along with wild type controls were sown in pots. Plants were grown for 10 days on MS medium and then transferred in fresh MS media containing various concentrations viz., 50 µM, 100µM and 150 µM of CdCl₂ and Na₂AsO₄. Shoots and roots from hydroponic media grown tobacco seedlings were collected and dried in hot air oven at 40°C to reach constant weight. Dried plant tissues (100 mg) were digested in HNO₃ and H₂O₂ (3:1), through microwave digestion, in Microwave digester (Roychoudhury *et al.*, 2002). This digested solution was diluted from which 10 ml aliquot was quantitatively analysed for As through atomic absorption spectrometry (Perkin–Elmer; AAnalyst 600)fitted with graphite furnace.(Reference standard for calibration was made using 1000 mg/ml (AA03N-5) standard supplied by Accustandard, USA).

III. RESULTS AND DISCUSSION

Two types of tobacco plant viz., homozygous transformed tobacco plant and wild type controls were analysed for heavy metals (Cd and As) accumulations in roots and shoots. Transgenic plants accumulated significantly increased accumulation of Cd (Cadmium) and As (arsenic) in shoots and roots compared to wild type control. Under 150µM Cd and As considerable variation were found between the (WT) wild type control and the transgenic (T) *N.tabacum* lines. A mean Cadmium concentrations of 50 µM,100 µM and 150µM is 180 ±2, 300±2 and 450±2 µg.g⁻¹ dry weight was recorded in root of transgenic *N.tabacum* line respectively(Fig. 37), compared with 100 ±2, 120±2 and 132±2 µg/g dry weight of Cadmium in wild type control respectively Similarly, under 50 µM,100 µM and 150µM is 220 ±2, 500±2 and 650±2 µg/g dry weight in transgenic tobacco line respectively. Whereas, wild type control showed a mean Arsenic concentration of 95 ±2, 110±2 and 117±2 µg/g dry weight respectively (Fig.1&2).

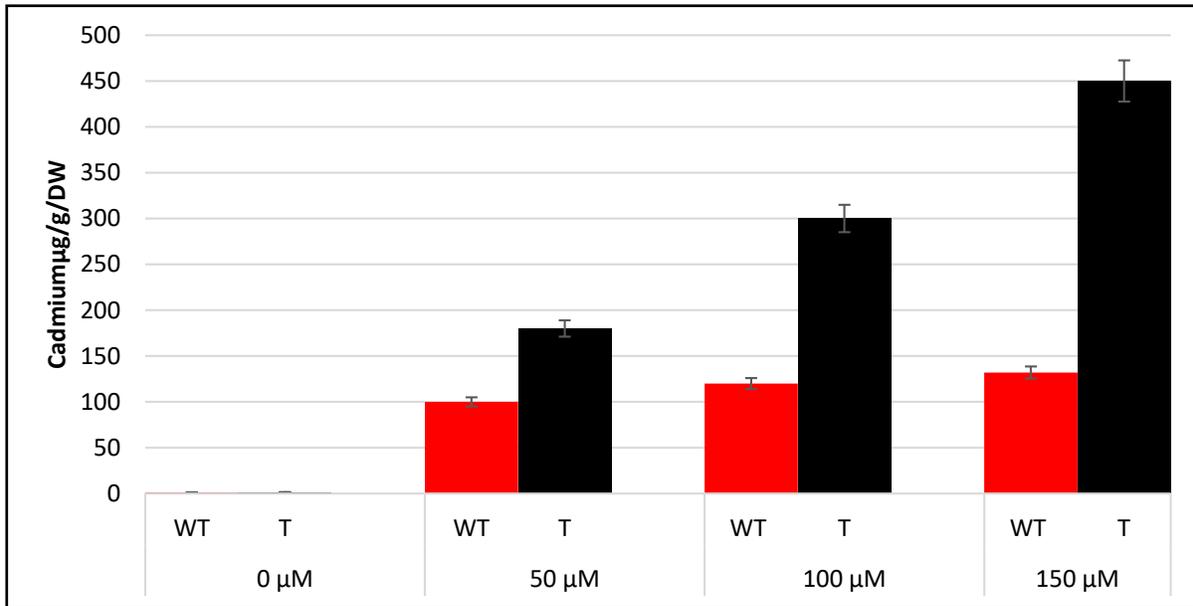


Figure. 1. Cd accumulation in roots of wild type controls (WT) and *AtPCS1* expressing in transgenic tobacco (T).

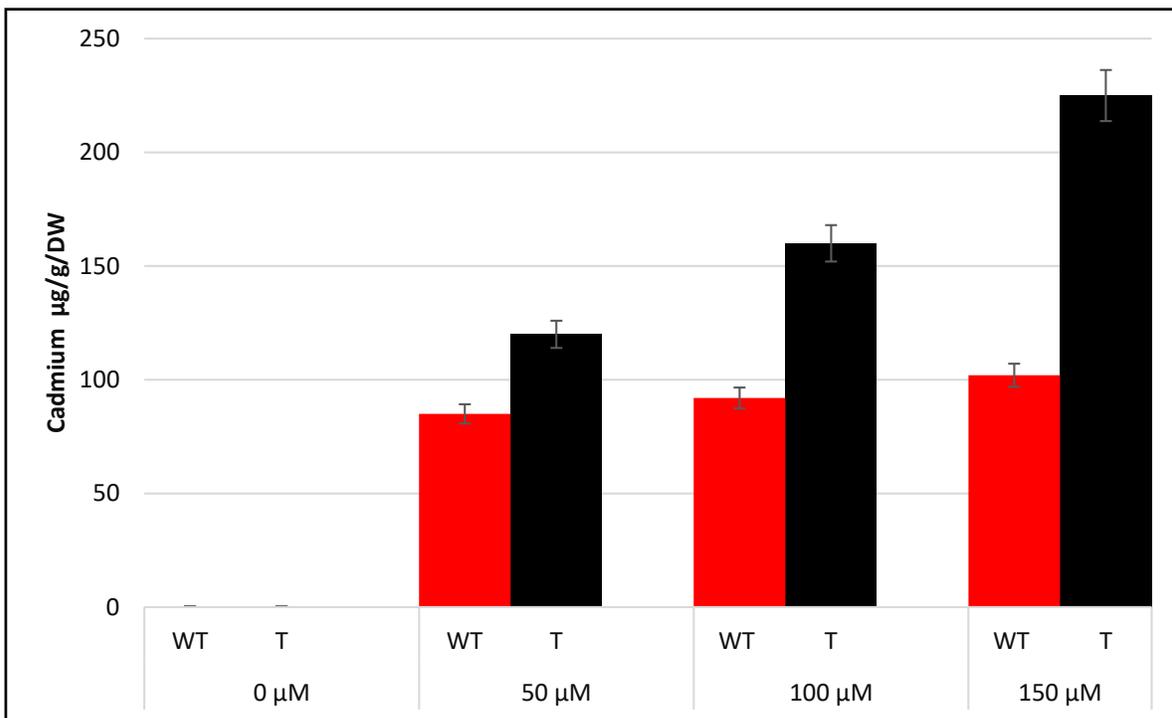


Fig. 2. Cd accumulation in shoots of wild type controls (WT) and *AtPCS1* expressing in transgenic tobacco plant (T).

Moreover, A mean Cadmium concentrations of 50 μM, 100 μM and 150 μM is 120 ± 2, 160 ± 2 and 225 ± 2 μg/g dry weight was recorded in shoots of transgenic *N. tabacum* line respectively,

compared with 85 ± 2, 92 ± 2 and 102 ± 2 μg/g dry weight of Cadmium in wild type control respectively. Similarly, under 50 μM, 100 μM and 150 μM As *Arabidopsis thaliana phytochelatin synthase 1* is 25 ± 2, 60 ± 2 and 92 ± 2 μg/g dry weight in transgenic

tobacco line respectively. Whereas, wild type control showed a mean As concentration of 10 ± 2 , 30 ± 2 and 47 ± 2 $\mu\text{g/g}$ dry weight respectively (Fig.3&4).

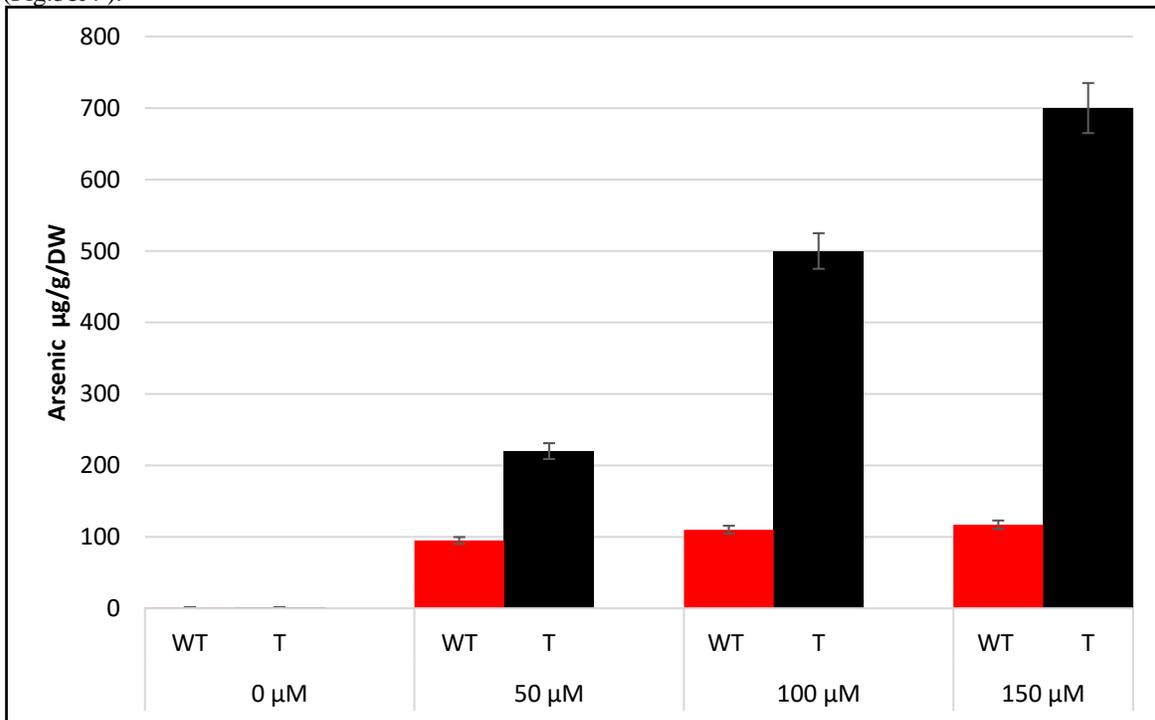


Fig. 3. Arsenic accumulation in roots of wild type controls (WT) and *AtPCS1* expressing in transgenic tobacco plant (T).

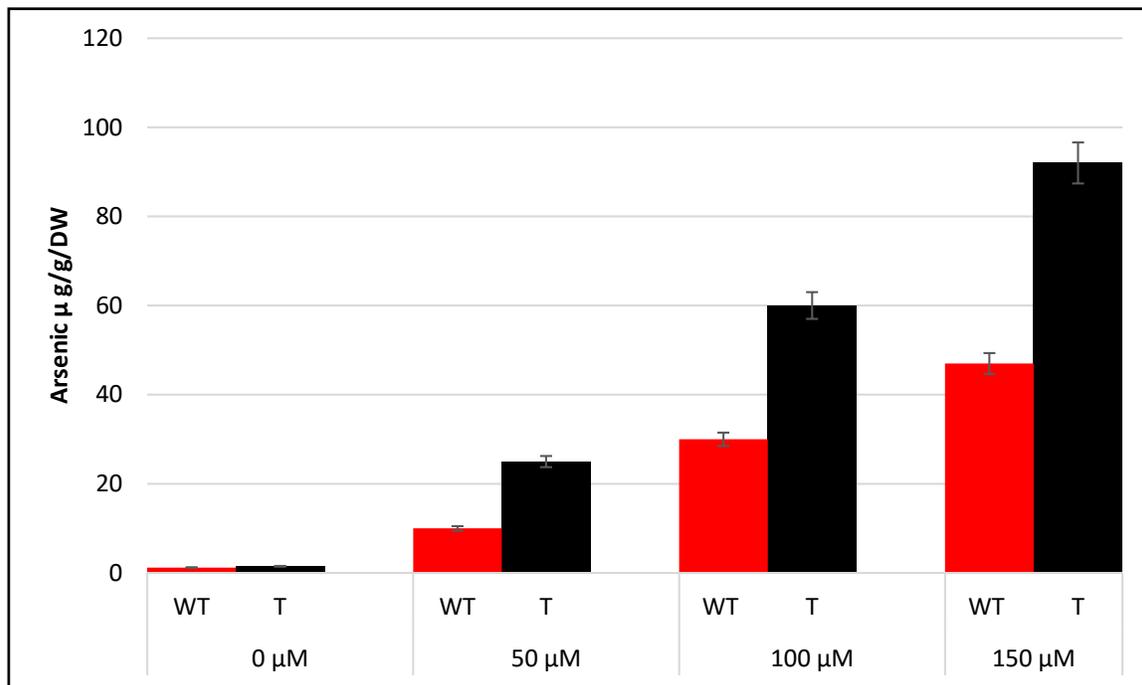


Fig. 4. Arsenic accumulation in shoots of wild type controls (WT) and *AtPCS1* expressing transgenic tobacco plant (T).

The overall results clearly suggest that *Arabidopsis thaliana phytochelatin synthase1*-expressing transgenic tobacco lines exhibit higher-levels of Cadmium and Arsenic accumulation in both shoots and roots when compared to (WT) wild type control. It was reported that heterologous expression of *C. demersum (CdPCS1)* in tobacco and *A.thaliana* led to considerable increased Arsenic or Cadmium accumulation in root accompanied by enhanced Phytochealatin content [Shukkla *et al.* (2012)&(2013)]. Furthermore, ectopic expression of *CdPCS1* complements cad1-3 mutant of *A. thaliyana* to the same level of synthetic Phytochealatin (Shukkla *et al.*, 2013). Earlier, it was reported that expression of *NnPCS1* in *Arabidopsis*, *PtPCS1* and *TaPCS1* in poplar and *TcPCS1* in tobacco disclosed accumulation of various metalloids and heavy- metals, viz., Pb As, Cd, and Zn [Liu *et al.* (2012); Adams *et al.* (2011); Liu *et al.* (2011); Couselo *et al.* (2010)]. Whereas, heterologous expression of *TaPCS1* in wheat, over-expression of *A. thaliana phytochelatin synthase1 (AtPCS1)* in *Arabidopsis thaliana* resulted in Cadmium hypersensitivity [Wang *et al.* (2012); Li *et al.* (2004); Lee *et al.* (2003)]. These disparities in transgenic tobacco plants expressing phytochealatin synthase might have risen due to differential phytochealatin synthase (PCS) activity in source genes and nature of the plant species selected for transformation. There are the enough proofs which suggest role of Phytochealatin in the long distance transport of the heavy-metals through either phloem or xylem [Mendoza *et al.*, (2008); Li *et al.* (2006); Chen *et al.* (2006); Lappartient and Touraine, (1996); Gong *et al.* (2003)]. The similar kind of mechanism might have been involved in *Arabidopsis thaliana phytochelatin synthase1*-expressing tobacco plants which has lead to the higher heavy- metals accumulations in both roots and shoots.

IV. CONCLUSION

The overall study clearly suggest that *Arabidopsis thaliana phytochelatin synthase1-gene* expressing transgenic tobacco lines exhibit higher-levels of Cadmium and Arsenic accumulation in both shoots and roots when compared to (WT) wild type control.

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Learner Perspectives of Synchronous and Asynchronous Online Education: A Comparative Study

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Abstract- Synchronous and asynchronous online education came to the forefront as the most used mode of delivery in the education sector during the COVID-19 pandemic from early 2020 onwards. This paper presents the findings of a study conducted with a view of obtaining learner perspectives of both synchronous (real-time) and asynchronous (accessing material anytime) online education when learning English as a second language. The study used a population of tertiary-level engineering technology diploma students learning English at a higher educational institute in Sri Lanka. Data for the study was collected from students' feedback forms, reflective journal entries and essays. The study found that the students preferred a blended mode of online education (synchronous and asynchronous) in order to overcome the shortcomings of synchronous online learning. Furthermore, it was found that flexible learning hours, a stress-free learning environment, use of visuals and videos and easy to understand course material had maintained students' interest in the subject and contributed to their learning. Ninety-eight percent of students agreed that they had improved their level of proficiency in the English language and revealed that asynchronous online learning had increased their motivation to learn the language and made them more independent learners responsible for their own learning.

Index Terms- asynchronous online learning, synchronous online learning, blended method of online learning, student-centered learning

I. INTRODUCTION

As an immediate and timely solution to the temporary closure of the Higher Educational Institutes (HEIs) in Sri Lanka owing to the COVID-19 pandemic, the HEIs abruptly shifted from a face-to-face mode of classroom-based delivery to an online mode of delivery. Online education, as defined by Inch and Jacobs, (2012, p.546, cited in Sun & Chen, 2016) is "all forms of teaching and learning where the learners and teacher are separated geographically and temporally". Although e-learning was

previously limited to asynchronous teaching and learning, increase in bandwidth capabilities has led to the growing popularity of synchronous e-learning today. In the research literature, e-learning is also known as "distance education," "online learning," "blended learning," "computer-based learning" and "web-based learning." As Pappas (2015) defines, in synchronous learning learners virtually log onto a platform (Zoom, Microsoft Teams) in order to participate in real-time classroom discussions, whereas in asynchronous learning, learners have the convenience of accessing materials ubiquitously.

In the wake of the COVID -19 pandemic, the Sri Lankan government made an immediate decision to conduct students' educational activities without interruption under the distance education concept from 31st March 2020 (Gazette Notification 2169/02). This unexpected and unplanned overnight transformation in the mode of delivery brought about a mixed reaction from students, teachers and the general public alike, worldwide, due to concerns such as lack of facilities and devices for online teaching and learning, insufficient Wi-Fi coverage, lack of IT skills among students and teachers and the lack of training for teachers. As an immediate solution, the University Grants Commission (UGC) and the Telecommunication Regulatory Commission of Sri Lanka (TRCSL) agreed with the network providers to provide free access to the university Learning Management System (LMS) for university students. Concurrently, a decision was also made to grant an interest-free laptop loan for undergraduates.

This study was carried out in this backdrop with a view of investigating the issues, challenges, and benefits of both synchronous and asynchronous online teaching and learning from the perspective of the learners and with a view of making recommendations for effective online education. The study will shed light on the benefits and challenges of online learning and provide a cornerstone for policymakers, educators, academia, and teachers in Sri Lanka, in decision making and planning future study courses.

II. LITERATURE REVIEW

Online education became a global discourse with the temporary closure of Higher Education Institutes (HEIs) worldwide, due to the COVID -19 pandemic. Following WHO's declaration of COVID-19 as a health emergency of international concern on March 11, 2020, the HEIs swiftly shifted to an online mode of teaching and learning. This unplanned and abrupt transformation in the mode of teaching and learning led to a plethora of studies on online education. This section brings to light the issues, benefits and challenges of online learning focusing on the pedagogical constraints of online language courses from perspective of language learners.

Along with the other countries, following the outbreak of coronavirus, the HEIs in Sri Lanka too shifted to online education. Free internet access provided to university servers during the lockdown period until 17 August 2020, as reported in Hayashi et al., (2020) was a promising step taken by the government of Sri Lanka to promote online learning in 2019. However, the study notes that poor internet connection tops the list of issues that students face while taking online classes. Further, it was reported that even though 90% of students own a smartphone, just 55% of students in state higher educational institutions and 66% of students in non-state higher educational institutions possess a laptop in Sri Lanka. Similarly, findings of a study conducted by Howshigan and Nadesan in 2021 revealed that "in Sri Lanka, both lecturers and students, especially students from rural areas, are severely affected by poor internet connectivity and other online learning facilities" (p.51). Additionally, as evident in the study, the online learning mode accounts for mental health problems,

including fear, anxiety, nervousness, boredom, distress, depression, anger etc. In a similar vein, Sudusinghe and Kumara (n.d) conducted an online survey among 253 students who followed compulsory English Language courses via distance learning education in Sri Lanka. Results showed that students in online classes were inclined to skip and postpone assessments and in-class activities.

A study conducted by Al-Qahtani in 2019 studied the effectiveness of virtual classes in enhancing communication skills in Saudi Arabia using online learning and teaching resources, such as chat, whiteboard, breakout rooms, application sharing, synchronized web browsing, and feedback. According to students, online learning is facilitative in many ways including providing a relaxed and comfortable learning environment, improving listening comprehension skills, boosting shy learners' confidence to share their thoughts in class and giving the opportunity to refer to recorded lectures over and over again. Students on the other hand regard technical issues, lack of facial expression and body language as downsides of synchronous learning. In a similar vein, Bukari and Basafar (2019) investigate EFL learners' viewpoint on blended learning in terms of motivation, interaction and learner autonomy by employing 120 female students who were enrolled in an intensive English course at a university in Saudi Arabia. Findings attest to the fact that blended learning was advantageous and interesting and the participants considered it to be more flexible, convenient, and useful in improving confidence. Moreover, the majority of learners perceived that blended learning creates interactive sessions where learners can receive feedback from teachers.

In order to maintain social distancing, all college courses in China were offered completely online across the nation from February 2020. Findings of a study by Lin and Gao (2020) identified that self-control learning is an advantage of the asynchronous online mode of delivery as it enables students to watch the course videos repeatedly. And also, students reported that they were able to concentrate more on learning when they engaged in self-studies. Being distracted by classmates in synchronous online classes or

feeling socially isolated in asynchronous online classes were the shortcomings of both modes of delivery.

In another study, Dahmash (2020) explores the benefits and challenges of blended learning during COVID-19 in Saudi Arabia from the perspective of English as a Foreign Language (EFL) students. Data were collected from 12 students taking a general intensive English course at a Saudi University over six weeks. All participants had 7 weeks of face-to-face teaching, and 7 weeks of virtual synchronous classes. In consonance with the previous research, the findings confirmed that implementing blended learning in English courses benefited EFL students by 1) supporting their writing skills, as the instructor demanded students to write in English in the chat box during virtual classes. And also, it had stimulated learners to search for supplementary materials immediately after class. Further, Damash goes on to explain that virtual classes are economical for learners in terms of both time and expenses. However, the study recommended that synchronous classes should not exceed 25% of the entire time allotted for each English course and that each meeting should not be longer than one hour. The challenges identified included technical issues such as constraints on providing access to a large number of participants, insufficient digital abilities of teachers, intermittent internet connection, and limited resources.

Altunay (2019) also investigated the opinion of 62 students who were following compulsory English language courses via distance education in a public university in Turkey. Results of the questionnaire reveal that students were unsure about the suitability, effectiveness and teachability of distance education and were of the opinion that face-to-face interactive sessions are facilitative for English language learning.

Adnan and Anwar (2020) state that a large majority of students in Pakistan are unable to access the internet due to technical (lack of digital skills, insufficient internet speed) and financial concerns (high cost incurred in regular connectivity). According to Adnan and Anwar, online learning suffers from a lack of engagement with the teacher and a lack of campus socialization which make it difficult for students to complete their group assignments. The study showed that 73 % of students had access to the internet and

71.4 % were digitally literate, thus, the majority of students (78.6%) agreed that traditional classrooms were more effective than online programs.

Similarly, analyzing the perceptions of students at a state university in Turkey, Gazan (2020) concluded that synchronous learning promotes flexibility, classroom interaction and an individual learning pace. However, learners on the other hand encountered technical problems due to poor internet connectivity, a lack of a real-time classroom environment, limited resources and a lack of digital skills.

Along with the other countries, Indonesia too shifted to e-learning in mid-March 2020. In a study conducted to investigate the perceptions of 66 students who were following an English Language Study Program in a college in Indonesia, Agung et al., (2000) mentioned that due to unstable internet connectivity in Indonesia students in rural areas had had to go miles away from their home to a relative's place or a hilltop to connect to the internet and therefore browsing the internet and uploading assignments were beyond the reach of the majority of Indonesian students. The study pointed out that 84.8% of students used low-end mobile phones with limited memory capacity which limited the number of applications that can be installed on the phone at a given time.

As evidenced in Nartiningrum and Nugroho (2020) the challenges and problems faced by Indonesian students in virtual classrooms were investigated using written reflections and semi-structured interviews obtained from 45 EFL students at a private university in Indonesia. The study echoes that unstable network connections, electricity blackouts and lack of interaction and feedback as being major obstacles to online classes.

In another study, Nambir (2020) mentioned that in the wake of COVID-19, the education sector in India underwent a major transformation in the mode of delivery shifting to fully virtual classes. The study mentions that a lack of supportive home environments, motivation and interest to attend online classes, health issues such as eye strain and pain, ear pain, backache, headache etc. and back-to-back sessions, boredom and frustration

make it harder for students to fully engage in online classes. As perceived by students, positive aspects reported are - conducive environment to clarify doubts, possibility of accessing recorded materials repeatedly and flexibility.

Following this line of thought, Zboun and Farrah (2021) examined the standpoint of 114 students who were following two online service English courses at a university in Palestine. According to the findings of the survey, 82 % of students, were dissatisfied with the online classroom and 68 % of students rejected online learning citing that they didn't understand the material well in online classes. Although many studies see technical and connectivity issues as challenges of online learning many studies conjointly attest to the fact that following language courses online promotes learning and develop language skills and other soft skills.

III.METHODOLOGY

The Institute of Technology, University of Moratuwa , Sri Lanka offers a diploma course in Engineering Technology to students with A' level qualifications in the physical science stream. The diploma course is conducted in the English medium. A pre-academic course is therefore offered to all students who register to follow the Diploma courses offered by the Institute with a view of helping them to switch over to English as the medium of instruction. Since the country went into lockdown due to the COVID-19 pandemic a few days prior to the commencement of the pre-academic English course, the Institute decided to offer the course to the students in distance mode. During this time, it was decided to offer the first two levels of the pre-academic English course online, and the course material was initially uploaded to the Institute's website since neither the teachers nor the students were conversant with online platforms such as Moodle, or google classroom. The level three course was also offered asynchronously via the MOODLE platform once the students were familiarized with the use of the platform for accessing the course material.

The research sample for the study consisted of a random sample of 100 students following the National Diploma in Technology course at the Institute of Technology, University of Moratuwa who had followed their pre-academic English course and the semester 1 English course online. The pre-academic English course was

conducted on a self-study basis online, while the Semester 1 English course was conducted real-time, online.

Both courses included lessons aimed at developing language proficiency through the four skills of language learning, i.e. listening, speaking, reading and writing plus viewing and representing. (Language arts stressed by the ELA framework of 2014 and the Manitoba Curriculum Framework of Outcomes and Standards - 2009). Cuban's study (2001) also reveals that 83% of what is learned is from the sense of SIGHT and that people generally remember, 10% of what they READ, 20% of what they HEAR, 30% of what they SEE, 50% of what they HEAR and SEE, 70% of what they SAY and 90% of what they SAY as they DO a thing.

The duration of the Pre-academic English course was approximately 08 weeks and the course consisted of an English for specific purposes (ESP) component consisting of science and technology-related reading passages, PowerPoint presentations with voice recordings, vocabulary tasks, grammar lessons and exercises, videos with subtitles for listening and speech practice, and model answers where appropriate. The course was offered asynchronously.

The semester 1 English course was offered synchronously using the MOODLE platform with screen sharing of PowerPoint presentations. The recordings of the sessions were also uploaded at the end of each session. The course comprised reading, writing, speaking, listening, grammar and vocabulary tasks. The lessons included exercises and tasks to be done by the students, model answers and oral and written assignments.

Reflective journal entries and feedback forms submitted by the students regarding the pre-academic English course and data gathered from students' essays about their perceptions of the Semester 1 English course were used for collecting data for the study.

IV.RESULTS

This section analyses the data gathered from students' feedback forms, reflective journal entries and essays.

Figure 4.1 given below shows students' evaluation of their standard of English at the beginning of the Pre-academic course.

As depicted in Figure 4.1 the majority of students who had registered to follow the course were average learners of English.

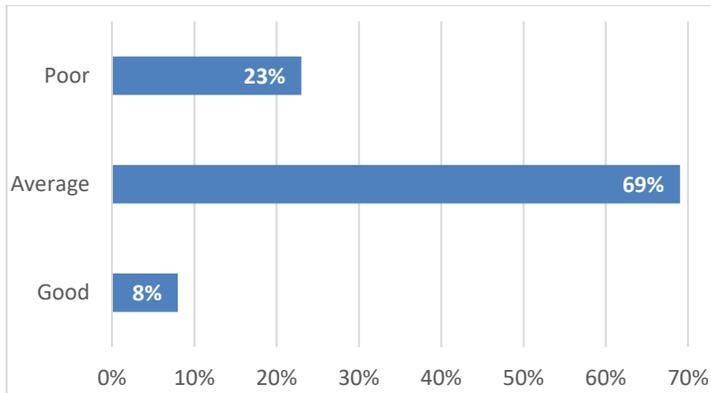


Figure 4.1 Students' Evaluation of their Standard of English

Data gathered from feedback forms also revealed that only 67% of students had followed the course using a laptop or a desktop computer and no student had used the Vidatha Resource Centres to follow the course (VRCs are located country-wide, covering 80% of the total number of DS divisions in Sri Lanka to develop IT literacy at grassroots level). It can therefore be assumed that a vast majority of students had access to a laptop or a desktop computer and /or a smartphone and had the opportunity to download the course material despite intermittent internet connection in some areas of the country.

The data gathered from students' essays and reflective journal entries were analyzed under the two categories of synchronous and asynchronous language learning and the results obtained are given below:

Students' perceptions of the asynchronously conducted pre-academic English course:

Students' reflective journal entries about their perceptions of the pre-academic English course which was conducted asynchronously brought forth the following comments.

Figure 4.2 below shows students' responses to the question as to whether they had improved their English language proficiency at the end of the Pre-academic course:

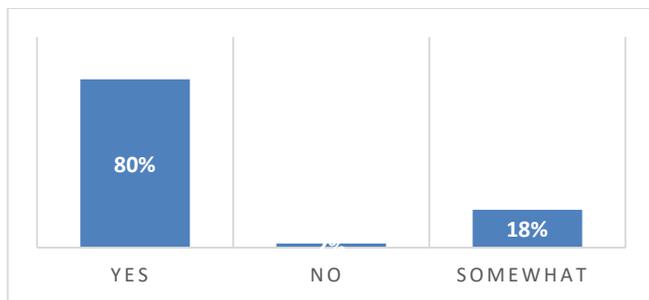


Figure 4.2 Students' Perceptions of their Improvement in the English Language

As depicted in Figure 4.2, more than 80% of students believed that the course had improved their language proficiency and only 2% of students were of the opinion that the course had little impact on their language proficiency.

Results of the survey conducted revealed that 98% of the students believed that they had improved their English language proficiency at the end of the pre-academic English course which was conducted on a distance and self-study mode (asynchronously) and 97.29% of students were of the opinion that they would be able to follow their academic programme with confidence after following the English for science and technology (ESP) component of the Pre-academic programme.

1. Easy access to materials through website / MOODLE
2. Free data to access Institute's MOODLE platform
3. Convenient – not time / place bound
4. Learner friendly environment (home) / stress-free
5. Lessons presented creatively using new technologies
6. Improved grammar
7. Improved subject -related vocabulary
8. Improved writing skills
9. Improved pronunciation and listening skills
10. Improved speaking skills – role played the dialogues
11. Encouraged us to engage in self-studies (read for more information, used dictionary/Google translator, learned pronunciation using e-dictionaries, made a list of new vocabulary with their meanings in a separate notebook)
12. The model answers made us realize our mistakes
13. Collaborative learning through WhatsApp groups - could discuss with peers.

14. Easy to understand material – simplified with audio recordings and visual illustrations
15. Interesting videos with subtitles were a real help in improving communication skills
16. Videos made learning fun / interesting / enjoyable
17. Narrated PPTs which included lists of technical terms and unfamiliar vocabulary with pronunciation were a real help and were more effective than text only lecture note.
18. If we needed to get something clarified, we were able to connect with the lecturer over the phone or via email and use the WhatsApp group to discuss with our friends. This compensated for the lack of real-time face-to-face interaction in online education.

All in all, the journal entries showed that the students were extremely appreciative of the efforts taken by the Institute to offer them a comprehensive English course which they had enthusiastically followed during the lockdown period in a stress-free atmosphere. The journal entries also revealed that the students had improved all four language skills; reading, writing, speaking, listening as well as vocabulary and pronunciation. According to the students, the course material and the power-point presentations with visual illustrations, graphics and images and voice recordings, and the videos with subtitles that were uploaded for conversation practice had made their learning interesting and enjoyable.

Students' perceptions of the synchronously conducted semester 1 English course:

Listed below are students' perceptions of the synchronously conducted semester 1 English course, as stated in their essays. The course material and the video recordings of the sessions were made available to the students through the MOODLE platform. The recordings of the live sessions were also made available to the students immediately after the lecture, on the Institute's MOODLE Platform.

1. Free access to MOODLE
2. Improved all four language skills; reading, writing, speaking and listening, grammar and vocabulary.
3. Lectures have become more interesting because of creative visual aids and videos.

4. Easy to understand course material and clear instructions
5. New technologies are helping students to gain knowledge and improve their skills.
6. Sitting for long hours, in front of a computer was stressful.
7. Were given the chance to ask questions and interact with the students
8. Since there are a large number of students at a lecture only a few students interacted with the lecturers, but we were able to listen to other students asking questions and clear our doubts.
9. Were able to connect with the lecturers and other learners through phone and email and WhatsApp groups.
10. Many siblings had online classes at the same time. Some have to skip lessons due to lack of computers/phones, but we were able to follow the lectures asynchronously because of the recorded lectures.

Given below are students' views on the uploaded recordings.

1. Recorded lectures are time saving and not affected by power cuts, signal issues, lagging etc.
2. Can watch recorded videos at our convenience so we don't have to stay focused on the computer/ phone for long hours, therefore there are no health issues.
3. Can prepare for exams well by watching the recorded sessions over and over again.
4. Recorded lectures are convenient and stress-free – Not time / place bound. We can learn at our own pace.
5. Sometimes if we had questions regarding a lecture, we were able to clear our doubts by watching the video recordings of the lecture over and over again or by doing some supplementary reading on the internet.

V.DISCUSSION

Similar to Howshigan & Nadeshnan (2021), Zboun & Farrah (2021), Agung et al. (2000), Andan & Anwar (2020), Gazan (2020) and Bukari & Basafar (2019), the present study too identified poor internet connectivity and technical issues as being two major obstacles of online learning.

Along the same line as Hashigan & Nadeshnan (2021) and Nambir (2020) the study too attests to the fact that online learning had led to various health issues such as eye strain, backache, headache etc. Moreover, in consonance with Qahtani (2019), Lin & Gao (2020) and Nambir (2020) the study found that the recordings of the synchronously held online sessions that were made available to students had contributed immensely towards their learning and that the students preferred to follow the course asynchronously due to various reasons such as unstable signal strength and poor Wi-Fi coverage, lack of proper e-devices for online learning and learning under stress, having had to be in front of the computer screen for long hours at a stretch.

Additionally, in agreement with Lin & Gao (2020) and Damash (2020) the study highlights the fact that asynchronous online education had promoted student-centred learning and that the students had become more independent learners eager to do supplementary reading online and find information using online reading material and dictionaries.

VI CONCLUSION

This study was conducted with a view of obtaining students' perspectives on both synchronous and asynchronous online learning. Results show that ninety-eight percent of students had improved their level of proficiency in the English language and revealed that asynchronous online learning had increased their motivation to learn the language which had made them more independent learners responsible for their own learning.

The results also bring to light that the students preferred a blended mode of face-to-face online learning with access to video recordings that they could access at any time in order to overcome various difficulties they have had to face when following an online real-time course of study (synchronous). The study concludes that a successful language course can be offered to students online in asynchronous mode if the course material is designed to develop all four language skills of listening, speaking, reading and writing, making use of new technologies and easy to understand course material supported by visual illustrations and video material which can create interest in the students and motivate them to learn the language. The findings of the study will bring important insights

to academia, policymakers and educators when planning online language courses.

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Effectiveness Of Independent Policing Oversight Authority In Enhancing Police Performance In Starehe, Nairobi County, Kenya

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Abstract- The purpose of this paper is to examine the effectiveness of the Independent Policing Oversight Authority (IPOA) in enhancing police performance in Starehe Division in Nairobi County, Kenya. The paper seeks to understand the role of IPOA and analyze how this citizen oversight body monitors police performance with a view of ensuring effectiveness and professionalism among police officers. Among the specific issues addressed in the paper are; first whether the measures used by IPOA influences work performance in the National Police Service (NPS). Secondly, the paper analyzes the effectiveness of the strategies that IPOA uses in enhancing the work performance of police officers. Thirdly, and finally, the paper analyzes how IPOA has promoted accountability among police officers in the NPS. The paper, which is based on a descriptive survey research design, targeted about 500 police officers working in Starehe Division within Nairobi City. The key respondents were drawn from the Kenya police service, IPOA, and internal affairs unit. A stratified sampling technique was employed to select the respondents from the selected categories. From the sample, data was collected using questionnaires and structured interviews. Secondary data for the paper was gathered from the various libraries around Nairobi. From the findings of the study, the paper reveals that the existence of IPOA enhanced performance of the police by holding them accountable for their actions. It was further noted the strategies adopted by IPOA have been effective in enhancing police performance through the continuous monitoring of their activities. Finally, the paper reveals that IPOA has been experiencing challenges, which if addressed will improve the institution's relationship with the NPS.

Index Terms- Effectiveness, IPOA, Police, Relations, Starehe

I. INTRODUCTION

Many countries have tried different methods and approaches to enhance and restore public confidence in the police. However, it remains a great challenge since countries have not quite succeeded in achieving their intended objectives and goals. Law enforcement officers require a high level of an oversight mechanism to perform their duties satisfactorily (Harris, 2005;

Bailey, 2002). Without checks police officers can misuse and abuse their powers, therefore there is a need to have an oversight Authority to hold them accountable for their actions. This is to ensure those police officers are held accountable for any action in the line of duty (Chokprachakhat, 2011). In any community, living in a dangerous and chaotic environment stifles a country's diverse socio-economic and political development.

The police performance is about the efficiency or effectiveness of action by police officers, other than the task of pursuing, arresting offenders, and other related offenses to ensure the safety of the citizens. In order to decrease and eliminate social disorders, police officers are also obliged to handle numerous conflicts in their communities. In any culture, living in a dangerous and disruptive environment stifles a country's diverse progress (Coleman, 2012). There is no measure that will be remotely close to gauge the performance of everything that the Police do. However, it is still very important that police perform their work effectively and are accountable for their action even if this is a mere perception. This is because police officers are mandated worldwide to ensure security for all people and their property. And they need to be trusted hence the legitimacy of their work as custodian of safety. Notably, the mandate comes with immense power bestowed on the national police service that should be checked to hold the officers for their actions. Police accountability entails an important element in the level of police discipline; it encompasses regulation of police conduct, control of behavior, orderliness in Police operations, and responsibility among police officers for effectiveness in performance. According to Browning, (2012), for the police to fulfill their purpose of lawfulness and legitimacy, efficient accountability systems are required.

Towards this end, The United Nations (2011) which is a body that regulates global Security has set in place a code of conduct to ensure responsibility of police officers. The United Nations Code of Conduct for Law Enforcement Officers is a key set of principles for police officers to follow. Article 8 states that any infringement of the Code requiring police officers to perform their responsibilities professionally must be referred to higher authorities accountable for policing. Every law enforcement agency should be demonstrative, responsive, and accountable for

the community as a whole, according to the Assembly decision establishing the UN Code of Conduct. The United Nations (2011), goes on to say that an effective structure should be put in place to maintain internal discipline as well as external oversight and control of law enforcement officials. It is perhaps from this perspective that many UN member countries worldwide have constitutionally come up with oversight bodies to oversee the day-to-day activities of the police services.

II. CASE STUDIES OF POLICE OVERSIGHT INITIATIVES

Oversight mechanisms are aimed to empower police to deliver professional services and realize the expectations of citizens and provision of a reliable means of achieving a fair investigation (Walker, 2005 & 2010). Miller and Merrick (2015) observed that civilian oversight is a way of involving citizens to hold police answerable to the public for their activities. He describes a system for public to supervise and evaluate complaints made against the police and find explanations to problems regarding misconduct by police officers and the use of excessive force. Many countries have ratified the UN laws and have put in place oversight bodies to ensure that the cops must account for their acts.

According to Mawby & Wright (2005) the United Kingdom (IPCC) is mandated to investigate police complaints and police misconduct by holding them accountable for their actions and omissions. However, other than the investigation of police actions and misconduct, the Scholars did not show whether the role had been achieved or not. On the other hand, the study was not very clear on whether the investigation carried out on the police conduct effective and whether it promoted police accountability, in this research, the researcher shall explore in details to fill the knowledge gap.

In the United States, civilian oversight evolved in various form as early as the 1940s, but later in 1970s after the blames of excessive forces, unjustified shooting, as racial prejudice and a lack of accountability became more prevalent, statistics show that three-quarters of 16-year-olds in the United States described their encounter with the police as abusive. (Hyland, Langton, & Davis, 2015). Throughout, high-profile people are mentioned who have persisted to emerge despite the facts. Police officers maintain order, which is governed by a deteriorated system that appears to have a lessened ability to maintain work proficiency in the United States. Civilian's oversight is a way of involving citizens to hold police answerable to the citizens for their actions, as described concerning the US police oversight there is a need for an effective structure and a system for people to supervise and review complaints made against the police and solve problems of police misconduct and the use of brutality. From this information it is clear that even the civilian's Oversight experience some shortcomings. There is a need for a continuous review of the mechanism in place, in this study, the purpose is to determine the effectiveness of the IPOA mechanism employed to enhance accountability among police officers.

The requirement for an independent and impartial investigation of criminal charges allegedly committed by police officers prompted the establishment of an Independent Complaint Directorate (ICD) in South Africa. The South African Oversight has evolved from the Independent Complaints Directorate (ICD)

to the Independent Police Investigation Directorate (IPID). IPID has been able to execute its mandate by cooperation with the other key stakeholders, including the police themselves. IPID is established to perform the same functions as those of IPOA in Kenya. IPOA, in their mandates, the IPID does not interfere with the police responsibility of investigating crimes and the internal systems of dealing with police misconduct. Even with such a mechanism in South Africa, there are still reports of abuse of police power and misconduct, according to (Browning, 2012), there is a need for continuous examination to understand what contributes to this misconduct. The authority should receive complaints from the Public (PART1, B3 a). Without checks and balances, the law enforcers may become prone to acting unlawfully and abuse their powers without proper mechanisms that are in place. In this research, the researcher will Endeavour to investigate and understand how the IPOA has progressed in addressing police misconduct.

III. EAST AFRICA AND IPOA WITHIN THE KENYAN CONTEXT

Regionally in East Africa, particularly Kenya, the utmost referenced incident is the impunity witnessed in 2007/2008 post-election violence. The United Nation committee against torture UNACTAD (2011) observed that dealing with Human rights violations by the police was hindered by corrupt individuals within the police service. The Kenyan Police has topped the lists of the most corrupt institution on many occasions, Transparency international, Kenya (2011) reported that the cases of violations and abuse of power after the 2007 election had risen. When the results were announced, violence erupted and as a result, 1,133 people died, 3,561 sustained injuries, and 350,000 persons were internally displaced.

Waki (2008), Ransley (2009) and Alston (2009) observed that the police systems gave room for arbitrary arrests, engagement in crimes, and other related misconduct, their reports claimed that the police were to blame for the death and disappearances of youth, they further recommended for the establishment of an autonomous Authority that would investigate police actions and offer civilian's oversight. Similarly, Alston (2009) resolved that the police in Kenya regularly execute individuals making extra-judicial impunity to prevail.

Waki and Ransley commissions recommended the establishment of an authority that would investigate police actions and offer civilian oversight citing that, the investigations carried out by the police on their colleagues who had committed acts of misconduct were not effective and were faced with many challenges. The panel of eminent African Leaders was invited to oversee the mediation process between the Kenyan leaders, and on 28th Feb 2008, an agreement was reached by signing the Kenyan National Accord and Reconciliation Act (2008).

Following the Waki and Ransley commission's recommendations, the creation of the National Taskforce on police reform was formed, the report recommended for the establishment of IPOA to monitor the performance of the police and enhance its effectiveness in service delivery (Ransley, 2009). On 18 November 2011 the President assented to the IPOA Act of 2011, which established the Authority with the mandate of investigating any complaints related to police misconduct and also investigate any complaints against the police, other mandates include

monitoring and investigating policing operations which affect the citizens, the mandates of IPOA are spelled out in Article 244 of the Kenyan Constitution.

Despite the government effort to establish IPOA, not much appear to have been changed in the Kenyan policing methods and styles. For example, according to IPOA reports on preliminary investigations, the identified 30 cases out of 97 complaints received, the Oversight Authority monitored, processed, and recommended for the prosecution of the police officers involved.

Human rights groups argue that even with the presence of IPOA, police remain a force that perpetuates injustice arising from a closed disciplinary system and it has not changed into a modern police service accountable to the general public as recommended by Ransley Taskforce, the Police organization still faces allegations of inhuman treatment of suspects and use of excessive force and extrajudicial killings (HRW (2017).

The death of a 13 year old Hussein Mayo who was shot at his parent’s house balcony, (Daily Nation, Thursday the, June 2020). On 2nd May 2018 in its annual reports, IPOA accepted that for six months they had only managed a conviction of three cases, despite having fully completed the investigation of over 100 cases and closing of a total of 9878 cases recoded by them (Daily Nation, May 2020) this, therefore, beg the question whether the strategies employed by IPOA are effective to hold officers accountable and redeem the organization image.

Focus of the Research

Following an act of parliament (IPOA, Act, 2011), IPOA was created as a civilian oversight body to address police misconduct and to ensure liability of the police to the public. Despite its establishment, human rights abuse and Police involvement in Crimes continue to be reported in many parts of Kenya. However, there has been little focus from scholars to establish if the strategies of IPOA are efficacious in holding police officers accountable.

The studies on police accountability have come from human rights groups who have demonstrated that the police continue to abuse their power. For example, the Kenya National Commission for human rights (KNCHR) reported 37 people murdered in 2017 by Security officers, police were accused of misuse of force against protestors resulting to death and injuries. Similar reports came from the European Union reports 2017 general elections which revealed that police misconduct was experienced in forms of deliberates provocations by the police in the opposition strongholds whereby there were violations of human rights, use of violence, extrajudicial killings, rapes, and torture among other related crimes. These are against the code of conduct as exposed by the UN codes of conduct and the constitutions of Kenya 2010. Given the immense powers the Police have, this can undermine the rights and freedom of citizens, therefore police service ought to be accountable to the civilians. In addition to the normal disciplinary measures being undertaken through the police chain of command, civilian institutions outside the police systems are necessary to make the police account for their organizational procedures and actions, However, there is the dearth of empirical knowledge on how IPOA has responded to these accusations or how they hold police accountable for their actions and how this affects national police performance.

The problem that underpins this study and paper is that although IPOA was created as an oversight Authority to hold the police accountable for their actions and therefore encourage and instill professionalism in the organization, human rights abuses continue to be witnessed among the service personnel in the line of their duty. This study, therefore, endeavored to find out the effectiveness of IPOA in enhancing police performance in Starehe Sub-County, Nairobi City County.

IV. STUDY FINDINGS

This study set out to assess the effectiveness of the IPOA as a Civilian Oversight Authority in monitoring Police to enhance performance in Starehe Division within Nairobi, Kenya. The results of the study are presented in line with the set objectives as shown below

Whether the measures used by IPOA have influence Police work performance in Starehe Division, Nairobi

In relation to this objective, respondents were asked several questions regarding their views on the measures used by IPOA and their influence. The respondents were given multiple choices in which they were to choose on whether they 1. Strongly disagree 2. Disagree 3. Not sure 4. Agree 5. The findings are shown in table 1.

Table 1: Various response rate on effective measures in place to enhance police performance

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly disagree	14	18.7	18.7	18.7
Disagree	10	13.3	13.3	32.0
Fairly agree/Not sure	19	25.3	25.3	57.3
Agree	32	42.7	42.7	100.0
Total	75	100.0	100.0	

Source: Field Data

From the table above it can be deduced that 25.3% of the total number of respondents fairly agreed/ were not sure whether there were effective measures in place to enhance police performance. While on the other hand 42.7% of the total number of respondents who were the majority agreed that there were measures in place to enhance effective police performance. Equally, 18.7% of the total number of respondents strongly disagreed that there were measures in place to enhance police performance. Those who disagreed that there were no measures in place to enhance police performance comprised of 13.3% of the total number respondents. Therefore, it is important to note that 42.7% being the majority agreed that there were measures in place that enhanced effective police performance.

In relation to the question whether there are effective measures in place to enhance police performance, 42.7% or the majority agreed that there were measures in place that enhanced effective police performance. From the indicated data, this can be attributed to the police reforms in which The National Police

Service Act (2011) governs the IGP and DIGs, the Kenya Police Service, the Administration Police Service, and the Directorate of Criminal Investigations' administration, activities, and powers. It gives the police a clear mandate, promotes internal accountability, and attempts to limit government influence in police operations (Amnesty International January 2013) while those who disagreed that there were no measures in place to enhance police performance comprised of 13.3% of the total number respondents. This could have been informed by the fact that even as a few measures had been undertaken, the various maximum vital reforms haven't begun to be carried ahead elevating worries of a loss of political will to put in force the reform agenda (Amnesty International January 2013)

The effectiveness of the Strategies that IPOA uses to ensure discipline among Police Officers in Starehe Division, Nairobi County.

In relation to objective two which sought to examine the effectiveness of strategies that IPOA uses to ensure discipline among Police Officers in Starehe within Nairobi City County, the findings are as presented in table 2 below.

Table 2: Response rates on effectiveness of IPOA strategies

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly disagree	20	26.7	26.7	26.7
Disagree	18	24.0	24.0	50.7
Agree	28	37.3	37.3	88.0
Strongly agree	9	12.0	12.0	100.0
Total	75	100.0	100.0	

Source: Field Data

From the descriptive analysis of table 2 above it can be deduced that 26.7% of the total number of respondents strongly disagreed that IPOA strategies of enhancing effective police performance were aligned with their constitutional mandates. Those who disagreed represented 24% of the total number of respondents. Equally important from the field data represented by the table above was that 37.3% of the total respondents were of the opinion that IPOA strategies were aligned with their mandate while 12% of the respondents strongly agreed that IPOA strategies were aligned to their mandates.

It is therefore important to note that majority of the respondents were of the opinion that IPOA strategies of enhancing effective police performance were not aligned with their mandates. Corroborating data from respondents also revealed that IPOA officers sometimes breached the law and acted against their mandate in the process of enhancing effective police performance. They opined that IPOA should work hand in glove with police officers to ensure that there was effective service delivery.

The highest number of those who strongly disagreed on the with the statement that IPOA strategies of enhancing effective police performance were aligned with their constitutional mandates could be attributed to fact that in August 2017, When Kenyan police stormed into their one-room home in the western city of Kisumu, Pendo was sleeping in her mother's arms. After the government's opponents challenged the election results that month, the riot officers were collecting up suspected

troublemakers. Pendo died from her injuries days later when the police sprayed tear gas and repeatedly beat her father. During the brawl, an officer struck the infant on the head, and Pendo died as a result of her injuries (Fick 2018).

How IPOA has promoted accountability among police officers in Starehe, Division, Nairobi County.

On whether IPOA has promoted accountability and promoted police performance, the findings are as indicated in table 3 below:

Table 3: Various response rates on whether has promoted accountability and promoted police performance

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly disagree	16	21.3	21.3	21.3
Disagree	25	33.3	33.3	54.7
Fairly agree/Not sure	19	25.3	25.3	80.0
Agree	15	20.0	20.0	100.0
Total	75	100.0	100.0	

Source: Field Data

The research findings from the table 3 above showed that 33.3% of the total respondents disagreed that measures employed by IPOA have enhanced accountability and promoted police performance. On the same note, 25.3% of the total number of respondents fairly agreed/were not sure whether measures employed by IPOA had enhanced police performance. 21.3% of the total number of respondents strongly disagreed on measures employed by IPOA enhanced police performance. While 20% of the total number of respondents agreed that measures employed by IPOA had promoted police performance. Hence, majority of respondents that is 33.3% disagreed with the measures employed by IPOA promoted police performance.

The above responses could be due to the fact information is not well protected on cases between officers and civilians (Probert et al. 2020) states that while Kenya has a legal and institutional framework in place to oversee inquiries into potentially unlawful police killings, there are a number of practical deficiencies that allow for the manipulation of the investigative process to support impunity. Several respondents noted that whereas there was increased enhanced in the police performance, it was very difficult for the citizen to receive justice before the court of law.

Assessment of the relationship between IPOA and the NPS in Starehe Division, Nairobi County.

The researcher wanted to establish whether there was a good working relationship between IPOA officers and National Police Service. The results from this objective are presented in table 4 below:

Table 4: Relationship between IPOA and the NPS

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly disagree	12	16.0	16.0	16.0

Disagree	21	28.0	28.0	44.0
Agree	27	36.0	36.0	80.0
Strongly agree	15	20.0	20.0	100.0
Total	75	100.0	100.0	

Source: Field Data

From the findings in table 4 above, the respondents who agreed that police cooperates with IPOA were 27 representing 36% of the total respondents. Those who strongly agreed represented 20% of the total number of respondents. In addition to that, those who disagreed on the statement above represented 28% of the total number of respondents while 16 of the total number of respondents strongly disagreed with the statement above. Therefore, it can be deduced that more than half of the respondents agreed that there was cooperation between IPOA and national police service.

It can be revealed that it is very difficult to investigate a police officer and most of them are very uncooperative in giving information and thus keep delaying the process to waste time so that they can have time to destroy the evidence or distort the evidence. This thus resulted in poor working relations between IPOA and the National Police Service.

V. CONCLUSION

The aim of this paper was to present the findings from a study that sought to establish the effectiveness of IPOA in monitoring Police to enhance performance in Starehe within Nairobi, Kenya. In connection with objective one, which sought to establish whether the measures used by IPOA influenced the police work performance in Starehe, the findings revealed that majority of the respondents agreed that there are now effective measures to enhance police performance. These measures, as the paper showed have enhanced police performance.

In regard to the effectiveness of the strategies that IPOA uses to ensure discipline among Police Officers in Starehe, the paper revealed that majority of the respondents strongly disagreed to the statement that monitoring police by IPOA was effective. Therefore, it was concluded that monitoring the police by IPOA was not effective.

In terms of objective three that sought to analyze how IPOA has promoted accountability among police officers in Starehe, the paper showed that majority of respondents were of the opinion that IPOA inspection of police facilities did not improve police performance. Therefore, it was concluded that IPOA has not improved the police performance.

In connection with the objective on whether there is an improved relationship between IPOA and the National police service in Starehe, the paper revealed that the majority of respondents were of the view that indeed there was no need of having IPOA dealing with police matters. Therefore, based on this, it was concluded that IPOA has challenges in improving the relationship between itself and National police service

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Research Trend in Personality-based Recommender System

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Abstract- At the beginning of its appearance, recommender system made use of content-based filtering method where recommendation was based on similarity between keywords in item description and in user profile. The inability to differentiate item quality in this method was overcome by collaborative filtering method by facilitating users to rate items they consumed. However, this rating-based collaborative filtering suffered from cold-start problem. This problem was in turn solved by the use of personality traits due to its advantages. Initially, personality was predicted explicitly by means of questionnaire. Since this technique was regarded burdensome and time consuming, this led to the application of implicit personality elicitation technique. The commonly used techniques is Personality Elicitation from Text (PET) which predicts personality from what someone write in his/her social media account. When applied to a personality-based recommender system, the obligation to have social media account and to write status with certain length are the weaknesses of PET. In order to cope with such drawbacks, personality prediction based on demographic data is proposed.

Index Terms- Personality-based Recommender System, Content-based Filtering, Collaborative Filtering, Personality Elicitation from Text, Demographic Data.

I. INTRODUCTION

The drawbacks in content-based filtering and rating-based collaborative filtering methods and also the advantages of personality traits led the emergence of researches in personality-based recommender system. Personality is individual differences in characteristic patterns of thinking, feeling and behaving [1], [2] therefore it can distinguish one from another. Beside that it is known to have correlation with one's preference. These two are important reasons why personality is used besides its advantages. In order to predict personality, questionnaire is used. The commonly used personality questionnaires are the ones based on Five Factor Model (FFM) also known as Big Five. Big Five itself consists of five factors, namely: extraversion, agreeableness, conscientiousness, neuroticism, and openness.

Extraversion is related to the degree of desire to connect to the outside world. High scorer (extrovert) is energetic and

outgoing, while low scorer (introvert) is reserved and solitary. Agreeableness is related to empathy to others. Someone with high agreeableness score is altruistic, friendly and compassionate. Meanwhile someone with low agreeableness score is selfish, cold or unkind. Conscientiousness has to do with organizing and controlling behavior or desires. Organized and efficient are characteristics of high conscientiousness person. Whereas, careless and easy-going are the characteristics of low conscientious person. Neuroticism is a measure of emotional stability. High score neuroticism person is characterized by unconfident and nervous. The one with low score is characterized by secure and calm. Openness is related to how someone interprets new situations. High openness scorers like new thing, therefore they are curious and inventive. In the opposite, low scorers like familiar things. They are also cautious and consistent [3], [4], [5].

This paper discusses about research trend in personality-based recommender system and is structured as follows: section 2 talks about content-based filtering. Section 3 discusses about rating-based collaborative filtering. Personality-based collaborative filtering is presented in sections 4, 5, and 6 where section 4 explains personality-based recommender system in general, section 5 contains description on implicit personality elicitation using Personality Elicitation from Text (PET), and section 6 talks about the proposed method, implicit personality elicitation using demographic data. Conclusion is presented in section 7.

II. CONTENT-BASED FILTERING

Content-based filtering is a recommendation technique that is based on correlation between item content and user preference [6]. One attribute on item description is keywords. The same attribute is also used in user profile. A user is regarded has a preference on an item if his user profile stores the same keywords as on item description. Similarity between these keywords is the basis of recommendation in content-based recommendation filtering [7]. The mostly used method to create item keywords is by counting the words that appear frequently on a document or TF-IDF. The keywords selected as keywords are the ones having the best TF-IDF values [8], [9], [10], [11]. Although the TF-IDF used by [11] is the improved one.

In order to group items, similarity value must be calculated. Reference [7] used Hamming distance and K-Means clustering to group films into several genres. Meanwhile [8], [11], and [10] applied cosine similarity to calculate similarity between two documents. For similarity or distance between to web pages, minimum number of steps to go from one page to another was used by [9]. Reference [12] used a tool called Lemur to calculate distance between items.

Several examples of recommender systems applying content-based filtering are Pandora Radio which is a recommender system for music, Rotten Tomatoes and Internet Movie Database which recommend movies. However, content-based filtering has several weaknesses, namely [6]:

1. There are two ways to provide description on items: (1) if the data is of type text, the description can be obtained by parsing the text. (2) the description is inputted manually if the data is in the form of voice, photo, or video. However, it is a difficult task to input data manually or even impossible if the data is not available.
2. This technique does not have a way to recommend serendipitous items because it only recommends items based on only what have already been consumed by users. This problem is called serendipity problem [13].
3. Since content-based filtering recommends items based on similarity between keywords on item description and on user profile, this technique cannot differentiate the quality or the contents of the items. This is because high and low quality items use the same keywords.

III. COLLABORATIVE FILTERING

The weaknesses in content-based filtering led researchers to find alternative method. In 1990, Jussi Karlgren proposed new method in recommending items to users [14]. Although he did not use term collaborative filtering, the method he was proposing already provided solution on one of problems on content-based filtering that was on item quality. He did that by asking users to answer a questions: How good was this document? The users were asked to answer the question by giving a grade. This was similar to the current collaborative filtering method that uses rating to grade item quality [12]. In order to predict ratings of the recommended items, the current collaborative filtering applies matrices. The matrices contain users rating data on all items they have consumed [12], [15]. From this matrices, a recommender system applying collaborative filtering will calculate rating of all new items [15], select top N items with the best rating values then recommend those items along with their rating predictions [12]. These was already conducted by Jussi Karlgren using grading data provided by the users to predict document grading to be recommended to those users.

Reference [16] and followed by [17] started to use the term collaborative filtering when they discussed their system called GroupLens. GroupLens recommended articles to its users

based on what have been consumed by other users. After reading an article, users could rate the article. As already discussed above, this rating data was used to predict article rating to be recommended to other users.

References [6] and [18] proposed a variant of collaborative filtering called social information filtering. This method can be classified into collaborative filtering since it still uses information from other users to recommend items. Reference [6] applied this method to a recommender system called Ringo which was a recommender system for music and artist. Meanwhile [18] applied the method in a recommender system for video.

A recommender system applying collaborative filtering recommends items to an active user based on profile similarity to his/her nearest neighbors. The nearest neighbors are users with similar rating behaviors as the active user. Similar rating behavior means that they give similar rating to similar items. In such system, before recommending items to a user, the system will first search the nearest neighbors who have consumed similar items and given similar rating [15]. Since the data being used here is user profile containing list of items already consumed together with their ratings, collaborative filtering assumes that user preference does not change. If he liked item A, then he is now still like A. If he did not like item B, then he still does not like item B.

In order to search for nearest neighbors, similarity between the active user and all of his/her neighbors must be calculated. Several methods have been applied, among others are: Pearson correlation coefficient [19], [15]; Cosine similarity [12]; Naive Bayes [20], [21]; and Rule-based [21].

The famous example of recommender systems applying collaborative filtering is Amazon.com. It applies what so called item-to-item collaborative filtering. Other examples include Last.fm and Readgeek. Last.fm is a recommender system for music which recommends music by comparing music preference of a user to preferences of other users. Meanwhile Readgeek is recommender system for book.

In practice, rating-based collaborative filtering has some drawbacks, one of them is called cold-start problem also known as new-user problem [22]. This is a problem of a recommender system when it cannot give accurate recommendation to a new user. This is because the new user has not consumed any item therefore his/her user profile is empty. In other words, there is no consumption and rating history. Previously, this problem was overcome by applying hybrid recommender system that made use of combination of content-based filtering and collaborative filtering methods. Another way to overcome this problem was by recommending popular items [23].

IV. PERSONALITY-BASED RECOMMENDER SYSTEM

In order to solve cold-start problem, user profile must be available soon after he/she registers to be a member of a recommender system. One way to do this is by obliging new users to fill certain data on registration step. One kind of data that can be used here is personality data. By using this personality data, the

system can then recommend items based on user's personality. The advantages of the use of personality data are:

1. The system can recommend accurate items to new users as soon as they register [24].
2. Similarity between users does not need to always be calculated after a user rates an item [25]. This is because personality-based user profile never change and is not influenced by rating data.
3. For cross-domain system, it can use the same personality data to recommend items from different domains. This is because personality is not attached to certain domain [5].

Another advantage of personality over rating is found by [26]. From his research, he found that 53% of all users liked personality quiz-based system and only 13% liked rating-based system. Besides that, users also wanted to use personality quiz-based system again and introduced it to their friends.

In calculating similarity, [24] found that personality-based similarity calculation performed better than rating-based. This is similar to experiment results obtained by [25]. In their experiment, they compared three similarity measure methods: rating-based, Euclidean distance with Big Five, and weighted Euclidean distance with Big Five. Experiment results revealed that the performance of personality-based similarity methods are the same or even better than rating-based method.

In practice, personality data can be obtained in two ways: explicitly and implicitly. Explicit personality elicitation requires users to answer personality questionnaire to predict their personality traits. As already mentioned above, the commonly used personality questionnaires nowadays are the ones based on Big Five. The longest Big Five-based questionnaire contains 504 questions and the shortest contains only 10 questions [27], [28].

Several researchers predicted personality explicitly using Big Five-based questionnaires. In her two experiments, [29] employed two kinds of questionnaires. In the first experiment, she utilized NEO-IPIP questionnaire containing 300 questions. And in the second experiment, she made use of Ten-Item Personality Inventory (TIPI) with only 10 questions. IPIP50 questionnaire consisting of 50 questions was used by [25]. Reference [30] employed 44 questions Big Five Inventory (BFI) questionnaire. Meanwhile, [24] and [31] also used TIPI questionnaire.

In searching nearest neighbors, [29] tried two techniques, they were k-NN and Naive Bayes where she found that k-NN performed better than Naive Bayes. Reference [24] used Pearson Correlation Coefficient. Meanwhile, [32] compared three methods, namely Linear Regression, k-NN, and K-Means Clustering where they obtained that Linear Regression outperformed the other two methods. K-NN method was also employed by [25] where they used Euclidean formula to calculate distance.

When a recommender system applies explicit personality elicitation method to collect personality data, then users must answer personality questionnaire before being registered to be a member of such recommender system. Although, this method can indeed predict personality accurately, it is burdensome and

time consuming. Therefore, this explicit method suits only on laboratory study [5].

V. IMPLICIT PERSONALITY ELICITATION

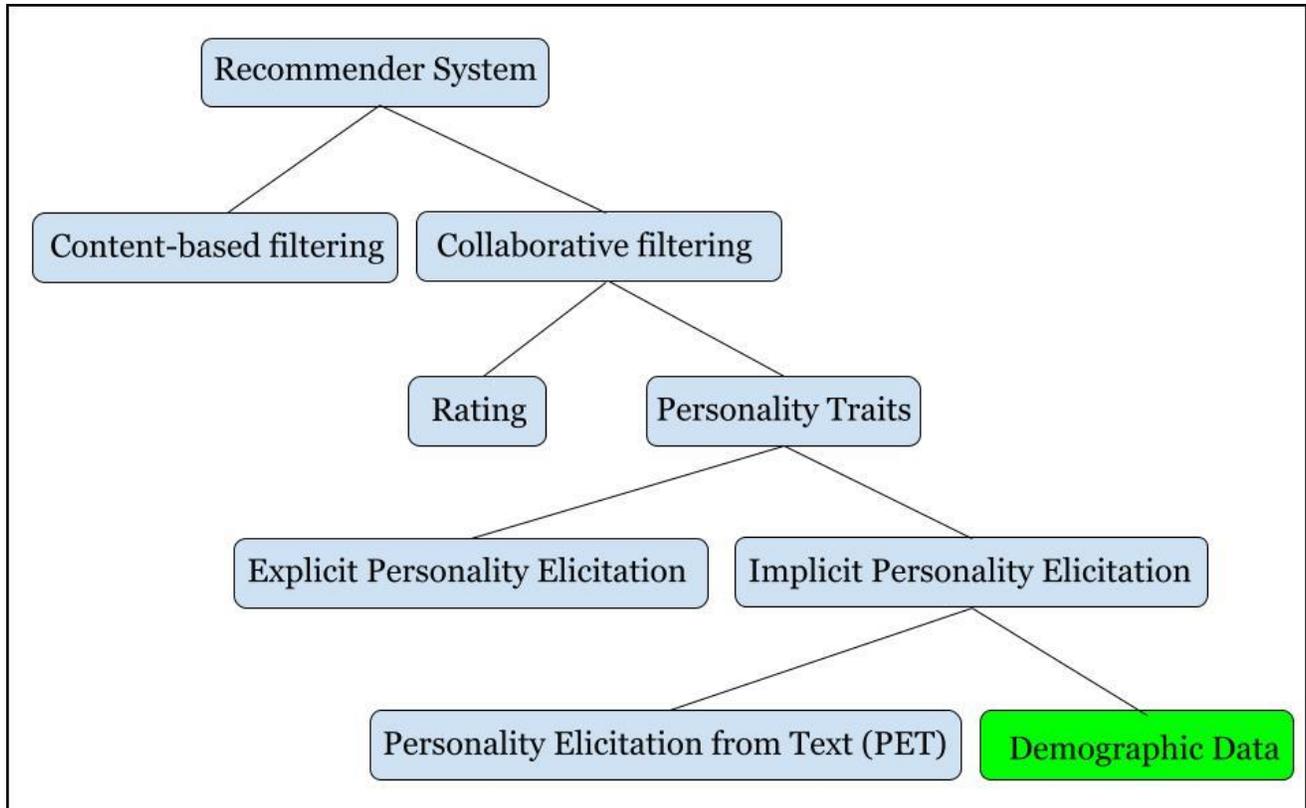
To resolve drawbacks on explicit personality elicitation, researchers make use of implicit personality elicitation. In this method, users' personalities are predicted implicitly. The commonly used implicit technique is Personality Elicitation from Text (PET). This technique predicts users' personality from the text they write in their social media accounts. PET has been applied to predict personality by extracting statuses of social media users such as Facebook [33], TripAdvisor [34], [35], Twitter [36], [37], Friendfeed [38], and Weblog [39].

The most important thing in implicit personality elicitation method is database. This database will be used to predict users' personality. Reference [38] collected data for his database from 748 FriendFeed users with 1065 posts. Meanwhile, weblog database were collected by [39] from 71 respondents (47 women and 24 men) by asking them to write about their studies in their own blogs. They were also requested to answer IPIP50 personality questionnaire.

The most common components in a recommender system applying PET are explained below.

1. Text Collector. This component collects text from what social media users write. This can be done by asking users to input usernames they use in one of their social media accounts. The system then crawls to retrieve the text they have written in their accounts. In order to be processed further, the text must exceed minimum length. For instance, [33] used average 42.6 words.
2. Text Processor. The task of this component is to extract linguistic cues. Linguistic cues is the words commonly used by a user. The steps to process collected text are [35], [37]: conversion of text to lowercase, tokenization, removal of stop words, stemming, text tagging, and short post removal. The processed text is then sent to text analysis tool like LIWC tool [34], [33] to get linguistic cues.
3. Personality Recognizer. This component predicts user's personality. There are two kinds of prediction results: score [34], [33] or text [35]. The user's personality is obtained by comparing linguistic cues and a table containing correlation between personality and linguistic cues (Table 1).
4. Similarity Estimator. This component searches for user's nearest neighbors. Reference [40] applied K-Means clustering method, k-NN method was used by [33]. Meanwhile [39] compared two methods namely Naive Bayes and SVM. In their study they obtained that Naive Bayes performed better than SVM. In calculating distance, [34] made use of Euclidean distance.

As already explained above, in order to predict user's personality by means of PET, This method obliges users to have at least one social media account and write at least one status with certain length. With this obligation, when this method is applied to a recommender system, such system can only be accessed by users having social media account. Not to mention, users must also write statuses in their accounts with certain length. Users having no such prerequisites cannot access such system.



Picture 1. Research trend in personality-based recommender system.

Table 1. Research trend in personality-based recommender system

No.	Papers	Methods	Recommendation	Similarity	Distance	Traits Prediction	Drawbacks
1	Van Meteren and van Someren (2000), Bogers and van den Bosch (2009), Li et al. (2012), Manjula and Chilambuchelvan (2016), Ke Ma (2016), Glauber and Loula (2019)	Content-based filtering	Keywords similarity	Number of steps, K-Means, Cosine similarity	Hamming distance		Difficult to input item description manually, Serendipity problem, Cannot differentiate item quality
2	Karlgren (1990), Resnick et al (1994), Shardanand and Paes (1995), Hill et al (1995), Breese et al. (1998), Gutta et al. (2000), Pronk et al (2007), Bogers and van den Bosch (2009), Burke et al. (2011), Rubbens et al. (2015)	Collaborative filtering	Rating history similarity	Pearson, Cosine similarity, NB, Rule-based			Cold-start problem
3	Hu and Pu (2011), Tkalcic et al. (2009), Nunes (2008), Ferwerda et al. (2016), Lu and Tintarev (2018), Ariely et al. (2004)	Collaborative filtering	Personality traits similarity	k-NN, NB, Pearson, Liner Regression, K-Means	Euclidean	Explicit personality elicitation (Questionnaire)	Burdensome, Time consuming, Suit only on laboratory study
4	Golbeck et al. (2011a), Roshchina et al. (2011), Roshchina et al. (2015), Di Rienzo and Neishabouri (2016), Golbeck et al (2011b), Carducci et al. (2018), Celli (2012), Oberlander and Nowson (2006)	Collaborative filtering	Personality traits similarity	K-Means, k-NN, NB, SVM	Euclidean	Implicit personality elicitation (Personality Elicitation from Text-PET)	Obligation to have social media account, Obligation to write status with certain length
5	Paryudi, Ashari, Tjoa (2019), Paryudi and Nursari (2020)	Collaborative filtering	Personality traits similarity	k-NN	Simple matching coefficient	Implicit personality elicitation (Demographic data)	

VI. IMPLICIT PERSONALITY ELICITATION BASED ON DEMOGRAPHIC DATA

Reference [27] and [28] proposed novel approach to predict personality implicitly where the prediction is based on demographic data.

So far, demographic data have been applied directly to a recommendation system hence it is called Demographic Recommender System. The demographic data in such recommender system is used by classifiers to find correlation between certain demographic data and rating or propensity to buy something [41]. One example of such system is Grundy. It is a recommender system recommending books based on user's characteristics. These characteristics are collected by means of a dialog. Basically, Grundy works like a librarian. With familiar customer, the system recommends books right away, no dialogue needed. However, with new unfamiliar customer, the system will have a dialogue first to collect his/her characteristics [42].

Demographic data is also used in a recommender system called Waldo the Web Wizard that recommends websites. The demographic data being used are American citizens data grouped into 62 demographic clusters. Each cluster has its own characteristics. When a user uses such system, it will ask questions. From the answers, the system will group that user into one of those clusters hence the system can predict user's characteristics [43]. Demographic data being used include age, gender, education [44].

Many researches have been carried out to find correlation between demographic data and preferences. In their study, [45] found that older users were more attentive than younger users. For instance, click-through rates (CTR) of younger users of ages from 20 to 24 years old was only 2.73%. A higher CTR, 9.26%, was obtained from older users of ages between 50 and 54 years old. Age and education also influence movie preference. Young people and/or low educated people were found to prefer across genre movies [46]. Similar to the above, preference of television programs were also influenced by age and education. Compared to younger people and/or lower educated people, older people and/or higher educated people preferred more on cultural and information programs than soap and erotic programs [47]. Beside age and education, gender also influences preference on television programs. Women prefer more on cultural and soap programs than erotic programs compared to men. In relation to movie preference, [48] found that women prefer romantic movies and men prefer action movies.

Summary of research trend on recommender system can be seen in table 2 dan figure 1.

VII. CONCLUSION

One of the Weaknesses on content-based filtering was inability to differentiate item quality. This problem was solved by collaborative filtering that enabled users to rate items they consumed. With this rating data on each item, users were informed on each item's quality. However, rating-based collaborative filtering was unable to give accurate recommendation to new users. This problem is called cold-start

problem also known as new-user problem. Personality traits were used to overcome this problem. The advantages of using personality traits in a recommender system are: (1) accurate items can be recommended soon after users join the system, (2) no obligation to always calculate similarity, (3) can use the same personality for different domains. Initially, personality is predicted explicitly using questionnaire. However, this technique is burdensome and time consuming. To cope with this problem, implicit personality elicitation was used. Nowadays, the commonly used implicit personality elicitation was the one based on what someone write in social media. Hence, it was called Personality Elicitation from Text (PET). The obligation to have at least one social media account and write at least one status with certain length made a recommender system applying PET could only be accessed by certain users. To solve this problem, implicit personality elicitation using demographic data was proposed. Demographic data such as age, gender, and education could be used to predict personality.

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Comparative Analysis of Cryptographic Algorithms in Context of Communication: A Systematic Review

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Abstract- Currently, there are billions of IoT devices connected to each other through the internet, manufacturers and IT engineers uses modern cryptographic tools to protect the networks and the devices from attacks. Communication is an important domain in this modern digital era. Nowadays, fast and reliable communication without breaking continuity between the IoT devices is a big challenge, because there are many cryptographic algorithms have been invented. So, it is difficult to determine which one is better and compatible for the concerned device and useful for communication purposes. We tried in this research paper to fill this gap by making a comparative analysis of frequently used cryptographic algorithms. In this research, we compared 23 algorithms with parameters, such as; key size, message size and execution time.

Index Terms- Cryptographic algorithms, Communication, Information Security, Symmetric, Asymmetric

I. INTRODUCTION

By 2023, almost 66 percent of the global population comprises of the internet access [1]. The internet users will be 5.3 billion by 2023 (two-thirds of the global population), up from 3.9 billion in 2018 (51 percent of the world population). By 2023, the number of IP-connected devices will be more than three times the global population, 3.6 networked devices per capita, compared to 2.4 devices per capita in 2018, and total number of 29.3 billion associated devices, compared to 18.4 billion in 2018.

Cryptography is used in all parts of digital technology through security, confidentiality, integrity and authenticity. The standard search strategy was applied in this paper. The seven popular digital libraries, such as; Web of Science, Google Scholar, ACM Digital Library, SCOPUS, IEEE Xplore, Science Direct and Springer were used to search the related paper. Mendeley was used as a reference manager in this research. The attacks and the mitigations of the attacks in the cryptographic algorithms is out of the scope of this paper. This result and comparison analysis is useful for the organizations, manufacturers, IT Engineers and research community to apply the best suitable cryptographic algorithms for communication purposes. The authors considered 23 well-known algorithms in one paper with the comparison of key size, message size, and execution time.

A. Related Work

Darpan et al. have discussed in a review article about identity-based cryptography techniques and applications. The drawbacks and benefits of ID based cryptography have been shown in the research [2].

Advantages:

- It has a limited number of public/private key sets, which means when all users provided the secret keys, the central party can destroy the secret, and the obligation of the central party is to deal with the keys, and that will no done in the identification based encryption schemes.
- Public key authenticity is guaranteed and also the private key is secure in the secret (confidentiality, integrity, and authenticity).

Disadvantages:

The disadvantage is that if the Private Key Generator (PKG) is compromised, all the messages will be compromised, and the messages which are protected by the public-private key pair and used by the server are also compromised.

The researchers have shown the communication cost in bits and forwarded messages of the proposed protocol and the comparison of other protocols is shown in figure 1 [3].

communication cost comparison.

	Forwarded messages	Communication costs in bits
Fouda et al. (2011)	3	3744
Chim et al. (2011)	3	4448
Sule et al. (2012)	3	4416
Mahmood et al. (2016)	2	4768
Li et al. (2017)	2	2752
Proposed	2	1152

- T_{PM} : time for point multiplication $\cong 2.226$ ms
- T_{HO} : time for hash operation $\cong 0.0023$ ms

Figure 1 Communication cost comparison [3]

Alese et al. have discussed the comparative analysis of public-key encryption schemes [4]. The researchers tested the RSA Encryption Scheme and the Elliptic Curve ElGamal Encryption Scheme. The authors compared the size of encrypted data, encryption, decryption, and key generation duration. The research work described when the RSA and the ECC ciphers are compared; the ECC has involved much fewer costs as compared to the RSA. Additionally, the ECC has a lot of benefits because it has the ability to provide the same security level as compared to the RSA. However, it has some drawbacks that may hide its attractiveness as a lack of maturity.

Nilesh et al. have discussed the RSA and the Diffie-Hellman [5]. The researchers discussed in detail both the protocols, their steps of the process, the limitations of both protocols, supportive software, and hardware. It is discussed that both algorithms behave differently. The RSA uses the public and private two keys for authentication, and it is more secure as compared to the Diffie-Hellman. The Diffie Hellman cannot authenticate two parties with the man-in-the-middle attack. According to the authors, both algorithms could be edited for their improvement in performance for future prospects.

Shaina et al. have discussed the comparing results of various asymmetric cryptography algorithms using MATLAB [6]. The authors compared the RSA and the ElGamal algorithms and introduced the modification of the ElGamal and the RSA cryptosystems based on the Integer Factorization Problem (IFP) and Discrete Logarithm Problem (DLP).

The authors in [6] compared the time execution between the RSA and the ElGamal algorithms, and after that they implemented the result by using MATLAB. They have proposed a method that is a combination of both the DLP and IFP algorithms.

Antonio et al. have discussed transaction oriented text messaging with Trusted-SMS [7]. The authors have introduced the Trusted-SMS system. The mobile devices will change to the Personal Trust Devices (PTD), which will allow them to send and receive private information from and to the PTD. In [7], it is proposed that this system will be reliable for commercial transactions, bureaucratic delegation, etc.

The existing research has not focused to compare all the frequently used algorithms in one paper in context of communication, and our research filled this gap to guide the suitable communication algorithm.

B. Contributions

The contributions of the research are as follows:

- Research and study the existing literature on comparative cryptographic algorithms
- Compare and analyze the frequently used cryptographic algorithms
- To find the best and most suitable communication algorithm
- To ensure the continuity and scalability of the IoT devices

The rest of this paper is organized as follows; the authors have compared the algorithms on the basis of key size, execution time, and message size in Section 2. In Section 3, the analysis of the experimented results is discussed. Conclusion and future research direction are presented in Section 4.

II. COMPARISON OF CRYPTOGRAPHIC ALGORITHMS

1) *Diffie-Hellman*

This algorithm was invented by Whitfield Diffie and Martin Hellman, so this algorithm's name was derived from their inventor's last names [8]-[9]. The Diffie Hellman (DH) is based on key exchange technique of securely transferring keys on a public network. Cryptographic keys are not essentially transferred, but derived in the same way.

If Alice and Bob want to connect, first they need to consent on (base g) where $(0 < g < p)$.

Alice picks a secret integer a which is her private key and then calculates $g^a \bmod p$ and that is Alice's public key. Bob picks his private/secret key b and calculates his public key by using the same process.

After that, Alice and Bob send their public keys to each other. Now, Alice has a and Bob's public key which is $g^b \bmod p$. Alice is unable to calculate the value of b from Bob's public key, because it is a hard mathematical problem which is known as the discrete logarithm problem. But, Alice can calculate $(g^b)^a \bmod p = g^{ab} \bmod p$.

Bob knows b and g^a , therefore he can compute $(g^a)^b \bmod p = g^{ab} \bmod p$. So, both Alice and Bob know a shared secret $g^{ab} \bmod p$. An eavesdropper Eve who was listening in on the communication knows p , g , Alice's public key $(g^a \bmod p)$, and Bob's public key $(g^b \bmod p)$. Alice is unable to calculate the shared secret key from these values.

In static-static mode, both Alice and Bob keep their private/public keys over several communications. Therefore, the resulting technique shared secret will be the same every time. In the ephemeral-static method, one person will generate a new private or public key every time, hence a new shared private key will be created.

2) *RSA Algorithm (Encryption and Signature)*

A. *RSA Signature*

The idea of the digital signatures was to use public-key cryptography, so that anyone can verify the signature, but no one can generate it [8], [10]. Rivest, Shamir, and Adleman described the method of digital signatures, and the method is now widely used which is called RSA. This model is most popular and most proven and gained the broadest adoption by practice and standards bodies. The discrete logarithm and elliptic curve cryptography have also available with several standards, but they are not familiar and not as commonly used as RSA is in practice.

B. *RSA Encryption Algorithm*

Rivest, Shamir, and Adleman developed the RSA algorithm used by modern computers to encrypt and decrypt messages [11]. It is an asymmetric cryptographic algorithm. The algorithm is based on the fact that finding the factors of a large composite number is difficult; when the factors are prime numbers, the problem is called prime factorization. It is similarly a key pair of private and public keys initiator or we can say generator.

3) *ElGamal Algorithm (Encryption and Signature)*

A. *ElGamal Encryption Algorithm*

ElGamal encryption algorithm is an asymmetric cryptography encryption approach, and it uses for sending encrypted messages between two entities [12]-[13]. This approach is difficult to compute g^{ak} , while we are familiar with g^a and g^k .

B. *ElGamal Signature Scheme*

This scheme is based on the difficulty of computing the discrete logarithms [12]. The public key for the ElGamal signature scheme is $k = (p, q, y)$, where p is a prime, q is a primitive element of Z_p^* and $y = q^x \bmod p$, where $1 < x < p$ is the secret key.

To create the signature s of a message m we need to choose a random integer $r \in Z_{p-1}^*$ and calculate $s = \text{sig}(m, r) = (a, b)$, where $a = q^r \bmod p$ and $b = (m - ax)r^{-1} \bmod p-1$. The signature $s = (a, b)$ for the message m is valid if $y^a a^b \equiv q^m \bmod p$.

4) *Elliptic Curve Cryptography*

Elliptic Curve Cryptography (ECC) is used for a public key, and it has a shorter key length as compared to other public-key algorithms like RSA [14] - [16]. ECC is an asymmetric public key cryptosystem and it provides equal security with a smaller key size as compared to RSA and other non-ECC algorithms. It makes use of elliptic curves. Elliptic curves are defined by some mathematical function- cubic function, e.g. $y^2 = x^3 + ax + b$ (this is the equation for degree 3).

5) *Digital Signature Algorithm*

The key for the Digital Signature Algorithm (DSA) is $k = (p, q, r, x, y)$, where p is a large prime, q is a prime dividing $p-1$, $r > 1$ is a q^{th} root of 1 in Z_p , ($r = h^{p-1/q} \bmod p$, where h is a primitive element in Z_p), x is a random integer, such that; $0 < x < q$ and $y = r^x \bmod p$. The values p , q , y , and r are made public, x is kept secret [8], [11].

To sign a message m we need to pick a random number k to such as extent that $0 < k < q$ and therefore $\text{gcd}(k, q) = 1$. The signature of message m is $s = \text{sig}(m, k) = (a, b)$, where $a = (r^k \bmod p) \bmod q$ and $b = k^{-1}(m + xa) \bmod q$, where $kk^{-1} = 1 \bmod q$. The signature $s = (a, b)$ is valid if $(r^{u_1} y^{u_2} \bmod p) \bmod q = a$, where $u_1 = mz \bmod q$, $u_2 = az \bmod q$ and $z = b^{-1} \bmod q$.

6) *Fiat Shamir Signature Scheme*

Fiat Shamir is used for creating digital signatures. Fiat Shamir heuristic is defined as non-interactive random oracle access and it's widely used for zero-knowledge proofs [12]. This scheme uses discrete logarithms.

7) Schnorr Signature Scheme

In the setup phase of the Schnorr signature scheme a Trusted Authority (TA) chooses a large prime p , a large prime q dividing $p-1$, an $a \in \mathbb{Z}_p^*$ of order q , and a security parameter t such that $2^t < q$. These parameters p, q, a, t are made public [12]. TA creates a secure digital signature approach with a secret signing algorithm sig_{TA} and a public verification algorithm ver_{TA} .

Then in the certificate issuing phase, TA verifies Alice's identity by conventional means and forms a string $\text{ID}(\text{Alice})$ which continues her identification information. Alice chooses a secret random $1 \leq a \leq q-1$ and computes $v = a^{-a} \pmod{p}$ and sends v to the TA. TA generates signature $s = \text{sig}_{\text{TA}}(\text{ID}(\text{Alice}), V)$ and sends $c(\text{Alice}) = (\text{ID}(\text{Alice}), V, S)$ back to Alice as her certificate.

A. Identification Protocol steps [12]

- i. Alice chooses a random commitment $0 \leq k < q$ and computes $Y = a^k \pmod{p}$.
- ii. Alice sends to BY and her certificate $C(\text{Alice}) = (\text{ID}(\text{Alice}), V, S)$.
- iii. Bob verifies the signature of TA.
- iv. Bob chooses a random challenge $1 \leq r \leq 2^t$ and sends it to Alice.
- v. Alice computes the response $y = (k + ar) \pmod{q}$ and sends it to Bob
- vi. Bob verifies that $Y \equiv a^y v^r \pmod{p}$.

8) Ciphertext-policy attribute-based encryption (CP-ABE)

The ciphertext communicates with the access structure and the key communicates with the set of attributes [16]. By using public parameters the user encrypts the data and decrypts the ciphertext with the attribute-based private key. The CP-ABE algorithm has four steps, setup, encryption, generating a key, and decryption, as follows:

Step 1: In the setup process, it results the public key PK and a master key MK.

Step 2: In the encryption process, it inputs a message m , as well as the access structure A and PK, and produces the ciphertext C.

Step 3: In the third step of generating a key, it inputs a set of characteristics S, MK, and PK, then produces a decryption key D.

Step 4: In the fourth step of decryption process, it inputs the key D, PK, C, and A. The user can decrypt and obtain the message m , if the numbers of characteristics that satisfy A in all the attributes relate to user D surpasses a specific threshold.

9) Lightweight Cryptography Algorithms

The purpose of a lightweight cryptography (LWC) algorithm is to compromise on a number of aspects, including resource consumption, performance, and cryptographic strength [9], [17]. The LWC is used smaller block sizes than traditional ciphers, and it also uses smaller key sizes. There are no particular requirements to fit in the LWC algorithms, however, block size, key size, code measures, clock cycles, etc. have paramount importance.

Lightweight algorithms use smaller circuitry, Read Only Memory, and Random Access Memory sizes, processing speed, power used by power harvesting devices, and power consumption for battery-powered devices, such as; cameras or sensors to adjust encryption algorithms for resource constraint environments like; SPECK, SIMON, PRESENT, and TWINE [18].

10) Blowfish Algorithm

The blowfish algorithm has two parts (i) the key expansion part which is used for transforming the variable key length to an array of several subkeys. The variable key length has advantages to this algorithm as brute force attack is not possible on it. (ii) data encryption which has 16 rounds of encryption steps and each consists of a permutation-based on key and another permutation, based on key and data [19]. The blowfish algorithm is also used for public-key and it is much faster than other algorithms like DES.

11) Advanced Encryption Standard (AES)

AES has such variations as AES128, AES192, and AES256 that are widespread symmetric block cipher algorithms [10], [19], [20]. AES uses 128, 160, 192, 224, and 256 bits symmetric keys. It combines plaintext with a provided key to calculate the ciphertext using a previous result. AES algorithms are also using block cipher modes of operation, such as; Cipher Block Chaining, Cipher Feedback, Electronic Code Block, etc. Those modes have different parameters and are meant to improve efficiency and provide stronger security [21] - [22].

12) Secure Hash Algorithm (SHA-256, SHA3-256, and SHAKE-256)

SHA-256 is a hash algorithm used in the latest SSL TLS v1.2 protocol [15], [23]. This algorithm is derived from a simpler cipher called Message Digest 4. The message digest formed by this algorithm can be used in software, firmware, and hardware to determine the message integrity [13]. SHA3-256 is an SHA-3 family cryptographic hash function. It is considered to be more secure as it has improved security features, such as; resistance to collision, pre-image and second pre-image attacks. SHA3-256 uses 1088 bits block size compared to 512 bits blocks of SHA-256 [24]. SHAKE-256 is an extendable output function of the SHA-3 family. Its main difference from SHA3 function is the output message length can vary depending on the requirements. The index 256 indicates the supported security level, not the digest length as for other hash functions [25].

AES-256, ChaCha20, and ChaCha20-Poly1305 have the largest key size equal to 32 bytes, while SHA3-256 and SHAKE-256 have the largest block size equal to 136 bytes.

13) *Comparison between the RSA and the Diffie-Hellman*

The RSA and the Diffie-Hellman both of them work differently but they used for the encryption and decryption of data [26] - [28]. The Diffie-Hellman can be integrated with the digital and public key certificates to prevent attacks. The Table 1 describes the comparison between the RSA and the Diffie-Hellman algorithms.

Table 1 Comparison of RSA and Diffie-Hellman

RSA	Diffie-Hellman
Very slow in key generation process	Cannot be used for asymmetric key exchange.
The RSA is slow in signing and decryption process.	Cannot be used for digital signature
Key is vulnerable to various attacks if poorly implemented.	The DH is vulnerable to man-in-the-middle attack and it could be used in Denial of Service attack.

14) *Comparison between the RSA and the DSA*

The RSA is an asymmetric algorithm, it has a digital signature, encryption, and key exchange functions, but as compared to the DSA, it is only used for digital signature schemes, it is not useable for key exchange and encryption. Table 2 is showing the difference between both the algorithms.

Table 2 Comparison of RSA – DSA

RSA	DSA
The RSA provides digital signatures, encryption, and key exchange.	The DSA is based only on digital signatures, and it has not the function of key exchanging and encryption.
The RSA provides public key method.	The DSA also provides public key method.
The RSA can be used for encryption and decryption	The DSA can only be used for signing and verification
The RSA, on the other hand, is fast at encryption than the DSA.	In the key generation process the DSA is faster than the RSA.
The RSA is a good choice for verification of the digital signatures.	The DSA is faster in decryption process. The DSA will be a good choice in the digital signing process as an encryption algorithm.

15) *Key size comparison between the ECC, RSA, DSA, and DH*

Table 3 describes the key size comparison between the ECC, the RSA, the DSA and the DH algorithms. The Elliptic Curve Cryptography is growing as a most trusted solution for providing security on embedded systems [29].

Table 3 ECC-RSA-DSA-DH [30]

Security strength/ Symmetric Key size (Bits)	Key Size	
	ECC Key size (Bits)	RSA/ DSA/ DH key size (Bits)
80	160	1024
112	224	2048
128	256	3072
192	384	7680
256	512	15360

16) Comparison between the DSA, the ElGamal, and the Schnorr

The ElGamal signature works modulo a prime p and requires one modular exponentiation (for generation) or two (for verification) with exponents as big as p , and the signature is two integers modulo p . The Schnorr and the DSA differ in key size, both works in a subgroup, generally a 160-bit subgroup for a 1024-bit modulus. Both the algorithm produces six times smaller signatures as compared to the ElGamal, and also both the Schnorr and the DSA algorithms are six times faster than the ElGamal.

17) Comparison of the RSA, the DES, and the ECDSA

The RSA algorithm is used for encryption and signature scheme in the component of blockchain data transmission and multi-signature. Digital signatures are public key techniques that accustomed to validate communications sent on a public channel, and whoever has a sender’s public key is able to verify it [31]. The Data Encryption Standard (DES) algorithm is a symmetric encryption algorithm [32]. It uses the same key for encryption and decryption operations. Also, it is vulnerable if the key is compromised, the data can be decrypted. The Elliptic Curve Digital Signature Algorithm (ECDSA) is an Elliptic Curve Cryptography-based simulation of the DSA. In addition, the authors in [33] have compared the time taken by the RSA, DES and the ECDSA for encryption and decryption, and for signature and verification.

However, the DES is faster than RSA during the encryption and decryption process, and the RSA is significantly faster than ECDSA during the signature verification procedure. Overall, the RSA has lower latency than the DES and the ECDSA. Besides, the DES require to share the key, and both parties, the sender and receiver need to cope the key.

Salma et al. have discussed hardware Implementation of biomedical data encryption using FPGA [34]. In their research, the encryption process for the DES takes 400 seconds, and for the RSA it takes 300 seconds to encrypt the same amount of data in MATLAB. In the decryption process, the DES consumed 390 seconds and the RSA consumed 350 seconds to complete the decryption process of the same amount of the data in MATLAB. The calculation of 100 characters of encryption/decryption, and signing/verification is shown in Figure 2.

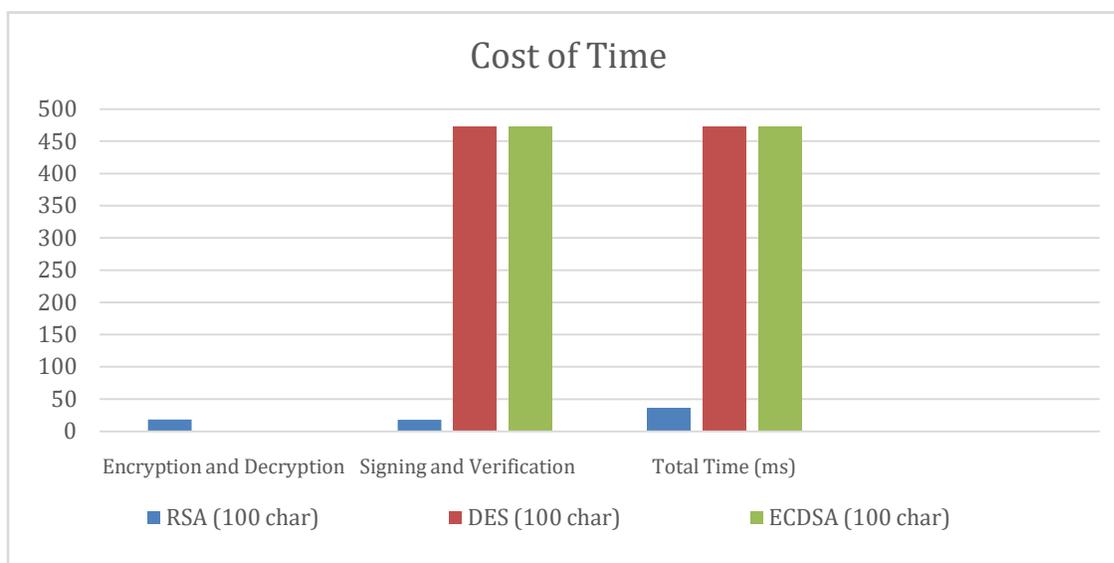


Figure 2 RSA - DES - ECDSA execution duration

18) Comparison of Digital Signatures

The key generation process of different algorithms the ECC, the RSA, and the DSA, with different key sizes, is compared with the execution duration process in Table 4.

Table 4 ECC - RSA – DSA [30]

Algorithms	Size	Sign (s)	Verify (s)	Sign (s)	Verify (s)
ECC	160 bit	0.0001	0.0003	12015.9	3081.8
RSA/ DSA	1024 bit	0.00031	0.000019	3220.6	53656.9
ECC	224 bit	0.0001	0.0002	10658.5	4770.9
RSA/ DSA	2048 bit	0.00204	0.000066	490.3	15257.5

ECC	256 bit	0.0002	0.0004	5729.1	2297.3
RSA/ DSA	4096 bit	0.017978	0.000268	55.6	3731.7

Figure 3 shows the signing and verification comparison between the ECC, the RSA and the DSA. The RSA and the DSA are taking less time in the signing process as compared to the ECC, but in the verification process, the ECC is taking very little time as compared to the RSA and the DSA, and also the ECC is using 160-bit size, on the other side, the RSA and the DSA are using 1024 bit size.

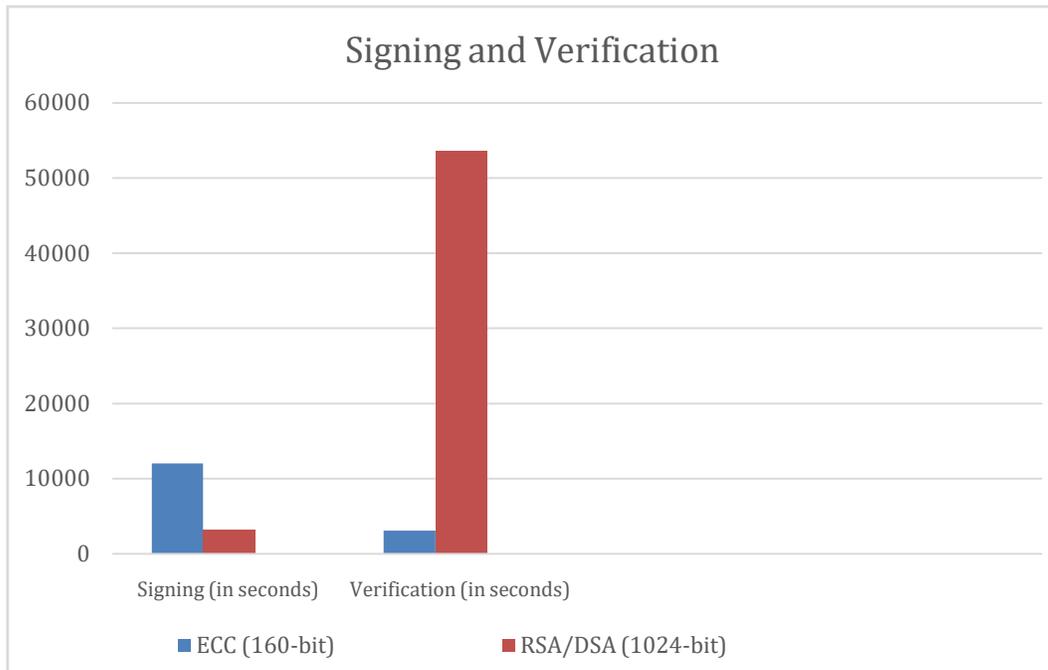


Figure 3 ECC - RSA - DSA signing and verification

19) Comparison of Execution Time

The ElGamal and the RSA algorithms are compared with parameters of execution duration with different message sizes in Table 5.

Table 5 RSA – ElGamal [6]

Message size	Operation	ElGamal	RSA
1 KB	Encryption	0.120 s	0.150 s
	Decryption	0.120 s	0.128 s
2 KB	Encryption	0.250 s	0.292 s
	Decryption	0.245 s	0.262 s
4 KB	Encryption	0.515 s	0.620 s
	Decryption	0.509 s	0.570 s
10 KB	Encryption	1.452 s	1.781 s
	Decryption	1.441 s	1.671 s
20 KB	Encryption	3.522 s	4.355 s
	Decryption	3.5.9 s	4.254 s
40 KB	Encryption	11.805 s	17.322 s
	Decryption	11.711 sec	22 sec

100 KB	Encryption	169 sec	195 sec
	Decryption	168 sec	250 sec

The authors have presented a comparison of the RSA, the Diffie-Hellman, the DSA, the ECC, the ElGamal, the DES, the ECDSA, and the Schnorr algorithm based on various criteria. Based on the aforementioned comparison, the RSA could be a good choice as compared to the Diffie-Hellman, because it is a public key cryptography approach, and it produces the digital signatures. ECC works on short key sizes as compared to the RSA, the DSA, and the DH. The Schnorr algorithm could be a suitable choice as compared to the DSA and the ElGamal, because it provides a multi-signature scheme, it works on the short key size, and it is six times faster than the ElGamal.

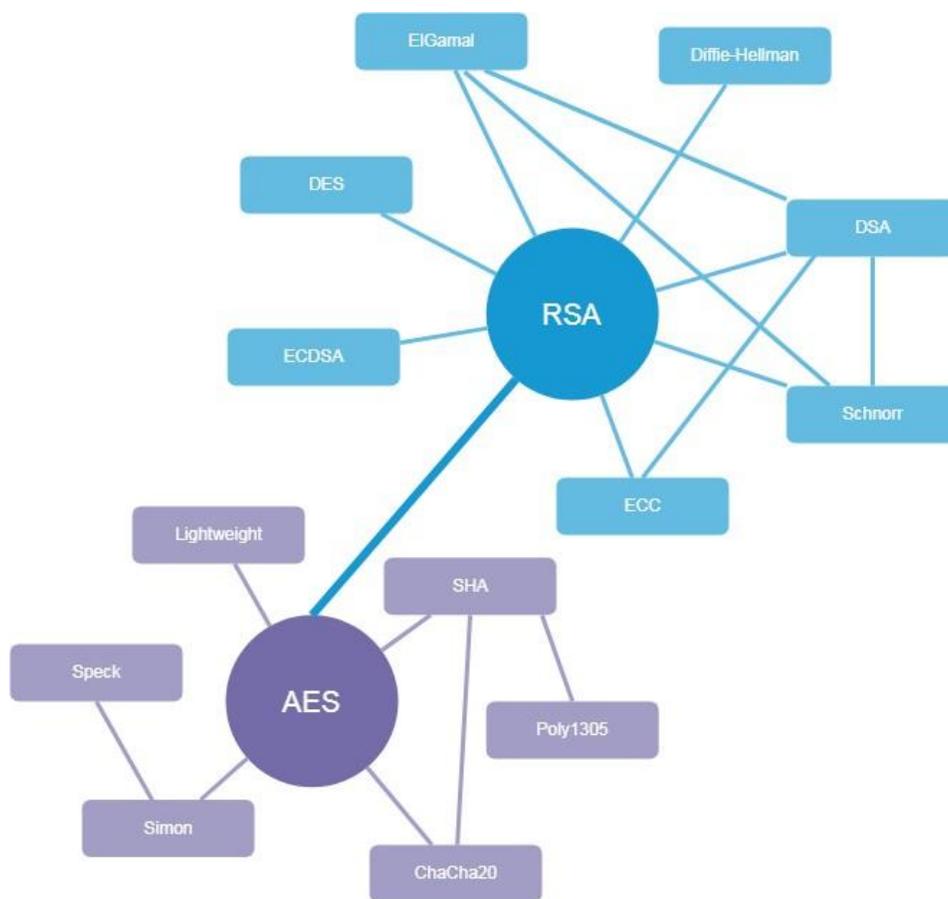


Figure 4 Comparison map

Figure 4 illustrates the comparison map of cryptographic algorithms. The authors focused to compare all the algorithms directly or indirectly with each other to ensure the quality of comparison and research.

III. EXPERIMENTAL ANALYSIS

The algorithms from Tables 6-8 are studied in the python programming language on a Ubuntu 20.04.1 LTS virtual machine with a base memory of 1024 MB, video memory of 16 MB, and a graphic controller VMSVGA. The process is done with 10 iterations of each algorithm, and the result is presented in the average of 10 iterations of each algorithm. In the key generation process shown in Table 6, the ElGamal takes 0.00305 seconds to process, and the DSA and the RSA are taking more time than the ElGamal. In the encryption and decryption process, as shown in Table 7, the ElGamal takes less time than the RSA in the prospect of encryption, and in decryption process the ElGamal takes more time than the RSA. When comparing the total time needed for encryption and decryption, the RSA is faster than the ElGamal. In the process of digital signatures, as shown in Table 8, the signing and verification process, the ElGamal is faster than all other algorithms in the verification process. However, the DSA is overall faster than the RSA, the ElGamal, and the Schnorr multi-signature.

Based on the results presented in the Tables 6-8, it is evident that the ElGamal is performing better in the key generation process, the RSA performs better in the encryption and decryption process, and the DSA performs better in the digital signature process.

The result analyzed in Tables 9-11 are experiments in the following environment:

Hardware: Monitor, Wireless Keyboard, Wireless Mouse, Raspberry Pi 3 Model B and Raspberry Pi Zero W, 32 GB Secure Digital Card, Charger 5V 2A, Universal Serial Bus flash drive for simpler algorithm transferring.

Additional Hardware for Raspberry Pi Zero W: High-Definition Multimedia Interface cable, mini HDMI to HDMI adapter and micro USB to USB type A adapter.

Operating System: Raspberry Pi 32-bit OS. The operating system is installed on a 32GB SD card using the Raspberry Pi Imager v1.6.1 application.

File: Created with “.txt” extension.

IDE: Thonny, a built-in python development environment is used for code execution.

As the result shows that the algorithms throughput increased in parallel with the file size, and there are no cardinal changes in connection to the device model as lower performance for the Zero W model is uniform across all cryptographic algorithms. The hash function SHA-256 kept showing the best results in every throughput test. AES-128, AES-192, and AES-256 showed similar and comparatively low results along the way. In the test with 1,048,576 bytes file for Raspberry Pi 3 Model B, AES-128 block cipher reached 8,975,997 bytes per second, while Simon, the lightweight block cipher, gathered 60,506,405 bytes per second.

Table 6 Comparison of Key Generation

Name of Algorithm	Execution Time (average of 10 iterations)
RSA	3.75461 s
DSA	0.0065 s
ElGamal	0.00305 s

Table 7 Comparison of Encryption and Decryption

Name of Algorithm	Encryption: Execution Time (average of 10 rounds)	Decryption: Execution Time (average of 10 rounds)	Total Execution Time
RSA	0.02269 s	0.0513 s	0.07399 s
ElGamal	0.00132 s	56.52932 s	56.53064 s

Table 8 Comparison of Digital Signatures (Signing and Verification)

Name of Algorithm	Signing: Execution Time (average of 10 rounds)	Verification: Execution Time (average of 10 rounds)	Total Execution Time
RSA	4.90917 s	0.01136 s	4.92053 s
DSA	0.00143 s	0.00536 s	0.00679 s
ElGamal	0.00347 s	0.00426 s	0.00773 s
Schnorr multi-sig	0.33162 s	0.47101 s	0.80721 s

AES-128, AES-192, AES-256: In comparison to the lightweight block algorithms, demonstrated significantly lower throughput. The AES algorithms are on average 5 times slower than lightweight algorithms. Though, the power consumption during encryption of

small files is similar to other algorithms, but twice as higher compared to Simon for encryption of large plaintext. Memory usage is not adapted to the needs of the resource constraint environment as it outputs the same size ciphertext.

SHA-256: This algorithm showed the best results of the throughput measurements among all algorithms there are no deviations from the average power consumption compared to others. Among hash functions, SHA-256 required the biggest memory space about twice more than the rest of the hash functions.

SHA3-256 and SHAKE-256: It demonstrated analogous test results. Throughput is noticeably smaller than SHA-256 had, while power consumption results are slightly better for the large size files.

Poly1305-AES: This performed well for the encryption of the large plaintext, had average power consumption and had a fixed output smaller than the SHA family.

ChaCha20: ChaCha20 showed good throughput and average power consumption results for a stream cipher. It produced ciphertext file sizes that are slightly bigger than the input, therefore, not adapted for use in a constraint environment.

ChaCha20-Poly1305: This showed better throughput and power consumption results than ChaCha20 and Poly1305 for the small sized plaintext as ChaCha20 it produces large ciphertext.

Speck and Simon: Speck demonstrated improved performance except in the cases when an extra-large plaintext is provided, in that case, Simon is more effective. The same situation is noticed during the power consumption tests, while memory usage is almost identical.

Table 9 Comparison of AES – SHA – Poly1305 – ChaCha20 – Speck – Simon

Algorithm Name	Key Size (byte)	Initialization vector (byte)	Nonce Size (byte)	Block size (byte)	Rounds
AES128	16	16	-	16	10
AES192	24	16	-	16	12
AES256	32	16	-	16	14
SHA256	-	-	-	64	64
SHA3-256	-	-	-	136	24
SHAKE-256	-	-	-	136	24
Poly1305-AES	16	-	16	16	-
ChaCha20	32	-	12	64	20
ChaCha20-Poly1305	32	-	12	-	-
Speck	16	-	-	16	32
Simon	16	-	-	16	68

Table 10 Analysis on file size 1024 bytes

Algorithm Name	Memory usage (byte)	Execution time (sec)		Throughput (bytes/sec)		Power consumption increase (%)	
		3 B	Zero W	3 B	Zero W	3 B	Zero W
AES-128	1024	0.00349	0.02307	293,410	44,387	87	43
AES-192	1024	0.00343	0.02278	298,542	44,952	84	36
AES-256	1024	0.00347	0.02316	295,101	44,214	77	43
SHA-256	64	0.000054	0.00020	18,962,963	5,120,000	77	36
SHA3-256	32	0.00040	0.00153	2,560,000	669,281	84	29
SHAKE-256	26	0.00041	0.00149	24,975,60	687,248	84	29
Poly1305-AES	16	0.00089	0.00544	1,150,562	188,235	81	36

ChaCha20	1032	0.00063	0.00243	1,625,397	421,399	84	21
ChaCha20-Poly1305	1024	0.00023	0.00089	4,452,174	1,150,562	90	39
Speck	39	0.00072	0.00351	1,422,222	291,738	84	29
Simon	39	0.00129	0.00505	793,798	202,772	81	29

Table 11 Analysis on file size 1048576 bytes

Algorithm Name	Memory usage (byte)	Execution time (sec)		Throughput (bytes/sec)		Power consumption increase (%)	
		3 B	Zero W	3 B	Zero W	3 B	Zero W
AES-128	1048576	0.11682	0.29897	8,975,997	3,507,295	87	43
AES-192	1048576	0.13226	0.33979	7,928,141	3,085,953	87	43
AES-256	1048576	0.14863	0.36398	7,054,942	2,880,862	81	36
SHA-256	64	0.01260	0.04819	83,220,317	2,175,920	87	36
SHA3-256	32	0.09432	0.21298	11,117,218	4,923,354	87	36
SHAKE-256	26	0.09465	0.215916	11,078,457	4,856,407	81	36
Poly1305-AES	16	0.02014	0.04972	52,064,349	21,089,622	84	29
ChaCha20	1048584	0.03299	0.08541	31,784,662	12,276,970	84	36
ChaCha20-Poly1305	1048576	0.05555	0.15778	18,876,256	6,645,810	84	36
Speck	39	0.01970	0.06182	53,227,208	16,961,760	81	29
Simon	39	0.01733	0.06212	60,506,405	16,879,845	39	36

According to the result, the authors analyzed that four algorithms are better than others, such as; Schnorr, RSA, Elliptic Curve Cryptography and ElGamal. The authors further try to prioritize them. ElGamal is expensive and the key size of it is larger. ElGamal is slow for signing the signature, and also it needs a random number. ElGamal has a disadvantage in the sense of message expansion factor, it is expanding by a factor of two-place while encryption which means that the ciphertext is two times larger than plaintext. ECC is fast in key generation, and also it has small key sizes, signatures, and cipher text, ECC is also fast for signatures. ECC is faster than RSA in the sense of signature process. But, ECC is difficult to implement securely; importantly it is the standard curve. The standards of the ECC are not the state of the art, especially ECDSA and another disadvantage of ECC is, it is signing a signature with a broken random number generator that has the chance of compromising the key. It may be costly, particularly in a binary curve, and ECC is slow in public key operations. RSA is more suitable to implement as compared to ECC. It is very easy to understand. RSA is similar in encryption and verification, and also it is the same in decryption and signing. It is deployed widely. But RSA is a large key size and the signing and decryption process is slower. RSA is very slow in the key generation process. If it is implemented poorly then it has a chance in the two-part key which may be vulnerable with GCD, and a middleman can attack. If we have a large data size to encrypt, RSA is very slow in this case. Currently, the two most popular approaches to digital signatures are discrete logarithm and elliptic curves. The reason for their popularity is that they have short keys in size in which security is not compromised and computational efficiency is better for both of them. Under the discrete logarithm approach, the ElGamal algorithm based signatures are often deployed. DSA is also a widely used algorithm that was patented but the National Institute of Standards and Technology (NIST) issued a royalty-free license in 1993. Besides DSA, Schnorr is also a great algorithm. It is not commonly used, because it was under patent until 2008. Schnorr provides better digital signatures than others. Its security and security proof is very strong. It is also faster and more efficient than other algorithms. It also has the feature that, it can combine two signatures in a very simple way which will later create a multi-signature. The feature of these multi-signatures is that, this approach gives the benefit of low accountability and high privacy and the key look like a single signature. The advantage of high privacy is that only the participant can view this policy and no third party can view it. There are advantages and disadvantages of low accountability. If there is a signing requirement in it, you cannot see the signers. So, it can be harmful if it is used as a financial multi-signature. And the advantage of it is, helpful for signatures in the ring and group, both of which depend on anonymity.

So, finally, the authors prioritized them, first Schnorr when choosing digital signatures, second RSA when choosing encryption, third ECC, and the fourth is ElGamal.

IV. CONCLUSION AND FUTURE RESEARCH

In this research, 23 algorithms have been discussed, compared, and analyzed with key size, message size, and execution time parameters. The authors examined the most familiar algorithms in the python programming language and discussed the result in this paper. The algorithms from Tables 9-11 were analyzed on the Raspberry Pi environment and discussed the result. We recommended the best suitable and fast cryptographic algorithms to fill the communication gap between the IoT devices over the internet and intranet.

The attacks on these cryptographic algorithms and how to mitigate them are out of the scope of this paper. In the future research direction, more cryptographic algorithms have been combined and analyzed, also hash function needs more analysis which is not discussed in detail in this paper.

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Social Demographic Characteristics and Teachers' Performance in Government Aided Secondary Schools: Evidence from Uganda

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Abstract- In this study, we aimed at examining the association between social demographic characteristics of teachers and their performance in government-aided secondary school Kasese district southwestern Uganda. Using purposive and stratified for both schools and teachers in this quantitative study, we recruited 234 teachers from 25 government aided secondary in Kasese district southwestern Uganda

Data was analysed using SPSS version 24, and presented using both descriptive and inferential statistics.

Our findings indicate that social demographic characteristics of respondents such as gender, age and education levels are significant predictors of teachers' performance in secondary schools of Kasese district southwestern Uganda.

We conclude that some teachers' social demographic characteristics have a significant influence on teachers' performance in government-aided secondary schools with in Kasese district south western Uganda. We recommend that policy makers design the most appropriate interventions entailing human resource practices aimed at streamlining the needs of teachers from different demographic cohorts.

I. INTRODUCTION

Teachers are the most important resource in education system world over (Kizi & Ugli, 2020). For instance, since early 2000s, policies in the United States of America have aimed at identifying performance of individual teachers to ascertain their contribution towards a bigger institution (Symeonidis, 2015). Similarly, between, 2007 and 2012, France dropped 80,000 teachers because of their decline in performance following the recommendations of Union Nationale de Syndicats Autonomes (UNSA) report (Symeonidis, 2015). Countries like Brazil were not exceptional of this situation (Repec, 2013). Likewise in Nigeria, in Ogun, state public secondary school teachers under Nigeria Union Teachers (NUT) an umbrella body that brings teachers together, teachers have gone on strikes because of poor remuneration systems, thus, compromising performance (Abiodun, Dele, & Abimbola, 2015). These strikes were mostly

seen between 2009 and 2015 because the government had failed to implement 27.5% increment on teachers' salaries as agreed upon with NUT (Abiodun, Dele, & Abimbola, 2015). Finally, this led to low performance of teachers, as most of them could no longer come early to school. Teachers' absenteeism was high compromising their ability to assess learners and conducting normal duties as expected (Gbenga & Yakub, 2018).

In March 2018, World Bank through its report "Severe Learning Crisis" on Africa revealed that there is need to support teachers better in areas of preparation, supervision and deployment in order to have them perform better (Bashir, et al., 2018). Policies need to be developed and address high rates of teacher absenteeism, lack of teacher knowledge, and skills and focus more on better and effective teaching (World Bank Group, 2018) for instance from 2006-2010, Cameroon and Madagascar governments tried to hire contract teachers by introducing the Contract Teacher Program (CTP) (Kepa, 2015). Communities started hiring teachers at their own expenses paid by parents but still performance of teachers remained uneven and low (World Bank Group, 2018). In 2012, Kenya developed the Teachers Service Commission (TSC), which aimed at improving the performance of teachers. Section 11 (C) and (F) of the Constitution of the Republic of Kenya talk of monitoring the performance of teachers in public learning institutions (Kagama & Irungu, 2018). The TSC calls for use of confidential reports in assessing teacher performance. In a bid to improve on this, Kenya has also introduced a more modern and open assessment system where the teacher participates in their performance (Ngeno, Bett & Chervigot, 2013). Poor performance was also manifested in 2014 in the Ministry of Internal Security despite efforts made by government to improve their performance (Long & Gibson, 2015). Performance of teachers is primarily considered to be the core for the success of schools and education in Uganda (Kigenyi, 2017) and is influenced by a number of factors among which include demographic characteristics. The study by Francisco (2020) on teachers' personal and professional demographic characteristics as predictors of students' academic performance in English found out that teachers' demographic variables do not have any significant

effect on performance. However, a number of studies have pointed out that demographic characteristics such as age, gender, education level, marriage, religion, ethnicity among others are significant predictors of teachers' performance not only in secondary schools but also in other levels of education (Kabadayi, 2010; Kimani, Kara, & Njagi, 2013; Mahmood et al., 2021; Sadeghi & SimaKhezrlou, 2014; Stearns, et al., 2016).

For the last two decades, the Uganda government has invested a lot in secondary school teachers with a sole intention of improving their performance (MOES Report, 2017). Although, these initiatives have been put in place, performance of secondary school particularly in upcountry areas is still wanting, particularly in areas of preparation, content delivery, students' assessment and evaluation (Jackline, 2018). This has greatly compromised the quality of education in government-aided secondary schools in upcountry communities of Uganda (Jackline, 2018). The situation is not any different in Kasese District of western Uganda, where teachers' performance in government aided secondary schools has for many years lagged behind (Baluku & Kasujja, 2020). It is acknowledged that despite several attempts and initiatives by the government of Uganda through the Ministry of Education and Sports to improve the education system, teacher performance in government-aided secondary schools in Kasese District has remained at bottom half of the pyramid (Jackline, 2018).

Several studies have tackled a number of factors linked to poor performance of teachers in government-aided secondary schools in Kasese District including but not limited to compensation and remuneration, motivation, leadership, adoption of ICT among others ((Murongo & Nzaghale, 2019; Kisembo, 2015; Kule, et al., 2021; Jackline, 2018). However, little research has been focused on teachers' social demographic characteristics even when studies in different parts of Uganda and the world have concluded that they have a bearing on performance of teachers not only in government aided secondary school but also other levels of education (Kabadayi, 2010; Mahmood, et al., 2021; Stearns, et al., 2016). The Ministry of Education and Sports Annual Evaluation Report (2012), UWEZO Report (2016) and Kasese District Annual Performance Report, Education Extract (2017) show that teacher performance in the district is low as manifested in teacher absenteeism, missing scheduled lessons, poor time management, low staff attendance, late coming, and lack of team work. Both the Ministry and UWEZO reports did not cater or control for teacher's social demographic characteristics while assessing their performance. To this effect, little research is known on whether teachers' individual characteristics particularly social demographic variables of gender, age, levels of education, and marital status could have tangible impact on the performance of these teachers. The current study examined the association between the teacher's social demographic characteristics on their teachers' performance in government-aided secondary schools in Kasese district of south western Uganda.

II. METHODOLOGY

Research design, Population and Sample size

This study was a cross-sectional study design adopting a quantitative approach of data collection. The design enabled the collection of data in its natural setting and depict an overall picture of the phenomenon at the time of the study (Kumar, 2011; Koul,

2005). The survey targeted 601 teachers from government-aided secondary schools in the Kasese district. Teachers were considered because the study is looking at their performance in the context of their remuneration in government-aided secondary schools. A sample size of 234 teachers was selected from 25 government-aided secondary schools in Kasese District. These were randomly selected to participate in this study. A maximum variation approach was used in the selection of the schools for the study. In the same vein, study participants were selected using probability sampling techniques where stratified and simple random were applied.

Questionnaire and measurement

Data were collected from the participant using a structured questionnaire set on a four-level Linkert scale. The questionnaire was administered to the participant by the researcher to ensure clarity and consistency in answering the questions. These questions were anchored on a four-level Linkert scale i.e. 0-3 was used whereby 0=Not at all, 1=Sometimes, 2= More often, and 3=Almost Always. This tool has been used in a similar setting in Uganda (Ssekakubo, 2014).

Data Management and Analysis

Data were coded and a database was created using the Special Package for Social Scientists (SPSS version 24) a computer program used to customize the data entry process and analysis. The codes were designed based on a pretested standardized questionnaire. At the end of every day of data collection and before the data entry process, the researcher checking for possible errors, incompleteness, misclassification edited data /filled questionnaires, and gaps in the information obtained.

Ethical Consideration

We sought permission and ethical clearance from the Research Ethics Committee and Uganda National Council of Science and Technology (UNSC), which is the body mandated to issue ethical clearance letters in Uganda. The researcher sought informed consent of the respondents and made it known that their participation is voluntary and they are free to withdraw from the study at any time or free not to answer questions that they are not comfortable with. Research findings were reported completely and honestly, without misrepresenting any responses given or intentionally misleading readers and researchers interested in this study.

III. RESULTS

Characteristics of teachers

This study included 234 participants who included teachers from government aided secondary schools and education stakeholders in Kasese District. Result indicate that majority of the participants 208 (88.9%) were males whereas the minority 26 (11.1%) were females. This indicates that there are more male teachers than female teachers in government aided secondary schools in Kasese District.

Results as well indicate that majority of the participants: 186 (79.5%) were married, 45 (19.2%) were single, 2 (0.87%) were widowed and 1 (0.43%) was divorced. This clearly indicates that

married staffs prominently spearhead the teaching profession in Kasese District.

Additionally, the findings unveiled majority of the respondents: 86 (36.8%) as having spent a period between five and ten years in the teaching profession, followed by 66 (28.2%) who had spent a period between 11-15 years in teaching whereas the minority 24 (10.3%) had spent less than five years in teaching profession. This implies that about 89.7% of the teachers in government-aided secondary schools in Kasese District have spent more than five

years in the teaching profession indicating that the area has experienced teachers.

Finally, on the characteristics, majority of the participants; 144 (61.5%) held bachelors' degrees in education, followed by 64 (27.4%) who were Grade V (Diploma in Education Secondary) whereas the least 26 (11.1%) had a Masters level of education qualifications. For more information, refer to findings as presented on Table 1.

Table 1: Characteristics of respondents (N=234)

Characteristic	Frequency	Percent
Gender		
Female	26	11.1
Male	208	88.9
Age		
18-30	24	10.3
31-40	110	47.0
41-50	63	26.9
50 and above	37	15.8
Marital status		
Single	45	19.2
Married	186	79.5
Divorced	01	0.43
Widowed	02	0.87
Years of service		
less than 5 years	24	10.3
5-10 years	86	36.8
11-15 years	66	28.2
16-20 years	27	11.5
above 20 years	31	13.2
Qualifications		
Grade V	64	27.4
Bachelors	144	61.5
Post graduate	26	11.1
Main Variables		
	Mean	SD
Employee's performance, total score	22.2	3.81
Incentives, total score	7.18	3.56
Salary, total score	7.87	0.56
Benefits, total score	14.3	3.12

Hierarchical regression showing the Individual contribution of each independent variable to the dependent while controlling for gender, age and qualification

Results indicate that teachers who were postgraduates and graduates performed highly compared to the grade V (b=1.074, p<=0.001, b=0.784, p=0.012 for Postgraduates and graduate teachers respectively). Performance of teachers in age category of 41-50 was high compared to those in age category of 18-30 (b=0.221, p<=0.001). Gender was not a significant predictor of performance in this study. Furthermore, results indicate that teachers who were post graduates performed highly compared to the grade V (b=1.102, p<=0.001).

Table 1: Hierarchical Regression

	Model 1		Model 2		Model 3	
	B	SE	B	SE	b	SE
(Constant)	29.42	3.759	28.69	3.916	27.91	4.01
Age						
18-30	Ref		Ref		ref	
31-40	-.628	.857	-.608	.858	-.622	.859
41-50	.138	.940	.221	.949	.201	.950
>50	-1.148	1.034	-1.138	1.035	-1.168	1.036
Gender (Male)	-.315	-.556	-.336	.558	-.327	.558
Qualification						
Grade V	Ref		Ref		ref	
Bachelors	.718	.573	.733	.574	.807	.580
Post graduate	1.074	.944	1.068	.945	1.102	.946
Adjusted R Square		0.150		0.103		0.120

Dependent Variable: Staff Performance; N=234; B, regression coefficient, SE, Standard error

IV. DISCUSSION AND CONCLUSION

Discussion

This study set out to examine the influence demographic characteristics on teachers’ performance in government-aided secondary schools in Kasese district of western Uganda. Focus was placed on gender, age, and education level of teachers.

From the findings, we found out that there are more male teachers than female teachers in government aided secondary schools in Kasese district of western Uganda. This points to gender inequality in Uganda’s institutions of higher learning. The study by Odaga (2020) revealed that men outnumbered women by a ratio of eight to two reflecting the highest level of gender inequality. Irrespective of the efforts laid down to bridge the gender gaps, little progress has been realized. From the gender perspective, the present study found that gender was not a significant predictor of teachers’ performance in Kasese district. The findings concur with an earlier study by Islahi and Nasreen (2013), which found that male and female teachers exhibited insignificantly different effectiveness, an indication that gender has nothing to do with individual teacher’s performance. Relatedly, another study by Wanakacha, Aloka, and Nyaswa (2018) revealed that that gender difference did not have an effect on both intrinsic and extrinsic motivation of teachers to perform their core functions. Though the study was looking at a different component of motivation and how it affects performance of teachers, a closer link looks at how a demographic characteristic of gender and its contribution towards performance of teachers. Basing on this empirical evidence, it is clear that gender dimension has less significant towards performance of teachers in not only Kasese district but also other areas in Uganda and beyond. Until another study is done disputing this fact, for now, this is the evidence at hand.

We found out that age was a significant predictor of teachers’ performance in government-aided secondary schools of

Kasese district, western Uganda. We found out that senior teachers in the ages of 41 and above were better performers than the young ones. These findings are in disagreement with prior findings by Pranoto, Utami, and Latiana, (2021) there is no significant correlation between teaching experiences and age ranges to the quality of teaching performance. To the contrary, the study by Ismail, Rozita, and Abas (2018) reported that teachers’ age and teachers’ teaching experience significantly influenced their effectiveness in teaching problem solving skills in the classroom settings. Older teachers might be more knowledgeable, as they had ‘knowledge base’ that is developed over years of teaching experience compared to the younger teachers. All these findings point to the fact that as teachers grow through ranks in the teaching profession, their skills and competence grow eventually.

We found out that teachers’ education level was a significant predictor of their performance, the higher the teachers’ qualification, the higher the level of performance. Findings revealed that teachers at graduate and postgraduate level were performing better than those of Grade V. These findings concur with previous findings by Babatunde et al (2021) which found out that there was a great significant influence of the teacher’s academic qualifications and qualifications on students’ academic performance. It should be noted that students’ academic performance is an important indicator of teachers’ performance. In the same stance, the study by Waweru (2016) revealed that higher qualification improves teaching performance on instructional preparation, adoption of better teaching strategies, assessment and evaluation of students and maintenance of student discipline. Educational qualification come with mastery of new skills, professional growth and competence as time goes by. It is from this view, that we find teachers level of education imperative towards improved performance in the context teaching profession.

Conclusion

Age and education level are significant predictors of teachers performance in government-aided secondary schools of

Kasese district, western Uganda. On the other hand, gender was found to be an insignificant predictor of teachers' performance in government-aided secondary schools of Kasese District, western Uganda. Whereas age and qualifications have an influence towards teachers' performance, gender was found to have no impact on the performance of teachers in government-aided secondary schools. This happens on top of the fact that there were more male teachers than female teachers in the area.

Recommendations

There is a need for education service commission to recruit more teachers to bridge the gaps of gender inequality existing among teaching staff in government-aided secondary schools of Kasese district, western Uganda. Whereas the study found no statistical significance between gender and teachers' performance, gender inequality aspect may have a long-standing impact on performance of teachers. This calls for further study to ascertain the implication of gender inequalities in teachers' staffing on their performance in government aided secondary schools not only Kasese district but also the rest of the country.

It is now known that educational level is a significant predictor of teachers' performance, these calls for the need to support teachers' professional growth and career lifelong learning. This will help in enhancing teachers' competence and learning of new skills in the teaching arena. This can be done through extending incentive and policy reforms aimed at encouraging more teachers to upgrade and uplift their qualifications in the teaching profession.

There is a need for educational stakeholders such as head teachers, inspectors and the ministry of education to pay attention to different demographic variables and how they influence performance among teachers in government aided secondary schools. Taking stock of these factors such as age, gender and education qualification can help in policy reforms to bridge the gaps arising from teachers' performance.

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Visualization Teaching Methodology For Assimilation Of Knowledge: An Adult Educator's Approach

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Abstract: This paper takes a critical and in-depth analysis of visualization as a teaching methodology which enhances assimilation of knowledge by students. This methodology was developed by a Community development Lecturer and has been proved to be very effective in teaching students through a participatory approach coupled with visualization and the field work approach as investigative learning experience. It is recommended that teachers of the social sciences and adult educators adopt this approach to enhance assimilation of knowledge, encoding of information and thus, enable students impact positively on their world after graduation. It exposes the students to the skills of enquiry learning, stimulates their thinking and makes them problem-solving conscious. Though, found to be challenging to the Lecturer, its use will, over time, elicit such satisfaction in the teacher that his versatility will be enhanced.

Keywords: Visualization, Teaching Methodology, Assimilation, Knowledge, Adult Educator.

Introduction

Creative thinking ability is usually developed if a student is exposed to the skills from infancy. This is what education ought to impart to the human organism as a means to conquer his environment. Fafunwa (1994) stated that education is the aggregate of all the processes by which a child or young adult develops their abilities, attitudes and other forms of behaviour which are of positive values to the society in which he lives; that is to say, it is a process for transmitting culture in terms of continuity and growth and/or disseminating knowledge either to enhance social control or to guarantee rational direction of the society or both.

To be able therefore, to fulfill the purpose of education, teachers have to endeavour to task the intellectual capacity of the students. They should be able to associate abstractions with realities. This is where the challenge lies. The teaching of abstraction challenges the intelligence of a student to grasp constructs which enhance his problem-solving abilities. It also challenges the versatility of the teacher to make more concrete abstractions for use by the student to solve problems, which is the kernel of human development. Bah (1982) regretted that many teachers are like donkeys or mules which tread forever round and round the same course once they have learnt the routine. For an ideal university teacher therefore, an effort has to be made to innovate so that the student can relate abstraction to solve emergent problems in the society. This borders on traversing the information superhighway for knowledge and to visualize abstracts and bring them live to knowledge recipients. In this regard, Adult education as a programme of study on our campuses has multiplier effects as it fits nicely into the scenario created above.

Adult education utilizes subtle ways to lure and retain adults in learning experiences. Through the process of diffusion and assimilation, adult learning facilitators can begin their job of positive influence right there on the campuses (Kobani and Kpurunee, 2019) and as emphasized by Smith in Kobani (2018) adult educators must concern themselves with what the learners learn, what holds their attention most and their reactions to specific methods and techniques used.

Homily (2000) saw visualization from its verb form to visualize as meaning to form a picture of something or somebody in one's mind or to imagine. For the teacher therefore, visualization will mean forming constructs or abstractions in creative manner. Artists who have visual images of abstractions create these in drawing. For the teacher, this will mean forming mental images and using words to create these images or bring them to life.

Value of Good Tertiary Education

Tertiary education, also referred to as third stage education, is the educational level following the completion of a school providing a secondary education. It is an optional final stage of formal learning often delivered at universities, polytechnics, academies, colleges, seminaries, conservatories, and institutes of technology. Tertiary education typically seeks to ensure students have a broad understanding of many subjects, with an extensive and deep understanding of a particular field of study. It is an educational level where one is exposed to diverse knowledge while focusing extensively on one field. A popular campus pun says 'a university is a universe in a city and a city in a universe'. The diverse experiences on campus positions tertiary education graduates for the inter-relatedness of knowledge in the future. Completers of tertiary education institutions are awarded with certificates, diplomas, and other degrees (Kobani and Kpurunee, 2021). Justifying the need for tertiary (higher) education, Wilhelm von Humboldt in a letter to the Prussian king, wrote:

There are undeniably certain kinds of knowledge that must be of a general nature and, more importantly, a certain cultivation of the mind and character that nobody can afford to be without. People obviously cannot be good craftworkers, merchants, soldiers or Businessmen unless, regardless of their occupation, they are good, upstanding and – According to their condition – well-informed human beings and citizens. If this basis is laid through schooling, vocational skills are easily acquired later on, and a person is always free to move from one occupation to another, as so often happens in life. (Günther, K. H. 1988: 127–136).

The Federal Republic of Nigeria (2004), indicated that the goal of tertiary education, amongst other goals, was to develop the intellectual capability of individuals to understand and appreciate their external environments and acquire both physical and intellectual skills which will enable individuals to be self-reliant and useful members of the society. In order to achieve such goals, teachers in tertiary institutions are required to undergo training in the methods and techniques of teaching.

The World Bank (2003) showed that good quality tertiary education promotes economic vitality, improves people's health and livelihoods, and encourages open and cohesive societies. By their opinions, better education can transform the development prospect of developing and transition countries around the world, reducing poverty and inequality, and boosting economic growth. For this they concluded that tertiary education stands out in particular as they key to harnessing a global economy which increasingly relies on the use of ideas and technology to devise smarter ways of working and doing business.

Emphasizing the value of tertiary education Salami (2003) stated that more than ever, tertiary education drives a country's future, and in today's world it can make the difference between a dynamic economic and a marginalized one. As a result, modernizing the content and management of tertiary education must play a key role within a country's overall education agenda.

Salami went further to say that the key to a country's full participation in the global knowledge economy is the development of a comprehensive learning system that can move people from primary and secondary up through university level education and other forms of higher learning including workplace training where employers can update their skills on the job.

To be able to fill these needs, tertiary institutions need to have skilled Lecturers who are able to deliver the knowledge that is available in the information highway and to innovate. The task is arduous because knowledge management is vital for tertiary institutions.

Knowledge Management

As has been stated above the starting point for knowledge management is the cultivation of knowledge. McKinsey & Company (2003) showed that at a society level, two factors have the greatest influence on cultivation of knowledge, viz; education and the research and development environment.

What an education system is to achieve in this area as pointed to by McKinsey & Company (2003) which opined that "an effective education system cultivates talented individuals, and helps to create an environment in which these individuals have the opportunity and the aspiration to develop their own intellectual capital to its potential over time, and develop new forms of knowledge". In their opinion too, the payback to society is often longer term, but systemic and fundamental. Conclusively, McKinsey & Company (2003) showed that a society is in a position to cultivate knowledge effectively through its education system if three conditions are met:

- High-quality educational institutions exist at all levels, that will assist an individual to reach the potential of his or her intellectual capability;
- Individuals from all socio-economic levels of society have access to those institutions;
- A high proportion of individuals wish to take advantage of that access – i.e. continue their education beyond the maximum school leaving age into tertiary and post-graduate education.

In terms of knowledge cycle, McKinsey & Company (2003) stated that knowledge development cycle is not linear; knowledge does not remain stagnant once cultivated. When knowledge is disseminated and used, it is often improved. A teacher, in their opinion, who imparts knowledge, adds his or her experience or interpretation; a student who uses knowledge may conduct additional research. The three dimensions are to some extent blended. The student improves the knowledge, and the teacher in turn passes on the improved knowledge to the next student or the next class. And so the cycle continues.

Teaching/Learning

As assessment of the teaching/learning experience in Nigeria appears to show a gross deficiency requiring a critical shift from the status quo. This fact was highlighted by Sainta, Hartnett and Stressner (2003) who regretted that much of university teaching in Nigeria is based on traditional pedagogy and conventional curricular, and does not even meet the government's own standards in these areas. In their opinion, in today's world, the content and method of Nigerian university teaching is often outdated, not responsive to employer's requirements, and disconnected from the labour market. They stated further that likewise, its research output is extremely low and unable to prompt innovation-based productivity gains. They suggested that in order to increase the relevance and effectiveness of teaching and research, classroom dynamics may need to focus more on student learning performance, and that academic performances should seek stronger linkages with employers, and universities might pursue knowledge coalition with other institutions that possess a comparative advantage in some aspects of teaching and research.

The goal of learning should be clear: development of young people who can rise to the challenge of impacting their world positively through knowledge acquired in their institutions.

Bah (1982) expressed the same opinion when he quoted Bertrand Russell who stated:

When we have created young people freed from fear and inhibition and rebellions or thwarted instincts, we shall be able to open to them the world of knowledge, freely and completely, without dark hidden corners; and if instruction is wisely given, it will be a joy rather than a task to those who receive it. It is not important to increase the amount of what is learnt above that now usually taught to the children of the professional classes. What is important is the spirit of adventure and liberty, the sense of moving out upon a voyage of discovery.

If formal education is given in this spirit, all the more intelligent pupils will supplement it by their own effort, for which every opportunity should be provided. Knowledge is the liberator from the empire of natural forces and destructive passion; without knowledge, the world and hopes cannot be built.... Not we, but the free men and women who we shall create, must see the NEW WORLD, first in their hopes and then at last in the full splendor of reality.

It was in the spirit of impacting the knowledge needed to solve emergent problems and impact one's world that Nwakaire (2008) visualized the following constructs as a means of concretizing abstractions in three courses he taught final year students in the Department of Adult Education and Extra-mural Studies of the University of Nigeria, Nsukka.

I. The Course is Community Development, Theory and Practice.

Apart from understanding the key concepts implicit in the topic, the processes of carrying out the activity are required to visualize a situation where the knowledge would apply practically and how to do something about what they face using the knowledge. For this, Nwakaire (2008) created an imaginary community thus;

Umunkor is an autonomous community in Akan L.G.A. It has a traditional ruler who lives in properly landscaped compound of about two hectares of land. Community institutions in Umunkor include the Umuada Women Group, Ofu Obi Age Grade, the Hunters' guild and Umuokolobia Youth Association. Unfortunately, this same community of a population of about 50,000 is infected with absolute poverty. Men here are polygamous and engage in subsistence agriculture. To grind cassava, their women have to trek a distance of over 6 kilometers to a lone garri processing mill where they are charged exorbitantly. This same community has a lone stream - spring water, located at about 100 meters below sea level. The same women who "breed" children are sometimes seen, "baby at back", carrying pots of water balanced on their heads. This trip might take 6 hours to complete each day. In some families, there are up to fifteen mouths to feed. The three wives in some families quarrel and compete among themselves in their efforts to curry the flavour of their lousy husbands, who must each day consume a gallon of palm-wine each and empty two boxes of snuff in each nostril with tears dripping down their cheeks. The Associations existing there contribute money but merely engage in lavish parties each month, drinking themselves insensible

at such parties as they grope their way home at the end. You can only imagine the state of the children and the condition of women in the community.

It is to this community that you have been posted after your appointment and deployment to Akan L.G.A as a Community Development Officer.

Fully, identify the development needs of Umunkor community and write a proposal to the Chairman of the L.G.A on how to develop the community bearing in mind the social institutions that may serve as resources in your development proposal.

2. Another course involves the Role of Adult Education or Adult Educators in moderating the environment which may be hazardous to ensure the survival of the human species. The title of the course is Adult Education and Society. Health hazards in the environment are expected to be analyzed but how will an Adult Educator play his part? Nwakaire (2009) visualized, using a CNN Report:

The CNN (2009) reported that the Pope's visit to Africa ended in Angola amid controversies. The controversy centered around the Pontiff's reiteration of the Catholic Church Official stand on the use of condoms as a contraceptive. As a religious stand, the church maintains strict abstinence from sexual relations outside of marriage for its members rather than the recourse to condoms as a protective device. Aid groups in Africa however, feel that their work will be hampered by this stand of the church since already; many had contracted the HIV through sexual relations. As a consequence therefore, the Aid groups distribute condoms as a means of stemming the spreads of the disease. Nigeria as you know is not exempted from the spread of the virus and through the mass media, the people's stand has come to the knowledge of the aid groups working in Nigeria. A Seminar/Workshop has therefore, been organized to discuss the way forward amid the controversy.

Between the two divergent views/extremes, you have been invited by the Organizers of the seminar/workshop to deliver a dispassionate/non-religious, non-partisan paper to the August gathering. Present your Paper to me for vetting before delivery. Take cognizance of your role in managing the health hazards in the environment as an adult educator.

3. And finally, for the course that borders on the socio-cultural aspects of community Development (ADE 421), the visualization which was used to drill the students is indicated below:

Novelty does not enjoy universal appeal. That does not discourage active social animators anyway. Armed with working knowledge of development strategies they are still able to catalyze innovations in many societies as may be demonstrated in the situation that exists in Umuabali community.

Nwankwo of Umuabali community has had ten (10) births by his wife, Mgbafor. Of these ten, only two, look healthy and certain to keep alive. Others, apart from another two have followed a pattern of death throes – looking pale and the Hyperbilirubinemia manifesting in their eyes, hands and feet, a little fever, coldness and then death. Three other families scattered in the community have similar experiences. Over the years therefore, Nwankwo and his companions have had the sad experience of performing simple burial ceremonies for their dead children amid sadness, anger and curses by fellow residents in the community. Sadness over the death; anger over the presumed reincarnation of particular children; and curses that the gods should not allow them reincarnate again.

As a Social Animator, you happened to be visiting your friend in the community located in Ijemba L.G.A. where you have been deployed as a Community Development Inspector. You ventured to suggest that a genotype test be conducted on the parents of the deceased, anemic and ailing children. The dialogue followed this pattern:

Animator: But have they tested their blood so as to determine of the genotype of parents?

Residents: What test? The children are 'Ogbanje'. Even when we took one to task, she was able to locate her chi; we dug there and found it

Animator: That is the usual belief in many areas but we tried to investigate and found that some are associated with the genotype of their parents.

Resident: Look at this person: from where are you?

This dialogue is attracting some other residents who were eavesdropping; you are therefore, determined to change the negative perception of the residents. You have a health officer attached to the local government and there are age grades, youth clubs, Out Umuada etc., as human resources in the community. As a social animator, how will you go about developing this community? Start by mentioning the role of the social animator as an agent of rationalization.

Visualization may thus, serve as means to bring abstract constructs to reality and challenge the intellect to the student so that he may develop problem-solving skills and impact his world after graduation. This is realistic human development. Field trips may be undertaken to concretize the visualization after which the students will write reports.

Implications for Adult Education

It is the function of Adult Educators to engage in Workers education as highlighted in the National Policy on Education (2004) section 6 to the effect that the goals of Mass literacy, Adult and Non- formal Education shall be to:-

Provide in-service, on-the-job, vocational and professional training for different categories of workers and professionals in order to improve their skills. Arising from the goals:

- I. Adult Educators should organize workshops to ensure that even Lecturers improve their teaching methodology to stimulate the thinking of the students to impact their world. This derives from the fact that problem-solving education is needed now in view of the numerous problems bedeviling the society.
- II. Students should be helped to develop the skills of enquiry learning so that on graduation they may be able to engage in skills geared towards self-reliance.
- III. Adult educators are expected to collaborate with other institutions within the country and abroad to develop more problems-solving.

Conclusion

This paper has taken a look at visualization as a teaching methodology that will enhance assimilation of knowledge by the students. In it, visualization has been extolled as capable of enhancing the problem-solving skills of students so that they can impact their world after graduation. Knowledge has been presented as an economic good which will add to the national development process and for this tertiary institutions are expected to develop more innovative teaching methodology by traversing the information superhighway.

The visualization methodology developed by Nwakaire (2008: 2009) in teaching three courses were presented as a means of sensitizing other teachers to concretizing abstractions and enhancing student's problem-solving skills. If this is accompanied with field trips, then it will be possible for the students, on graduation, to impact on their world positively.

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The World disenchantment, re-enchantment, neo-tribalism and the Free Masonry

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Abstract: This contribution of mine, which addresses the themes of intellectualisation, rationalisation, disenchantment, death, civil religion, autonomy of styles, fourth secularisation and re-enchantment, seeks to outline the context in which to frame the current state of Italian Freemasonry. The question I am trying to answer is: "How did we get to this point?". These are reflections on some of the writings of Max Weber (the themes of intellectualisation, rationalisation and disenchantment), Philippe Ariès (the theme of death), Luigi Berzano (the themes of the autonomy of styles and the fourth secularisation), Robert Neelly Bellah (the theme of civil religion), Michel Maffesoli (the theme of re-enchantment) and on two earlier research papers of mine on cognitive social deviance, already published. The first research work concerns a Masonic Academy in the Sicilian hinterland which, in the second half of the 18th century, worked in a network with other Academies in Palermo and Catania and with the Roman Arcadia and which can be traced back to the Neapolitan Masonic circles of Raimondo di Sangro, prince of San Severo, and the Sansevero Chapel. The second research work was conducted, both in the Masonic Order and in various Masonic Rites, using the method of participant observation, after initiation, within the two most important and numerous Italian Masonic Obedience's, in terms of number of Freemasons: the GOI, Grande Oriente d'Italia Palazzo Giustiniani (Grand Orient of Italy – Giustiniani Palace) and the Gran Loggia d'Italia degli ALAM – Palazzo Vitelleschi (Grand Lodge of Italy of the ALAM – Vitelleschi Palace).

Index Terms – disenchantment, civil religion, autonomy of styles, re-enchantment, cognitive social deviance.

I. INTRODUCTION

In «Science as a profession», Max Weber writes: «I only ask: how can a believing Catholic on the one hand and a Freemason on the other – in a course on the forms of church and state or on the history of religion – ever be led to an equal assessment of these topics? It is excluded. Yet, the university teacher must wish and aim to be of help, with his knowledge and methods, to one and the other» (Weber, 2004, p. 31), he must give himself this task and he must self-limit himself. The background to this question followed by a statement is the age-old question of «disenchantment».

It was Max Weber himself who introduced the concept of "disenchantment" in the social sciences, on 7 November 1917, in Munich, with his lectio magistralis «Wissenschaft als Beruf» (The Science as a profession), delivered at a conference organised by some young university students. On that occasion, he said to these young people: «You will remember the marvellous image at the beginning of Book VII of Plato's Republic [See Platone, *Repubblica*, VII, 514a-517c.]: those men in a cave chained up, their faces turned to the rock wall in front of them, while behind them stands the source of light that they cannot see, and therefore they only look at the shadows it casts on the wall and try to understand its connection. Until one of them manages to break the chains, and he turns and sees: the sun. Dazzled he gropes inside and babbles about what he has seen. The others call him crazy. But gradually he learns to see into the light, and then his task becomes that of descending among the cavemen and leading them into the light. He is the philosopher, but the sun is the truth of science, which alone does not hunt for ghosts and shadows but for true being. Well, who today stands in this way before science? Today, the way of feeling of youth in particular is the opposite: the conceptual constructions of science are a subterranean world of artificial abstractions that try, with their exanguious hands, to capture the blood and sap of real life, but never succeed in doing so. Here in life, in what for Plato constituted the play of shadows on the walls of the cave, true reality pulses: all the rest are phantoms drawn from it and devoid of life, and nothing else» (Weber, 2004, p. 21-22). The distance from Durkheim and the difference in the approach to the problem are obvious. Max Weber places disenchantment, i.e. the processes of rationalisation and intellectualisation, as the foundation. Hence, the notion of the idealtype. Émile Durkheim, on the other hand, the elementary forms of religious life (see Durkheim, 2020), the sacred and the profane, the force of social facts.

The question Weber posed to the young academics at this point was of fundamental importance, and it is also of fundamental importance for understanding "the current state of Freemasonry": "How did such a turnabout come about? How did we arrive at the "situation of meaninglessness of all science"? This was his answer to that question: the turning point came about with the increasing intellectualisation and rationalisation, with the disenchantment of the world. «Increasing intellectualisation and

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rationalisation does not mean [...] an increasing general knowledge of the conditions of life under which one is subjected» (Weber, 2004, p. 20). As Harari writes, hunter-gatherers did not have to wait for the Agricultural Revolution to know the secrets of nature. They had already known them for a very long time and much better than farmers, because their survival was intimately and profoundly linked to an accurate knowledge of the animals they hunted and the plants they harvested (see Harari, 2019, p. 108). «It means something different: the consciousness or faith that, if one only wished, one could at any time come to know, that is, that mysterious and unpredictable forces are not at play, but that one can - in principle - master all things through rational calculation. But this means the disenchantment of the world. It is no longer necessary to resort to magical means to dominate spirits or to ingratiate oneself with them, as the savage does for whom such powers exist. Technical means and rational calculation take care of that. Above all, this is the meaning of intellectualisation as such» (Weber, 2004, p. 20).

I warn the reader that the texts quoted in inverted commas, with the exception of a few quotations from Maffesoli, have been translated by me from Italian.

II. THE LOSS OF SENSE OF DEATH AND SCIENCE

Weber, after the theme of the cave and of light (to which both esoteric and esoteric science can be linked), after that of the conceptual constructions of science contemporary to him (and to us), after the question of intellectualisation of rationalisation and disenchantment, of the dominion of all things by means of rational calculations, he introduced the theme of death (the search for light, the science that deals with it, and death are intimately and profoundly connected), saying to young people the following words «But does this process of disenchantment, which has continued for millennia in Western culture, and in general this “progress”, of which science constitutes an element and a driving force, have any meaning beyond the purely practical and technical level? You will find this question formulated in fundamental terms above all in the works of Lev Tolstoy. He arrived at it by a route that was peculiar to him. His central problem increasingly addressed the question of whether death was a phenomenon endowed with meaning or not. And his answer is that for civilised man it is not» (Weber, 2004, p. 20). So: processes of rationalisation and intellectualisation, disenchantment with the world, loss of the sense of death. But, not only death, even science no longer makes sense. Even on the subject of death, the distance from Durkheim is evident (see Durkheim, 2010).

Not only death, but also science, transformed over time (part of this history is certainly Platonic science sacred /philosophy) by the processes of intellectualisation, rationalisation, disenchantment, no longer makes sense to Weber. Nor can it have any more. At first it was «the way to true being» (see Plato's myth of the cave), later it became «the way to true art» (see Leonardo and Piero della Francesca), «the way to true nature» (see Descartes and Galilei), «the way to true God», the «way to true happiness» (This concept was destroyed by Friedrich Nietzsche). The simplest answer, Weber told the young people, was given, once again, by Tolstoy: «“It is meaningless because it gives no answer to the only question that is important to us: what are we to do? How are we to live?”» (Weber, 2004, p. 26).

But how can we address the subject of the disenchanted world, that is, of contemporary science and meaningless death, without considering, in a diachronic manner, the fundamental, and foundational, question of God, of the Supreme Being, of the Great Architect? (For this concept of God, see the notion of “American civil religion”, see Bellah, 2009). At the time of the origin of the exact sciences of nature, Weber continued in his lecture to the young academics in Munich, a great deal was expected of modern science. «If you remember Swammerdam's saying “I bring you here the proof of God's providence in the anatomy of a louse”, you can see what scientific work, under the (indirect) influence of Protestantism and Puritanism, then regarded as its own task: the way to God. This way was no longer to be found in philosophers, in their concepts and deductions [in their conceptions of science: see, in this connection, the whole question of the crisis of the proofs of God's existence, from Anselm and Gaunilone up to Kant]: that God could not be found by the path [on the one hand Platonic and on the other Aristotelian] by which the Middle Ages had sought him, well knew all the pietistic theology of that time, [knew it above all] Spenner [the founder of the pietistic movement]. God is hidden, his ways are not our ways, his thoughts are not our thoughts. But in the exact sciences of nature, where one could physically grasp his work, there one hoped to trace his intentions concerning the world. And today?» (Weber, 2004, p. 24-25). It is clear that Weber's answer is: not any more. Today, science is meaningless because the world is disenchanted.

As is well known, Weber relates the Protestant ethic not only to a certain historical phase of modern science, but also to the spirit of capitalism (see M. Weber, 1991).

I also quote here a passage from Morris Kline on Kant: «If Kant had paid more attention to the mathematical activity of the time, he would at least have been more cautious in arguing that the mind must organise spatial sensations in a Euclidean manner. The indifference and even rejection of a God legislator of the universe, combined with Kant's theory that laws are intrinsic to the structure of the human mind, provoked the reaction of the divine architect. God decided to punish the Kantians, particularly the egocentric, proud and conceited mathematicians. And so He began to favour non-Euclidean geometry» (Kline, 1985, p. 88).

Kline, who was Professor Emeritus of Mathematics at New York University and a contributor to «Mathematics Magazine» and the «Archive for History of Exact Sciences», recounts an anecdote in his «Matematica la perdita della certezza» (Mathematics the Loss of Certainty) about Lagrange's *Mécanique analytique* (Analytical Mechanics, 1788), a work which, according to him, can be considered the best example of Newtonian mathematics (i.e. mechanics treated mathematically, with a quantitative mathematical method, without any reference to physical processes or geometrical diagrams). «When Sir James Jeans in his work *The Mysterious Universe* (1930) revealed that “The great architect of the universe is now beginning to assume the appearance of a pure mathematician”», Kline writes, «he was at least two centuries too late» (Kline, 1985, p. 68). Apparently, Lagrange, to Napoleon's remark «“I have been told that you have written this big book on the system of the universe without having mentioned

its Creator even once”», replied: «“I have no need of this hypothesis. Nature had now taken the place of God», Kline continued, «as Gauss said, “you, O Nature, are my divinity and to your laws are my services”» (Kline, 1985, p. 83).

Weber’s references to Freemasonry, to Plato (to the myth of the cave, to be more precise) and to Tolstoy, to Light and death, to traditional philosophical science (which can also be called sacred science, which is both esoteric and esoteric), to medieval science and then to modern and contemporary science, in my view, are not accidental (Weber, comparing German and American universities, expressly mentions American associationism of all kinds. In my view, such “all kinds of” associationism can also include American Masonic associationism, which evidently differed from German associationism). In fact, all these themes, directly or indirectly, explicitly or implicitly, are present in a very specific “literary place” in Tolstoy’s novel *War and Peace*. This is how the Russian intellectual recounts the Masonic initiation of Pierre Bezuchov in his masterpiece. Pay particular attention to the suggestions about light and death, in relation to God, to the Great Architect of the Universe, to the role of the Master (i.e. the one who, in the Platonic sense, *gradually learns to see in the light, and then his task becomes that of descending among cavemen and leading them to the light*), to the meaning of life and the relative plan to realise this meaning.

A week after his arrival, the young Polish Count Willarski, [...] addressed Pierre. [...] – I have come to you, Count, with a proposal and an assignment, – he told him without sitting down. [...] Do you wish to enter the brotherhood of free masons under my guarantee? [Yes, I do, – said [Pierre]. [...] – One more question, Count, – said [Willarski], – to which I ask you to answer in all sincerity, not as a future Freemason, but as an honest man (galant homme): have you repudiated your past convictions, do you believe in God? [here the reference is to atheism and the processes of intellectualisation and rationalisation] Pierre became pensive. – Yes ... yes, I believe in God, – he said. – In that case ... – Willarski began, but Pierre interrupted him. – Yes, I believe in God, – he said again. – In that case, we can go, – said Willarski. – My carriage is at your disposal. [...] [Arrived at the Masonic house] Having taken a handkerchief from the cupboard, Willarski placed it over Pierre’s eyes and knotted it behind him, painfully imprisoning his hair in the knot. [...] When you hear a knock at the door, blindfold yourself, – Willarski added. [...] The five minutes that [Pierre] spent blindfolded seemed to him an hour. [...] He was glad that the moment had come when he would finally take that path of renewal and an actively virtuous life that he had been dreaming of [This path also has to do with understanding of science and sacred science, both exoteric and esoteric, of Plato]. [...] Pierre removed the blindfold and looked around. It was pitch dark in the room: only in one place was a lamp lit inside something white. Pierre approached and saw that the lamp stood on a black table, on which an open book was placed. The book was the Gospel; the white thing in which the lamp was burning was a human skull with its holes and teeth. Having read the first words of the Gospel: «In the beginning was the Word, and the Word was with God», he walked around the table and saw a large open coffin filled with something. It was a coffin full of bones. [...] The skull, the coffin, the Gospel: [...] «God, death, love, the brotherhood of men», he said to himself, linking vague but joyful images to these words. The door opened, and someone entered. In the dim light, to which, however, Pierre had already become accustomed, a rather short man [the Lodge’s Worshipful Master] entered. Having evidently passed from light into darkness, he stopped [...] – Why have you come here? – asked [the rather short man] turning to Pierre’s side [...] – Why have you, who do not believe in the truths of the light and do not see the light, come here, what do you want from us? Wisdom, virtue, enlightenment? [...] – Yes, I ... I ... want renewal, – Pierre articulated with difficulty. – Well, – said Smol’janinov and immediately resumed: – Do you have any idea of the means by which our sacred order will help you attain your goal? ... said the speaker quickly and calmly. – I ... hope ... for guidance ... help ... in renewal, – said Pierre [...] – Did you look to religion for the means to reach your end? – No, I considered it wrong and did not follow it, – said Pierre in such a low voice that the speaker did not hear him and asked what he said. – I was an atheist, – Pierre replied. – You seek truth in order to follow its laws in life; consequently, you seek wisdom and virtue, do you not? – said the speaker [...] – Yes, yes, Pierre confirmed. [...] – Now I must reveal to you the principal end of our order, – said [the speaker], – and if this end coincides with yours, you will profitably enter our brotherhood. The first and most important end and at the same time the foundation of our order, on which it is built and which no human force can demolish, is the custody and transmission to posterity of an important mystery ... which has come down to us from the most ancient centuries and even from the first man, a mystery on which perhaps the destiny of the human race depends. But since this mystery is of such a nature that no one can know it and take advantage of it unless he is prepared by a long and diligent purification of himself, not everyone can hope to attain it soon. Therefore we have a second end, which consists in preparing our affiliates, as far as possible, in emending their hearts, purifying and enlightening their reason with the means revealed to us by tradition by men who have laboured in the search for this mystery, and thereby making them capable of receiving it. Lastly, by purifying and correcting our affiliates, we also seek to amend the whole human race, proposing in our affiliates an example of devotion and virtue, and by this we seek with all our strength to oppose the evil that reigns in the world (Tolstoj, 2019, p. 477-482). [...] Willarski coughed, they answered him with the Masonic wooden hammer, and the door opened in front of them. [...] Then they led him away again, without blinking their eyes, and as he walked they spoke to him in allegories of the hardships of his journey, of sacred friendship, of the eternal Architect of the universe, of the courage with which he had to endure hardships and dangers. [...] Then they blew out the candles, lit some alcohol, as Pierre guessed from the smell, and said he would see a small light. They removed his blindfold, and by the faint light of the spirit flame Pierre saw [...] Among them [among the Freemasons present] was one with a bloodied white shirt. At that sight, Pierre advanced with his chest against the swords, wishing they would pierce him. But the swords moved away, and immediately the bandage was put back on him. – Now thou hast seen the little light [together with the blood of death], – said a voice to him. Then they lit the candles again, said he should see the full light, and again they removed his blindfold, and suddenly more than ten voices said: *sic transit gloria mundi*. [...] A blazing star was embedded in the wall (Tolstoj, 2019, p. 484-486). [...] The session was over, and on his return home Pierre had the impression that he had returned from a long journey that had lasted decades, during which he had changed completely and had detached himself from the previous order and habits of life. [...] The day after his admission to the lodge Pierre was at home reading a book, trying to penetrate the meaning of the square that represented God on one side, the moral world on the other, the physical world on the third and their fusion on the fourth. From time to time he would detach himself from the book and the square and work out his new life plan in his imagination (Tolstoj, 2019, p. 488). [...] (It was now such a joy for him to rid himself of free will and submit his will to him and those who knew an indubitable truth) (Tolstoj, 2019, p. 482-483).

Concerning disenchantment with death (which, as we have seen, in Weber, through Tolstoy, is as fundamental as disenchantment with God, with the Supreme Being, with the Architect of the Universe, and with light and its pursuit, because disenchantment with these “things” goes hand in hand with disenchantment with death, and because the meaning of life goes hand in hand with the meaning of death), one text to refer to is Philippe Ariès «Storia della morte in Occidente» (History of Death in the West) (see Ariès, 2006). Here too, as with Max Weber’s conference on science as a profession and the disenchantment of the world, we are dealing with an essay that originated from four lectures given at conferences organised at Johns Hopkins University (with the addition of some articles, previously published by Ariès), intended this time not for young German university students but for the American public. Appearing in print in English in 1974, these conferences were actually supposed to focus and argue not on attitudes towards death in Western Christian cultures, but on history and national consciousness.

It is certain that, in Free Masonry, there exists, along with a personal and dramatic feeling (the «Death of the self» and of Master Hiram), a «filial, familiar feeling» (the Sons of the Widow, the Brothers) of death and that one of the aetiological/founding myths of it is precisely that of Hiram (on the Founding Myths of Free Masonry, see Durand, 2021). Ariès writes: «I had just

finished a long study on family sentiment, in which I realised that this sentiment, which was said to be very ancient and rather threatened by modernity, was in fact recent and linked to a decisive stage of this modernity. I therefore wondered whether it was not necessary to generalise, whether we had not still retained [despite Weberian disenchantment], in the 19th and early 20th centuries, the habit of attributing distant origins to collective and mental phenomena that were in reality very recent, which would be tantamount to recognising in this age of scientific progress the capacity to create myths» (Ariès, 2006, p. 6-7), to reenchant ourselves and to know how to reenchant, as Michel Maffesoli put it. The concept of re-enchantment I will explain later.

The problem is this: how are such myths to be “understood”, given that we are dealing with processes of disenchantment and re-enchantment of the world? How is re-enchantment to be interpreted? Are we dealing with a single type of re-enchantment or with several types of re-enchantment, linked and interlinked, synchronically and diachronically. My idea, which I cannot go into here, is that we are in the presence of several types of re-enchantment. After all, Weber himself, in his lecture on science as a profession and disenchantment, complained to the Munich students that «science as a way to nature» would have sounded like blasphemy to their ears. For many of them, indeed for the greater number, «liberation from the intellectualism of science», i.e. re-enchantment (I should point out that this concept is not Weber’s, but Maffesoli’s), was the way «back to one’s own nature and thus to nature in general» (Weber, 2004, p. 24). Let us be careful: here the concept to be taken into consideration, albeit by way of contrast, is “liberation from the intellectualism of science”, i.e. liberation from the processes of rationalisation and disenchantment of modern and contemporary science, in order to arrive at one’s own nature and, consequently, at the re-enchantment of nature in general, and not “science (modern and contemporary, disenchanted) as the way to arrive at nature”!

The thesis put forward by Ariès in his essay, the drafting of which had begun some time before with the study of the cult of cemeteries (better said, of necropolises and cemeteries) and of pilgrimage to the tombs, is that the changes in man’s mentality towards death, for millennia, have been very slow, sometimes unnoticed, or have been located between long periods of immobility, to the point of seeming to be acronic. Contemporaries have not felt them, have not been aware of them, because the time of change has spanned many generations and has exceeded the capacity of collective memory. [«Contemporary historians», writes Ariès, «have discovered that traditional cultures are almost static. Even the economic and demographic balance do not evolve; if by chance they are shaken, they have a tendency to return to the initial situation. See the works of E. Le Roy Ladurie (in particular *Le territoire de l’historien*, Paris, Gallimard, 1973) and of P. Chaunu, *Histoire science sociale*, Paris, SEDES, 1975»] (Ariès, 2006, footnote no. 1 on p. 17). At a certain point, however, in the midst of disenchantment as Weber put it, they became faster and more conscious. In methodological terms, «The historian of death must not read them with the same lenses as the historian of religions. [...] He must decipher them in order to find, beneath the ecclesiastical language [filled with elitist lessons of spirituality or morality], the banal background of common representation that seemed obvious and made the lesson [to be derived from death] intelligible to the public» (Ariès, 2006, p. 13).

A brief summary makes it easier to read the essay on death considered here, which, in the first part, consists of four reports: «The first is rather in synchronicity. It covers a long series of centuries, in the order of a millennium» and concerns «domesticated death» (this is a definition introduced by the author), that is, «family death». It is with the second paper that we enter «the diachrony: what changes in the Middle Ages, from around the 12th century onwards, began to modify the achronical attitude towards death, and what sense we can make of these changes. Finally, the last two papers [are] devoted to contemporary attitudes, the cult of cemeteries and graves, and the interdict launched against death in industrial societies» (Ariès, 2006, p. 17-18).

With regard to “tamed death”, also taking into consideration the *Novels of the Round Table*, the *Chanson de Roland*, Ariès distinguishes between “death forewarned” (when one has time to know one is about to die) and “terrible death” (sudden, which must be presented as exceptional and which one must not, or cannot, talk about) (In the aetiological myth of Hiram, the “terrible death” and the “lost word” are at work). Human beings have been dying “in a warned way”, for millennia, and in an enchanted way as Weber puts it. «The warning, we observe, was given by natural signs or, more often still, by an intimate conviction, rather than by supernatural or magical premonition. It was a very simple thing, which has persisted through the centuries and which we still find today, at least as a residue, in industrial societies». This is “spontaneous recognition”. «Something alien both to the supernatural and to Christian piety» (Ariès, 2006, p. 19). Knowing that death is imminent, one begins to foresee, to prepare and to formalise the ceremony and the dispositions of last will.

If Weber, during the conference held in Munich, had spoken to the young university students about the importance, in general, of the theme of death and its meaning in Tolstoy, Ariès points out that in the Russian author it is possible to identify the theme of “death forewarned”: Tolstoy’s mugiki (see Ariès, 2006, p. 20-21). The French historian also refers to the ritual attitude of the “giacent statues”, prescribed by 13th-century liturgists: «“The dying man” [...] “must lie on his back, so that his face may always look up to the sky”» (Ariès, 2006, p. 22). From the Old Testament we learn that the dying Hebrew people, on the other hand, turned towards the wall.

Death forewarned was awaited in bed, usually in one’s own bed, in one’s own home, «“lying in bed sick”». It was «a public ceremony [the dying man’s room became a public place] and organised. Organised by the dying person himself who presides over it and knows its protocol» (Ariès, 2006, p. 24). It was conducted in a ceremonial, but not dramatic and overly emotional manner. It was necessary for relatives, friends and neighbours to be present. Until the 18th century, children also had to be present. This last aspect is very important, given the «precautions taken today to keep children away from the things of death!» (Ariès, 2006, p. 25). It is, as we shall see, the “forbidden death”, the “turning away from the things of death” that also concerns adults and has to do with the sense of life, the sense of death and the disenchantment of the world.

Ariès calls “tamed death” «The old attitude in which death is at once familiar, close and attenuated”. This contrasts sharply with our attitude of “wild death”, in which death is hospitalised, distant (we try to entrust it to others: carers, doctors, specialists, old people’s homes, funeral parlours, morgues, etc.) and frightening, just as it is frightening to grow old, «to the point that we no longer dare pronounce its name» (Ariès, 2006, p. 26), preferring instead to talk about, desire, or practise the right diet

(Mediterranean, macrobiotic, vegetarian, vegan, etc.), cosmetic surgery, sports, body care (creams, gym etc.), delayed ageing, the avoidance of ageing, eternal youth. In reality, it is the ageing that scares us and not the dead. This says a lot about the sense (or missing sense) that we attribute to the dead and to death, ours or that of others, a sense (or missing sense) which, inevitably, also concerns Masonic initiation, sacred science, in the same way as intellectualisation, rationalisation, disenchantment, above all with regard to God, the Supreme Being, the Great Architect of the Universe.

The ancients, on the other hand (the reference is to the centuries before the Middle Ages), were not afraid of ageing, nor of death, but of the dead. «Despite their familiarity with death, the ancients feared the proximity of the dead and kept them apart». (One must keep these concepts separate and distinct from the “forbidden death” of disenchanted industrial societies, about which I will speak later). «The world of the living had to be separated from that of the dead. [...] For this reason, cemeteries [necropolises] were located outside cities, on the edge of roads» (Ariès, 2006, p. 26-27). (This is interesting for understanding the aetiological myth of Hiram: could the Master’s dead body have been transported to the Holy of Holies in the Temple of the city of Jerusalem?). Burials in cities, in city temples, etc., were forbidden. The dead began to enter the cities «with the [Christian] cult of martyrs, of African origin» (Ariès, 2006, p. 27). In the Middle Ages, and again in the 16th and 17th centuries and up to the Enlightenment, there was no distinction between the church and the cemetery (the necropolis): «the parish church includes “nave, bell tower and cemetery”» (Ariès, 2006, p. 29) and ossuary.

Throughout the Middle Ages, and at least until the 17th century, i.e. for more than a millennium, the living no longer feared the dead and lived in promiscuity with them, within their cities and church spaces. It is in this sense that Ariès speaks of “domesticated death”, specifying, in the chapter on the “Death of the self”, that, however, already from the 11th and 12th centuries some small changes began to occur that, without replacing it, altered the familiarity between man and death, introducing personal, individualistic and dramatic elements.

It is to these dramatising alterations, to the “Death of Self” and to the combination of individual, personal, and familial elements, that, in my view, can be traced the aetiological myth of Hiram and the meaning it has (or rather, it is better to say had, in fact we Westerners, as I will say later, live the time of the “forbidden death”) for the initiatory death and initiatory life of each Freemason. «Familiarity with death», writes Ariès, was «a form of acceptance of the natural order, an acceptance at once naive in daily life, and learned in astrological speculation» (Ariès, 2006, p. 34) (Astrology, namely the Sun, the Moon, the starry sky, the constellations). It was within this millenary idea of the collective destiny of human beings, that, according to Ariès, little by little, new elements of concern «for the particularity of each individual» were introduced, until the definitive paradigm shift: from «family death» to «death of the self», to the «death of the other», and finally to today’s “forbidden death”.

The phenomena that the French historian chose for the demonstration of the presence of individualistic elements (the “death of self”) within the paradigm of “domesticated”, “familiar” death are: «the representation of the universal Judgement, at the end of time», i.e. the common and collective death of the entire species, the common and collective end; «the displacement of the Judgement» from the end of time to the end of each individual life, «at the precise moment of death» of the individual (controversial and extremely complex has become, with the passage of time, the theme of personal responsibility, i.e. free will or servant arbitrariness); «the macabre themes and the interest nurtured in images of physical decomposition; the return to funerary epigraphy and a principle of personalisation [individualisation] of burials» (Ariès, 2006, p. 35).

«The worms that eat corpses do not come from the earth, but from inside the body, from its natural “liquors”», writes Ariès, «Decomposition is the sign of man’s failure, and this is undoubtedly the profound sense of the macabre, which makes it a new and original phenomenon. To understand it properly, one must start from the contemporary notion of failure that, unfortunately, is very familiar to us in today’s industrial societies» (Ariès, 2006, p. 43).

All these elements (however, I cannot demonstrate them in detail here), together with those of the “family death”, are present in the aetiological myth of Hiram. This means that they, although traceable to the “death of self” (it is the Freemason who dies in/with Hiram, not so much “the other”, it is the “death of self” and not the “death of the other”), can still be located within the ancient paradigm of “familiar death”. It means that the aetiological myth of Hiram is a child of its time. Think, for example, of how, in the sense of a symbolic and metaphorical “initiatory universal Judgement”, the death of Master Hiram caused the impossibility of continuing the construction work on the Temple and how, at the same time, the death and “rebirth” of Master Hiram are also the individual death and rebirth of each Free Mason, i.e. a symbolic and metaphorical “initiatory universal Judgement” shifted onto each individual Free Mason. Think also of the fear, not towards death, which on the contrary is seen as an initiationally necessary and inevitable event, but towards the type of dead represented and representable through Master Hiram’s assassins, who are certainly not Freemasons but anti-Masons. Think again of the signs used to recognise Master Hiram’s burial place and the emotional taming of those (the Sons of the Widow) who, at least initially, would have wanted to avenge him.

Ariès makes a remarkable observation, which is also very useful for understanding the meaning of the failures of the alchemist’s transmuting operations: «between our contemporary sense of personal failure and that of the late Middle Ages, there is a very interesting difference. Today we do not relate our life failure and our human mortality. The certainty of death, the fragility of our life are foreign to our existential pessimism. In contrast, the man of the late Middle Ages had the acute awareness that he was a near-dead man, and death, ever present within him, shattered his ambitions, poisoned his pleasures. And this man nourished a passion for life that we can hardly understand today, perhaps because our life has become longer» (Ariès, 2006, p. 44). Here the author expressly refers to «the man of the proto-capitalist ages – that is, in which the capitalist and technical mentality was in the process of being formed (perhaps not until the 18th century?)» (Ariès, 2006, p. 44).

Ariès also writes that, in ancient Rome, the dead were identifiable in their burial places and tombs. To make them identifiable, funerary inscriptions and portraits were used as markers. Such inscriptions, around the 5th century, became rare, until they disappeared altogether, depending on the location. The dead thus ceased to be identifiable for eight to nine hundred years. Funerary inscriptions reappeared in the 13th century, on the tombs of illustrious personages, and with them effigies, which were not, however, true portraits. In the 18th century, plaques with a simple inscription became increasingly common (Ariès, 2006, p. 45-47).

From the 18th century onwards, again according to Ariès, attitudes towards death began to change radically: in the paradigm (Kuhn, 2009) of “familiar”, “domesticated” death, in addition to the individualistic elements of “death of the self” (rise of the individual conscience), elements relating to the “death of the other” began to enter (the death accepted with greater difficulty, more feared, was not so much one’s own death, but that of the other, the “death of the you”), occultism (ghosts and séances, or mediumistic séances, which allowed contact with the “dead you” from whom one did not want to separate oneself, with the “death of the other”), the exaggeration of mourning in the 19th century, the “new cult of tombs and cemeteries” of the 19th and 20th centuries (new and completely different, “fractured”, “broken”, from the ancient, pre-Christian cults) and sadism. «Like the sexual act in the Marquis de Sade, death is a rupture. Now, let us keep this in mind, this idea of rupture is completely new» (Ariès, 2006, p. 51).

What does rupture mean? «Like the sexual act, death is now increasingly seen as a transgression that tears man away from his daily life, his reasonable society, his monotonous work, to subject him to a paroxysm and throw him into an irrational, violent and cruel world» (Ariès, 2006, p. 51). (On these issues, see for example Horkheimer and Adorno, 2010). The death, which before was familiar, domesticated, even when it was the “death of the self” and the “death of the other”, becomes terrifying, haunting: a rupture, precisely. «Death in one’s own bed, as it once was, had the solemnity but also the banality of seasonal ceremonies. Everyone expected it and lent themselves to the rituals prescribed by custom». Instead, in the 19th century, a new passion took hold of the bystanders. Emotion stirred them, they cried, they prayed, they gesticulated. They did not reject the gestures dictated by custom, on the contrary, they made them by stripping them of their banal and customary character. Now these gestures were described as if they had been invented for the first time, spontaneous, inspired by a passionate grief, unique in its kind. Certainly, the survivors’ expression of grief was due to a new intolerance for separation. But the upset did not survive only at the bedside of the dying or the memory of the missing. The mere idea of death moved (Ariès, 2006, p. 53).

One cannot understand “forbidden death”, i.e. the 20th century’s “great rejection of death”, the revolutionary paradigm (see Kuhn, 2009) shift from “domesticated”, “familiar” death, if one does not have a clear understanding of this concept of “rupture”. It is in fact from it that, for Ariès, originated the “brutal revolution of traditional ideas and feelings” about death, that “absolutely unprecedented phenomenon” of death as an object of shame and prohibition. The transition from “domesticated death”, “familiar death”, “death of self” and “death of the other” to “forbidden death” is characterised by the fact of «avoiding, no longer to the dying person, but to society, to the relatives themselves, the excessively strong, unbearable disturbance and emotion caused by the horror of agony and the simple presence of death in the midst of a happy life, since it is now generally accepted that life is always happy or must always look like it» (Ariès, 2006, p. 69).

III. THE AUTONOMY OF STYLES AND THE FOURTH SECULARISATION

On the subject of the “happy life”, it is useful to consider Luigi Berzano’s essay «Quarta secolarizzazione. L’autonomia degli stili» (Fourth secularisation. The autonomy of styles, see Berzano, 2017). Secularisation is another way of understanding the Weberian concept of disenchantment. The concept of “fourth secularization” is used by Berzano to explain that society which is contemporary to us and which, as we shall see, Maffesoli defines as neo-tribal, re-enchanted. I have already mentioned that Ariès, in order to explain disenchantment, with regard to Westerners’ attitudes towards death, proposed two paradigms: the paradigm of “domesticated”, or “familiar” death, with elements of “death of self” and “death of the other”, and the paradigm of “forbidden death”. Berzano, addressing the general issue of secularisation, in turn, started from the observation of the weakening of the «vertical processes of reproduction, i.e. those through which cultural models are transmitted from one generation to the next», a weakening that has configured contemporary Western societies as «“horizontal societies” with “horizontal lifestyles”» and with «increasing complexity of organisational models» (Berzano, 2017, p. 8) and he identified four of them: three already established and one, the fourth, which he proposed to the scientific community. It is this fourth paradigm that I will now briefly address.

The four paradigms are: 1) the secularisation from Greek mythology to classical philosophy (first secularisation); 2) the secularisation from the abstract *Logos* of classical Greek philosophy to the *Christian Logos* (second secularisation); 3) the secularisation of the sciences, which occurred at the beginning of the modern age (third secularisation); 4) the secularisation of the autonomy of styles (fourth secularisation).

Regarding the state of the art of religion, or rather religions, and the publications on the subject in Italy, a recent research by Franco Garelli bears the title «Gente di poca fede» (People of little faith) (see Garelli, 2020) and, among other things, deals with so-called “cultural Catholicism”. Luigi Berzano used the expression “devout atheism”, referring to the autonomy of styles and the theorisation of the fourth secularisation. The title of another very recent research study edited and directed by Roberto Cipriani is «L’incerta fede» (The uncertain faith) (see Cipriani, 2021), and that of the research edited by Cecilia Costa and Barbara Morsello is «Incerta religiosità» (Uncertain religiosity) (see Costa e Morsello, 2021). Stefania Palmisano and Nicola Pannofino, in turn, used the title «Religione sotto spirito» (Religion under spirit) for their research (see Palmisano e Pannofino, 2021), in the sense that there are many in Italy today who declare: «I am spiritual, but not religious», as if to say that «being spiritual» means engaging in a search for meaning and that organised religions, for the purposes of this search, are obstacles, because with their structures, with their hierarchies, with their statuses and with their religious roles, with their liturgies, with their ceremonies, with their history, in fact prevent an authentic relationship with nature, with the environment and, consequently, the attainment of an authentic condition of inner well-being, in relationships with oneself, with one’s exterior and with others. Another research, however, has also detected a different trend. This is atheism, i.e. the return of God, albeit in different, albeit organised, hierarchical and top-down forms, after the death of God, in the countries of the former USSR (the Soviet Union), or under the influence of the former USSR, where state atheism was in force. This is the 2017 research by Cooperman, Sahgal and Schiller (see Cooperman, Sahgal, Schiller, 2017). Ours has been called the «era of susceptibility» (see Soncini, 2021), or the time of «Cancel Culture».

Lifestyles are «the ways in which individuals organise their existence [...] the profiles through which individuals communicate, to themselves and to others, who they are, to whom they feel similar and from whom they want to distinguish themselves, outlining a unitary meaning for their living and behaving». These are the ways in which each of us tries to portray our “happy life” to others, *because it is now generally accepted that life is always happy or must always look that way*, as Ariès argued in his second revolutionary paradigm on death, “the forbidden death”. «They are peculiar to today’s society, in which it is often no longer values, ideologies or even social position that explain the behaviour of individuals, but rather tastes, sensitivities, personal interests, fashions» (Berzano, 2017, p. 8-9).

Religions, churches, practices, beliefs, spiritualities, including the Masonic one I would add, for Berzano today cannot be understood outside the paradigm of the fourth secularisation, which, precisely, is characterised by the autonomy of styles, that is, by dependence on the choices of individuals. What I am interested in pointing out here is that, in this context which, as we shall see, can also be defined as neo-tribal and re-enchanted, individuals without a fixed religious status and in search of a spirituality of their own, for the construction of their own “stylistic” project of material and, at the same time, spiritual life, are constantly increasing. Thus, «new spiritual profiles take shape, which are fascinating precisely because of their free nature and their horizontal and personalised practices» (Berzano, 2017, p. 11), and this also happens within «weakened “vertical” reproduction processes», whether religious (religious traditions) or Free Masonic (Masonic Tradition). It is a matter of “spiritual styles” that, even if framed within «weakened “vertical” reproduction structures» of a hierarchical type, such as those of churches or Masonic Obediences, are proper to «individuals who choose on the basis of personal needs, interests, sensibilities» (Berzano, 2017, p. 11).

The word *spirituality* has now entered our everyday vocabulary. We encounter it more and more often and on the most diverse occasions, just as the number of those who define themselves using the formula is growing: *I am spiritual, but not religious*. To be spiritual is to engage in a search for meaning (for sense) without affiliating or recognising oneself in a specific organised religion, following paths that usually lie outside the traditional enclosures of the sacred drawn by churches or historical confessions (or civil religions). In Italy too, there is an increase in those who set out on the path of spirituality to rediscover a deeper relationship with nature, to achieve a state of inner well-being and in their relationship with others, to unveil the mysteries that surround us. From being a marginal phenomenon, spirituality has acquired a new visibility in our country (see Palmisano e Pannofino, 2021, *synthesis of the introduction*).

As Berzano writes, lifestyles, in relation to groups, perform a dual function: *ab intra* they characterise a group and cement it, *ad extra* they differentiate it from other social groups. It is for this reason that the issue of lifestyles is intimately connected to neo-tribalism and re-enchancement.

IV. THE DISENCHANTMENT, POSTMODERN RE-ENCHANTMENT AND NEO-TRIBALISM

In one of his articles, entitled «From society to tribal communities» (see Maffesoli, 2016), Maffesoli writes that there were three fundamental factors that, between the Eighteenth and Twentieth centuries, contributed decisively to the Weberian disenchantment, that is to say, using his vocabulary, to the birth of modernity: rationalism, individualism and the social contract. On the other hand, the fundamental factors that contributed decisively to the postmodern re-enchancement were two: the powerful return of the need for collective emotions and communitarian impulses (i.e. neo-tribalism, the existence of emotional tribes: «l’Ombre de Dianysos» in the collapse of the welfare state); the “tribal person”, or “plural person”, which is plural because it is fragmented (fragmentation, i.e. neo-tribalism, is the “heartbeat” of the post-modern social bond) and because, precisely because it is fragmented, it identifies with or is part of several neo-tribes, also rediscovering the importance of territory (it is the theme of roots and borders) and of “comradeship”, i.e. a new way of being whose main characteristics are emotions, desire and passion. Sexual indecision is also a manifest expression of the “plural person”. «The heir of the culture of reason [subjectivism seen as governed by Apollo], of a history we can control and of a consensual social bond is a culture of instinct where people want to face up to destiny» (Maffesoli, 2016, p. 740).

Maffesoli is clear in stating that, in order to study the neo-tribal phenomenon, one cannot use the 1960s toolbox (groupings, gangs, subcultures, etc.), because postmodern neo-tribes are specific. The three important characteristics of the neo-tribal phenomenon, i.e. the neo-tribal sense of belonging, are: the importance of the territory (the neighbourhood, for example, or the Masonic Temple) in which the neo-tribe is located (neo-tribal localism), the sharing of common tastes and the return of the eternal child.

To get a clearer picture of the concept of fragmentation, think of role-playing games and, above all, social media and social networks, the fragmentation of identities into a multiplicity of identifications. Maffesoli’s concept of identification can be understood as a hook for the autonomy of styles in Berzano’s fourth secularisation hypothesis. If we consider the educational system proper to modernity, Maffesoli writes, we can argue that its aim was to lead the child from the status of an animal to that of a civilised human being, conforming to the social contract. First there was sexual identity, which was either male or female. Then there was the professional identity, which had to be stable, established and unchanging throughout the course of a career. Together with these two identities, there was the ideological identity, which could be either political, intellectual or religious. These identities, which tended to be predictable and secure, allowed for the identification of individuals through boxes, namely social classes or socio-economic groups to which they belonged. This “social edifice”, made of boxes, has been demolished, Maffesoli continues, by advertising, fashion and role-playing games, i.e. by lifestyles, those autonomous lifestyles that the 19th century instead eradicated. Maffesoli makes it clear that we can think of post-modern neo-tribes as ways of sharing specific tastes (musical, sporting, sexual, religious, spiritual tribes, etc.), sometimes territorially localised, and tastes as the social cement of them.

The two factors indicated by Maffesoli clearly imply and express the crisis of the wisdom we have received from «increasingly weakened “vertical” processes of reproduction» and which is based on the conviction that everything must be based on the individual, which has been the emblematic sign of the time of modernity. «The individual as a rational and consenting figure in stable institutions and functioning as a predictable counter in political science - for instance, the political science of the increasingly meaningless opinion poll - is being replaced by a much more shadowy person whose instinctive will to live will not be denied» (Maffesoli, 2016, p. 740).

V. CONCLUSION

If I had to hazard an identikit of a Freemason of today I would say that he is certainly a human being (*see* Pinello, 2021) of the fourth secularisation, a “plural person” and neotribal. If I also had to hazard a sketch of a Masonic obedience of today, I would say that it is a neo-tribe. It is this identikit of the contemporary Free Mason that I had in front of me, by difference and similarity, albeit not yet so clearly delineated, when I wrote «Sociologia della Massoneria» (Sociology of Freemasonry, *see* Pinello, 2017) and «Il Decoro» (The Decorum, *see* Pinello, 2020). The latter study/research, which deals with historical issues relating to order and social deviance, especially cognitive, was carried out by me with sociological imagination, following the original approach of the work of the same name by the American sociologist Charles Wright Mills (*see* Mills, 2014) and his conception of literature. It therefore concerns the quality of the mind, in response to a *Promise*, and is useful to «ordinary men» for the development in them of sociological imagination regarding the socio-historical-theological supernatural-preternatural-supernatural-artificial continuum in Southern Italy at the turn of the mid-eighteenth century, in relation to the civil sacred and so-called civil religion (*see*, Bellah, 2009), transformed, over time, by the autonomy of styles (fourth secularisation) and processes of re-enchantment. Civil sacredness was then emerging in an increasingly widespread and viral manner and would later explode, thanks also to long reflections and meditations on the European Wars of Religion and on the Tolerance (*see* Locke, 2005; Voltaire, 2020), with the American Revolution of 1775-1783 and with the Civil War; or with the Parisian Revolution of 1789; or, in Palermo, with the Freemason jurist patriot Francesco Paolo Di Blasi, nephew of the Jansenist Archbishop of Messina Gabriello Maria Di Blasi, beheaded in the piazza; or, in Potenza, with the assassination of the Jansenist bishop Giovanni Andrea Serrao by Sanfedists, after he had taken part in the events of the Neapolitan Republic; or, in Naples, with the gallows that was erected, in *Piazza Marcato*, in that widening where *Corradino di Svevia's head was cut off*, and the heads of intellectuals and aristocrats fell (Domenico D'Alessandro); or, in Rome, with the Roman revolution of 1848 etc. In Italy, the ideal cultural line is that from Arcadia and Ludovico Antonio Muratori's “Repubblica delle Lettere” (Republic of Letters) to Cesare Beccaria's *Dei delitti e delle pene* (Of Crimes and Punishments).

[...] civil religion. The expression, introduced by Jean-Jacques Rousseau in the Social Contract, enjoyed a moment of glory in the late 1960s and early 1980s, only to pass into that limbo of ideas that have never been fully clarified, to which reference is made more or less quickly, suggesting that everyone knows what they are talking about». It is necessary «to really grasp what “lies beneath” facts and events that are only apparently self-evident [...] from a research perspective, civil religion can be a tool to identify comparative areas for empirical analysis and framing possibilities that are too often ignored or, which is the same thing, taken for granted; finally, from the point of view of a social science that does not want to be only professional but also “public”, tackling the problem of civil religion is a way to engage in widespread discussions and sensitivities among our fellow citizens, in Italy and in America [...]. The argumentative architrave of *Civil Religion in America* is that even a modern, liberal and secularised society like the United States has its own religion, “articulated and well institutionalized” [religious dimension of American political life], which can and should be studied like any other. According to Bellah, the constitutional separation of church and State does not prevent the existence of “a set of common elements of religious orientation shared by most Americans”, which “have played a crucial role in the development of American institutions and still provide a religious dimension to the whole of American life, including the political sphere”. In short, the lack of a State church is compensated for by a set of shared beliefs, symbols and rituals endowed with an incontrovertible reality. Although its main reference is biblical culture, civil religion is not traceable to any specific creed - it is in fact “authentically American and authentically new”. Introduced in public ceremonies by the first presidents and initially linked to their personal beliefs [...] The United States will have to transcend itself by contributing to the creation of a “World civil religion” capable of overcoming fictitious divisions such as that between dictatorships and the free world [...] Is the plane on which America historically moves an exclusively immanent plane? The American tradition, Bellah answers, has already answered with “no” (Bortolini, 2009, p. 7-10).

For Italy, where the situation, also historically, is more complex than in the United States, «Bellah and his writings on civil religion in Italy and America can be an excellent starting point, and not an end point, for a reconsideration of the relationship between religion and politics in our country. Beyond the accuracy of his interpretations, in fact, the comparison made by Bellah tells us that in order to understand Italy and its civil religion, we must not look for punctual analogies with the American model, but rather articulations that trace the distinctions and historical events in our Country [Italy]. Beyond any theory of Italy's shortcomings compared to the Anglo-Saxon model, it is *our* “moments of truth”, *our* outbursts of passion and mission, and *our* most bitter defeats that are the places in which to trace the themes and figures of *our* civil religion [Italy]» (Bortolini, 2009, p. 22). The dynamics and processes of the sacred and of civil religion in Italy, as Elvira Chiosi writes in the Preface to Lucia Annicelli's book “Il Codice massonico di Ischia” (The Masonic Code of Ischia), *contributed to the growth of a civil conscience opposed to any form of despotism and increasingly intolerant of the censorship and repression implemented by the clergy. The supernatural, the holy and the religious sacred were joined, taking root more and more each day, by the civil sacred* (the sacredness of the Constitutional Charter, the sacredness of the Homeland, the sacredness of private property, the sacredness of the home, the sacredness of the Masonic temple, the sacredness of the Masonic fraternity, etc.).

Heresies, excommunications, royal sanctions (of the King), alchemy and freemasonry constitute phenomena of cognitive social deviance and, at the same time, symptoms and indices of social change. Using a comparative method, based on written texts, paintings, frescoes, statues, palaces, biographies, social structures, history – all synchronic data –, with the quality of mind

promised by Charles Wright Mills' sociological imagination, I was able to understand what happened in the kingdom of Naples and Sicily during the second half of the 18th century and before the French Revolution, regarding the virality of certain Jansenist, alchemical and Masonic information, which spread through a network of academies (Pinello's research on the Accademia degli Industriosi di Gangi, Second Colony of the Accademia Palermitana del Buon Gusto and Colonia Arcadia, in the second half of the 18th century in Sicily. *See*, Pinello, 2015a; 2015b; 2018; 2020; 2022).

My research on cognitive social deviance and social change has had as its *focus* a particular pre-revolutionary Christian-Masonic initiatory path from the second half of the 18th century (the reference is to the French Revolution). Applying Berzano's model of the four periods of secularisation to Western culture and history in a paradigmatic (and therefore conventional) manner, we find ourselves in one of the transitional phases between the second and third secularisations, within certain well-defined processes of disenchantment as Weber puts it. Today, on the other hand, we are in the midst of the fourth secularisation or, as Maffesoli and Ariès put it, in the midst of a neo-tribalism of "plural people" for whom death is forbidden (*see* my research published in *Sociology of Freemasonry*, Pinello, 2017).

The fourth secularisation, which is that of our contemporary times, is characterised not only by the autonomy of styles, but also by anatheism, to use Berzano's words (*see* Berzano, 2018), and other types of atheism. Anatheism, i.e. the return to the religious sacred after the death of God, according to another model used by Luigi Berzano, researchers at the University of Turin and others, is one of the five types of atheism found in Italian society today (and beyond). The term atheism, in this perspective, must not, however, be understood in its simple literal meaning of an attitude that denies the existence of God. The first type of atheism is the traditional anti-clerical atheism (scarcely present today and very much present, instead, at the time of the French Revolution and, in Italy, until the breach of Porta Pia, and even beyond). The second type is anatheism. The third is devout or devotional atheism towards the Roman Catholic Church and the Vatican (very widespread in the Italian political world, and not only). The fourth is methodological atheism (typical of the sciences, which cannot be conditioned by religions and religious values). The fifth is the atheism of the autonomy of styles. This last type of atheism (the fifth) actually also concerns those who profess to be believers and practitioners, for example of the Catholic religion. This is why the term atheism today can no longer be used in its simple literal sense of an attitude that denies the existence of God.

These classifications and typifications help us to understand how today's Freemasonry is profoundly different from that of the second half of the 18th century. Indeed, that of today cannot but be Freemasonry at the time of the open society, the secular state, complexity, the fourth secularisation, anatheism, the autonomy of styles, other types of atheism, the globalised information society (both vertically and horizontally), neo-tribalism, the "plural person", "fragmentation" and "forbidden death", of the civil religion of the autonomy of styles and neo-tribalism.

In this sense and in this direction, the model I proposed in «Sociologia della Massoneria. Lavoro massonico, solidarietà e progettualità sociale» (Sociology of Freemasonry. Masonic work, solidarity and social planning, *see* Pinello, 2017) concerns Freemasonry today, which is not a religion (the issue is much more complex for the second half of the 18th century, due to the processes of secularization, or disenchantment, underway at that time), which leaves Freemasons free to follow the initiatory path that suits them best and that they deem to be more suited to their own chords, regarding their own "very personal inner work" (autonomy of styles), and which, as far as group work is concerned, can be understood through seven paradigms, which I proposed in the work. Such a model is based on the distinction between Freemasonry and meta-Masonry, inner work and group work, *visio ad intra* and *visio ad extra*, as well as on the consideration of Masonic work as a function of solidarity (internal and external) and social planning (internal and external).

The focus of my essay «Il Decoro. Dalla Cappella Sansevero a Palazzo Bongiorno» (The Decor. From the Sansevero Chapel to Palazzo Bongiorno, *see* Pinello, 2020), on the other hand – we are in the transition phase from second to third secularisation, or third disenchantment, in Sicily –, is on the supernatural, as understood by the Christian religion (mind you: I did not write Catholic!), in its Jansenist and alchemical version, and the "civil religion". It is a Jansenist and alchemical version, also Masonic, socially deviant and not only cognitively deviant, condemned by the pope and the Roman curia as heretical, in agreement with the king (hence the cognitive deviance), and therefore sanctioned, labelled and stigmatised not only as a serious social deviance, but also as a "crime" that could cause literary works to be put on the *Index of prohibited books*, imprisonment, torture and capital punishment.

The object of my study was the behaviour of the *Decorous Man*, inside the academies and outside «tralle genti» (among the peoples). In the case I studied, the exemplary behaviour, to be imitated, conforming to a well-defined model of Man, of the *Hermetic Warrior*, was rewarded with «"Corone di Sonetti" o "Sonetti a Corona"» (Crowns of Sonnets or Crown Sonnets), «Catene (di Unione)» (Chains of Union), fraternal (metric-literary) embraces, whose symbol, or emblematic *body*, was *the Amaranth* and whose motto was «Sic Floret Decoro Decus», to be translated «Honour for the Decor flourishes in every age, like Amaranth» (*see* Pinello 2015a; 2015b; 2018; 2010).

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In The Covid-19 Pandemic, Implementation Of Learning To Write Non-Literary Text Using Technology-Based Learning Media On Class Viii Smp Students

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Abstract- Indonesian language learning amidst COVID-19 pandemic is required to adapt to the use of technology as the main basis for learning. The use of technology as a medium in learning is adjusted to the needs of communication between teachers and students and the needs of subject matter. This study discusses the implementation of Indonesian language learning for grade VIII of junior high school students, especially in learning non-literary texts using technology-based learning media. The research method used is descriptive qualitative with data collection techniques using observation and interviews. The research subjects used were Indonesian language teachers and grade VIII students at SMP Negeri 4 Kalasan. The results showed that learning to write non-literary texts was in accordance with the online syllabus and Learning Implementation Plan amidst COVID-19 pandemic. This can be seen based on the learning components which include objectives, materials, methods, media and evaluation. The technology-based learning media used by teachers and students included WhatsApp Group, Google Classroom, Google Meet, Quizizz, Wordwall, and YouTube. Learning news texts, advertisements, slogans, and posters, teachers use WhatsApp Group, Google Classroom, Wordwall, Quizizz and Google Meet media. Meanwhile, in expository and explanatory text learning, the teacher used WhatsApp Group, Google Classroom, YouTube and Google Meet media. Meanwhile, there were several obstacles faced by teachers and students during the learning process. Barriers faced by teachers include signal stability and creativity in online learning designs. On the other hand, the obstacles faced by students included signal stability, data packets, and the learning process. In this phenomenon, teachers and students had an important role in overcoming barriers to online learning that occurred.

Indeks Terms- implementation, write, non-literary text, technology-based learning media

I. Introduction

At the end of 2019, precisely in December, a similar case appeared with unknown pneumonia in Wuhan, China (Lee, 2020). The case was caused by the corona virus or what is now known as COVID-19 (Corona Virus Disease 2019). The spread of this virus is very fast. In fact, this corona virus also attacked Indonesian citizens for the first time on March 2, 2020 in a number of two cases (Susilo, 2020). Starting from there, a number of COVID-19 cases continue to emerge. Then, on Thursday, March 12, 2020, Achmad Yurianto, the Government Spokesperson for the Handling of the COVID-19, who is also the General Director of Disease Prevention and Control, delivered a statement that the World Health Organization (WHO) has determined that the COVID-19 is a Pandemic, thus signalling to the whole world to believe that this disease can attack anyone and any country in the world, therefore all countries must anticipate and respond and must also make vigilance. This pandemic then has an impact on all aspects of life, including the field of education.

Since the COVID-19 case appeared in Indonesia, the government through the Ministry of Education and Culture, Research and Technology has swiftly made a policy to change the learning process from being face-to-face to shifting to distance learning or online learning. Distance learning is an institution-based formal education, where learning groups are separated and a communication system is used in interaction (Holden and Westfall, 2008). Distance learning was chosen as something that is supportive to use during the pandemic, especially amidst COVID-19. This is in accordance with the President's instructions to stay at home, study at home, work at home, worship at home. The policy is contained in Circular (SE) Number, 4 of 2020 concerning the Implementation of Education Policies in the Emergency Period for the Spread of COVID-19, in this case point 2 which states, the distance learning process is carried out with the following conditions: a. Studying from Home through online/distance learning is implemented to provide a meaningful learning experience for students, without being burdened with

the demands of completing all curriculum achievements for grade promotion and graduation; b. Studying from Home can be focused on life skills education, including regarding the COVID-19 pandemic; c. Studying from Home learning activities and tasks may vary between students, according to their individual interests and conditions, including considering the gap in access/learning facilities at home; d. Evidence of Studying from Home activities are given qualitative and useful feedback from the teacher, without being required to give quantitative scores.

Regarding the distance learning process (online), the presence of technology-based learning media is very important. Learning with an online system requires adaptation in its implementation, especially in terms of the learning media used. Fortunately, nowadays there are many applications that can support the online learning process. In fact, there are many learning applications that can be accessed for free. This can help teachers and students adapt to this online learning system.

This study intends to describe the online learning process in Indonesian language subject, especially in learning to write non-literary texts using technology-based learning media. This research was conducted at one of the schools that participated in implementing the online learning system by utilizing the help of technology-based learning media, namely at SMP Negeri 4 Kalasan. As mentioned above, the focus of this research will be on the process of learning to write non-literary texts in grade VIII of SMP Negeri 4 Kalasan. The non-literary text materials in grade VIII in the first semester of the 2021/2022 academic year include news texts, advertisements, slogans, posters, expositions, and explanations. Researcher is interested in studying learning in non-literary texts because in previous practice, namely during face-to-face learning, non-literary texts became a cluster of texts in Indonesian which were considered difficult by students. This is consistent with the results of interviews conducted with several eighth-grade students at SMP Negeri 4 Kalasan that learning non-literary genre texts is considered difficult and requires a more detailed explanation from the teacher when learning. Based on this, the researcher wants to know how the implementation of learning to write non-literary texts when using technology-based learning media is carried out online.

II. Research Method

This study used qualitative research method. Qualitative research is research that produces analytical procedures that do not use statistical analysis procedures or other quantification methods (Moleong, 2010:6). Creswell (2015:34) suggests that in qualitative research, the researcher collects data from participants in the study and develops a form to record during the research.

The data sources used were Indonesian language teachers and grade VIII students at SMP Negeri 4 Kalasan, consisted of 128 students with a total of 4 classes. Data collection techniques that researcher used were observation and interviews. Observations were made when online learning took place in the first semester of the 2021/2022 academic year. Interviews were conducted with teachers and student representatives from each grade VIII at SMP Negeri 4 Kalasan.

The data analysis technique used by the researcher is the Miles and Huberman model analysis technique. In this case, there are three processes in data analysis, namely data reduction, data presentation and conclusion drawing/verification. The process of analysing qualitative data is carried out interactively and continues until it is complete so that the data is valid and get the best results.

III. Findings and Discussion

a. Technology-Based Learning Media

There are several technology-based learning media used by teachers in learning to write non-literary texts in grade VIII of SMP Negeri 4 Kalasan. The following are various technology-based learning media in question.

1) *WhatsApp Group*

As a social media, WhatsApp makes it easy for users to communicate with each other and interact and discuss online and does not cost too much to use. Users can communicate using text, voice and video.

2) *Google Classroom*

This application is devoted to online learning media, so it can make it easier for lecturers to create, share and group each task without using paper anymore.

3) *Google Meet*

By default, Meet is turned on for G Suite for Education. This app allows users to make video calls with 30 other users per meeting. Google Meet is integrated with G Suite, allowing users to join directly from Calendar or an invitation sent via email.

4) *Quizizz*

Quizizz is a web tool for creating interactive quiz games that are used in classroom learning. The created interactive quiz has up to 4 answer options including the correct answer and an image can be added to the background of the question.

5) *Wordwall*

Wordwall is a website-based application that can be used to create learning media such as quizzes, matchmaking, pairing, anagrams, word randomization, word search, grouping, etc. This application provides eighteen templates that can be accessed for free and users can change activity templates easily. Teachers can also make their own content a task.

6) *YouTube*

YouTube is a video content sharing site that is currently widely used in the world. YouTube is an application that provides information in the form of videos. In this YouTube application, users can upload any and as many videos if they already have a registered account. Uploaded videos can also be viewed by the whole world. Teachers and students can take advantage of this YouTube media as an online learning medium during this pandemic.

b. Observation Results

Based on the results of observation, learning to write non-literary texts in the first semester of 2021/2022 academic year is as follows.

Research Aspects	Observation Result
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Online Learning Planning	
a. Syllabus	Official Syllabus from the Government
b. Learning Implementation Plan	Learning Implementation Plan is specially made for online learning.
Online Learning Implementation	
a. Learning Objectives	Delivered directly by the teacher when the learning process takes place
b. Learning Materials	Textbooks from The Ministry of Education, Culture, Research and Technology and supporting material books from private publishers
c. Learning Method	Project Based Learning
d. Learning Media	Online learning media such as WhatsApp Group, Google Meet, Google Classroom, Quizizz, Wordwall, and YouTube.
e. Learning Evaluation	Daily assessment, mid-semester assessment, and end-of-semester assessment.
Barriers to Online Learning	a) Teachers: signal stability and creativity of online learning models b) Students: signal stability, internet quota, and online learning process
Efforts to Overcome Barriers to Online Learning	a) Teachers: improve the quality of the internet, learn knowledge about technology, and make innovations in learning b) Students: improve internet quality, take advantage of internet quota assistance from the government, and communicate difficulties encountered with teachers

c. Discussion

1) Online Learning Planning

At the end of December 2019, the world was shocked by the outbreak of the SARS-CoV-2 virus or the cause of the disease COVID-19. The COVID-19 pandemic has changed the world order and has had various significant impacts. This can be seen from several fields, one of which is in education.

In education field of Indonesia, the government has issued a learning system policy that was originally face-to-face to an online system. This is based on the Circular of the Minister of Education and Culture Number 3 of 2020 concerning the Implementation of Education Policies in the Emergency Period for the Spread of COVID-19. One of its contents is the rules in the process of learning from home. There are several provisions that are regulated, including the basic spirit of online learning, focus on learning from home, learning activities and assignments while studying from home, as well as the role of the teacher in providing feedback.

Based on the data that has been obtained in the field, it can be seen that the teacher is trying to rearrange and develop an online learning plan. Despite the COVID-19 conditions, teachers are still preparing for online learning as much as possible. This is in accordance with the opinion of Porter (1997), that an effective class should be able to do six things, namely (1) providing the equipment needed by students and if the equipment is not available then the teacher can inform where the students can get the equipment; (2) fostering hope for students and creating a conducive atmosphere for them; (3) fostering a sense of togetherness between teachers and students to share information and exchange ideas; (4) enabling students to experiment, test their knowledge, complete assigned tasks, and be able to apply a theory they have learned or read; (5) creating and developing mechanisms to evaluate students' abilities; and (6) providing a safe and comfortable place in the learning process.

The learning planning includes the syllabus and the Learning Implementation Plan. In this plan, the syllabus used by the teacher in online learning still follows the guidelines or regulations in the face-to-face learning system. However, this is different from the Learning Implementation Plan. The lesson plan used by Indonesian teachers at SMP Negeri 4 Kalasan is a special lesson plan for online learning. The Learning Implementation Plan contains the procedures for learning activities from the beginning to those that are in accordance with the indicators and learning objectives that have been formulated. It aims to make teaching and learning activities easier and smoother and can improve the results of the teaching and learning process. Furthermore, the teacher also adjusts the time allocation, learning media, learning methods, learning materials, and evaluations.

2) Implementation of Online Learning

The implementation of online learning in learning to write non-literary texts for grade VIII at SMP Negeri 4 Kalasan can be seen from the following aspects.

a) Learning Objectives

The learning objectives are stated in the Learning Implementation Plan which has been prepared by the teacher. The objectives that have been formulated by the teacher are based on the applicable curriculum and syllabus which are adapted to the conditions of the COVID-19 pandemic and the abilities of students. It is intended that learning to write non-literary texts can be focused and well directed. Even though online learning, the teacher always conveys the learning objectives to be achieved. Students are expected to achieve predetermined goals, for example being able to compose or write non-literary texts properly and in accordance with applicable regulations.

b) Learning Materials

Learning materials are one of the components that support the achievement of learning success. The material presented in the lesson is in accordance with the The Ministry of Education, Culture, Research and Technology syllabus. After that, the material was adjusted to the needs and conditions of grade VIII students at SMP Negeri 4 Kalasan amidst COVID-19 pandemic. These adjustments include the allocation of learning time, relevant sources of material, and additional material that is considered more important.

Learning materials are related to the materials and sources of textbooks used by teachers and students in the process of learning Indonesian language, especially writing non-literary texts. In this odd term, the non-literary text materials in the eighth grade include (1) news texts; (2) advertisements, posters, and slogans; (3) exposition text; and (4) explanatory text. Students are expected to hone their skills by writing non-literary texts in accordance with the Core Competencies and Basic Competencies in the Learning Implementation Plan. Based on interviews that have been conducted, teachers use learning resources such as The Ministry of Education and Culture books and supporting material books from private publishers.

c) Learning Method

The learning method is a method used to achieve the goals that have been set (Djamarah: 2006: 46). The learning method is one of the important components that influence the success of learning Indonesian, especially learning to write non-literary texts. Learning methods are useful for increasing student interest and motivation in online learning during the COVID-19 pandemic. In addition, the method is also influential in making the delivery of material easier and more effective. In delivering the material, the teacher always tries to make students feel happy following the lesson so that they are able to understand the material well.

The COVID-19 pandemic demands that face-to-face learning be replaced with online learning. In learning to write non-literary texts online, the Indonesian language teacher of grade VIII at SMP Negeri 4 Kalasan uses project-based learning. This is in accordance with the Minister of Education and Culture Regulation Number 22 of 2016 concerning the Standards for the Primary and Secondary Education Process as follows; "The choice of an integrated thematic and/or thematic approach and/or scientific and/or inquiry and discovery and/or learning that results in project-based learning that is adapted to the characteristics of competence and level of education".

Project Based Learning is project-based learning that provides opportunities for teachers to manage learning in the classroom by involving project work (Thomas, et al, 1999). Project-based learning can also be interpreted as learning designed for complex problems where students conduct investigations to understand them, emphasize learning with long activities, tasks given to students are multidisciplinary, and product-oriented (Nayono & ER, 2013).

Project-based learning is used by teachers when learning to write news texts, advertisements, posters, or slogans, expositions, and explanations. Students are asked to make the four types of non-literary texts according to the instructions given by the teacher. Next, the students' work is collected in various ways. For news texts, expositions, and explanations, students collect their writings through WhatsApp Group in the form of pdf files. Meanwhile, for the work in the form of advertisements, slogans, or posters sent by students through their parents or online motorcycle taxi services that deliver directly to school.

d) Learning Media

In online learning, the presence of learning media is very necessary. Learning media can be interpreted as anything that can be used to convey messages from the sender to the recipient so that it can stimulate students' thoughts, feelings, concerns, and interests in such a way that the learning process occurs (Arsyad, 2005: 63). Learning media is also useful for helping teachers when delivering material and making it easier for students to understand the material.

The success of teachers in conducting online learning amidst COVID-19 pandemic situation can be seen from the ability of teachers to innovate in designing, composing materials, and learning methods. Teachers must be able to determine what technology-based learning media is in accordance with the material and learning methods. In this phenomenon, creativity is needed. Creativity is the key to the success of a teacher to be able to motivate students to keep their interest and motivation to learn online. The learning media used by teachers and students at SMP Negeri 4 Kalasan are WhatsApp Group, Zoom Meeting, Google Meet, Google Classroom, Quizizz, Wordwall, and YouTube. The following is the application of technology-based learning media in learning to write non-literary texts for grade VIII students at SMP Negeri 4 Kalasan.

No.	Non-literary Text Types	Learning Application
1.	News	a. The teacher provided instructions regarding learning news text through WhatsApp Group. b. The teacher instructed the students to answer stimulating questions about news text material in the Quizizz.

		<ul style="list-style-type: none"> c. Teachers held virtual learning meetings through the Google Meet. d. The teacher instructed students to answer questions about the news text material that has been studied through the Quizizz. e. The teacher distributed news text learning materials that have been discussed as well as provides instructions for working on the task of writing news texts through Google Classroom. f. Teachers and students discussed with each other the development of the process of writing news texts through the WhatsApp Group. g. Students submitted news text writing assignments through Google Classroom at a predetermined time limit.
2.	Advertising texts, slogans, posters	<ul style="list-style-type: none"> a. The teacher gave instructions regarding learning advertising texts, slogans, posters through WhatsApp Group. b. The teacher instructed the students to answer stimulating questions about advertising texts, slogans, posters in the Quizizz. c. Teachers held virtual learning meetings through the Google Meet. d. The teacher instructed students to answer questions about advertising texts, slogans, posters that have been studied through the Quizizz. e. The teacher distributed the news text learning materials that have been discussed as well as provides instructions for the task of writing advertisement texts, slogans, posters through Google Classroom. f. Teachers and students discussed with each other regarding the development of the process of writing advertising texts, slogans, posters through the WhatsApp Group. g. Students submitted assignments to write advertisements, slogans, posters through Google Classroom within the specified time limit.
3.	Exposition	<ul style="list-style-type: none"> a. The teacher provided instructions and stimulation questions related to exposition text learning through WhatsApp Group. b. Teachers held virtual learning meetings through the Google Meet. c. The teacher instructed students to listen to video shows containing health information that are displayed on YouTube. d. The teacher distributed the exposition text learning materials that have been discussed as well as provides instructions for working on the task of writing an explanatory text through Google Classroom. e. Teachers and students discussed with each other regarding the development of the process of writing exposition texts through the WhatsApp Group. f. Students submitted an exposition writing assignment through Google Classroom by a predetermined time limit.
4.	Explanatory	<ul style="list-style-type: none"> a. The teacher provided instructions and stimulation questions related to explanatory text learning through WhatsApp Group. b. Teachers held virtual learning meetings through the Google Meet. c. The teacher instructed students to listen to video shows related to natural and social phenomena that are broadcast on YouTube. d. The teacher distributed explanatory text learning materials that have been discussed as well as provides instructions for working on the task of writing explanatory text through Google Classroom. e. Teachers and students discussed the development of the process of writing explanatory texts through the WhatsApp Group. f. Students submitted an explanatory writing assignment through Google Classroom by a predetermined time limit.

e) Learning Evaluation

Learning evaluation is carried out by teachers to measure the extent to which the level of mastery and learning carried out by students during the learning process after previously conducting an assessment (Haryanto, 2020: 66). Learning evaluation also aims to collect information that becomes the basis for measuring the level of progress, development, student achievement, and the effectiveness of educators in teaching. This learning evaluation is based on the learning objectives. This is in accordance with the statement of Brinkerhoff (1986: 9) that evaluation is a process that determines the extent to which educational goals can be achieved.

In accordance with the Indonesian language Learning Implementation Plan for grade VIII at SMP Negeri 4 Kalasan that has been made, the evaluation forms used in learning to write non-literary texts are tests and non-tests. Evaluation in the form of tests can be divided into two, namely oral tests and written tests. Non-test evaluation is done by observing student learning behaviour in the learning process.

Evaluations carried out in learning to write non-literary texts can be described in daily assessments, Mid-Semester Examination and Final Semester Examination. In the daily assessment, using the project-based learning method, students write non-literary texts that will be submitted to the teacher for assessment. The results of student writing must meet the standard of assessment criteria based on the assessment indicators that have been determined by the teacher. Amidst COVID-19 pandemic, the Mid-Semester Examination and Final Semester Examination will still be conducted online using Google Forms. To make it easier for students, the questions given are in the form of multiple-choice questions.

3) Barriers to Online Learning

The learning process is never free from various obstacles, especially in network learning (online) which still has a lot of adaptation. Barriers to learning become a spur to carry out better learning. The following are learning barriers that occurred during online learning to write non-literary texts.

Barriers perceived by teachers included signal stability and creativity in online learning designs. Signal stability is an important factor in online learning. However, sometimes the network signal is erratic. This can hinder the learning process, especially when the teacher delivers learning materials. Next, the creativity of online learning design. In this case, the teacher must be able to master the field of technology because the online learning system uses the help of information technology devices.

Barriers were also experienced by students. The obstacles felt by students include signal stability, availability of data packets, and the learning process. The first problem is related to signal stability and data packet availability. An unstable network becomes an obstacle in the online learning process. Therefore, the existence of adequate internet network facilities can be said to be the main thing in learning online systems.

The existence of students who are far from the city centre or far from the reach of the provider network, of course, cannot run this online learning process smoothly.

The other obstacle experienced by students is the learning process. In the learning process, students feel that there are too many tasks from all subject teachers. This component is considered an obstacle for students because students still need to adjust learning conditions with the online system. However, this will slowly improve if this online learning system is commonly used in the learning process, especially in writing non-literary texts.

4) Efforts to Overcome Barriers to Online Learning

The various obstacles that occur can interfere with the implementation of learning. Teachers have a role in overcoming learning barriers. The following describes some of the efforts made by teachers in overcoming barriers to learning to write non-literary texts online.

Efforts to overcome obstacles from teachers related to signal stability can be done by improving the quality of the signal network. Schools improve the quality of the Wi-Fi network to support the progress of the online learning process. Further efforts for teachers to study the field of Information and Technology and make innovations, mainly related to technology-based learning media that can support the progress of the learning process. Teachers continue to make and try new innovations and changes to support the success of online learning. Additionally, the schools also hold various trainings for teachers. With this, it is hoped that teachers can develop more in providing innovative learning media and methods.

Efforts to overcome student barriers can be done by improving the quality of the network. Students can change the type of provider that is better or in accordance with the environmental conditions in which they live. Students can also take advantage of the study quota assistance provided by the Ministry of Education and Culture, Research and Technology. The next effort is to build good communication with teachers through available online media. This is because amidst COVID-19 pandemic, students are required to study from home with an online system. Students often complain of too many assignments. Therefore, good communication among teachers and students is needed. Teachers can provide understanding and motivate students to always actively participate in learning to write non-literary texts well.

IV. Conclusion

Based on the results of research and discussion of learning to write non-literary texts using technology-based learning media for grade VIII students of SMP Negeri 4 Kalasan, it can be concluded that learning to write non-literary texts is in accordance with the online syllabus and Learning Implementation Plan amidst COVID-19 pandemic. This can be seen based on the learning components which include objectives, materials, methods, media, and evaluation. Technology-based learning media used by teachers and students included WhatsApp Group, Google Classroom, Google Meet, Quizizz, Wordwall, and YouTube. In news texts, advertisements, slogans, and posters learning, teachers used WhatsApp Group, Google Classroom, Wordwall, Quizizz and Google Meet media. Meanwhile, in expository and explanatory text learning, the teacher used WhatsApp Group, Google Classroom, YouTube, and Google Meet media.

Meanwhile, there were several obstacles faced by teachers and students during the learning process. Barriers faced by teachers included signal stability and creativity in online learning designs. On the other hand, the obstacles faced by students included signal stability, data plan and the learning process. Teachers and students have an important role in overcoming barriers to online learning that occurred.

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Analysis of the factors affecting the adoption of farmer led irrigation initiatives in the model A1 schemes of Zimbabwe: A case of Mazowe district.

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Abstract- Farmer led irrigation is a new phenomenon that is fast gradually take shape in the redistributed lands of Zimbabwe under the Fast Track Land Reform. This type of irrigation is taking place without much knowledge of the policy makers and irrigation planners. This study focusses on those factors that influence A1 model farmers in the adoption of this type of irrigation and Mazowe District was used as a case study. The current study utilized a mixed method research design with a target population of 3441 Smallholder A1 irrigating farmers in Mazowe District. The sample size for the study for quantitative data was 310 while 5 public officers were for qualitative data. For purposes of quantitative data stratified random sampling and convenience sampling were used while purposive sampling was employed for the 5 key informants (qualitative data). Data collection instruments used were a questionnaire for quantitative data, an interview guide for key informant interviews and focus group discussions while participatory observation was applied on transect walks. Processing of data was done using iNvivo version 12, SPSS version 20 and Amos version 22.5 before being analyzed by the researcher in line with the research objectives. The study found out that there were thirteen factors that affected the adoption of farmer led irrigation. The highest factor influencing the adoption of FLI was access to finance and the factor with the lowest influence was soil fertility. The study recommended government subsidies to farmer led initiatives, use of ICT and training to both smallholder farmers and extension officers. This study further called for more research in the future to include other variants of farmer led irrigation besides the one hinged on the use of water pumps. Further to this need, this study also calls for incorporation of market information and other stakeholder views to validate the views of interviewed A1 farmers.

Index Terms- farmer led farming, Fast track land reform, A1 model, livelihoods, A1 farmers

I. INTRODUCTION

Academic debates on land reform in the region focus on the political and social rationality of land redistribution as an approach to redressing inequalities in access to productive

resources including land ownership and access during the colonial era (Mandizadza, 2011). Land reform according to Boyce et al. (2005) describes the reallocation of rights to establish a more equitable distribution of farmland. At independence in 1980, Zimbabwe had inherited a skewed land ownership structure where 80 percent of all the arable land was owned by only a minority of white commercial farmers who only constituted less than 2 percent of the population (Marongwe, 2009). As a result, the new government of Comrade R.G Mugabe embarked on the first land reform programme to re allocate land rights from the few minority white farmers to the majority previously marginalized black indigenous settlers in both the communal and urban areas. They claimed that the reallocation could be a very powerful strategy in promotion and transformation of the economy and livelihoods of the farmers (Mukodzongi et al., 2017). This narrative of economic transformation and improvements has become more pronounced now against the backdrop of climate change, COVID 19 global pandemic and the war between Russia and Ukraine which has shown that over reliance of foreign aid for food is more likely to expose African economies to food insecurity. Zimbabwe with a massive land transfer reform should not be part of such statistics with abundance of land and water, the two most important resources (Rukuni, 2011). In this regard, Scoones et al. (2019) posit that in the rural and resettlement areas of Zimbabwe, smallholder farmers are now engaging into farmer led irrigation without the acknowledgement of the state and irrigation planners. This paper investigates the factors affecting the adoption of farmer led irrigation under the A1 model of the Fast Track Land Reform (FTLRP).

II. PROBLEM STATEMENT

The progress of Zimbabwe's Fast Track Land Reform Programme (FTLRP) of 2000 has been varied in terms of progress (Njaya, 2015). The initial causes and the resultant consequences of the FTLRP have been debated widely and now significant body of literature of the FTLRP exists (Masiiwa, 2004; Moyo, 2000, 2004; Njaya, 2016; Richardson, 2004; Sachikonye, 2003; Scoones, et al., 2010, 2019; Zikhali, 2008). The programme is credited with addressing the historical land imbalances and the same time broadening the base of black economic participation

(Mukodzongi, 2017). Despite being credited with the overhauling the racial inequalities in land ownership in Zimbabwe, the program is associated with losses in agriculture production and economic collapse (Richardson, 2004). The negative impacts often highlighted create a negative picture of the FTLRP. However, there has been lack of solid empirical research on how such an extensive land redistributive programme has impacted on the livelihoods of smallholder farmers especially those that have gone on to engage in farmer-led irrigation farming (Njaya, 2016). In this regards A1 model settlement farmers who have ventured into farmer led irrigation or those intending to practices farmer led irrigation need to make sound decisions before engaging in farmer led initiatives and there is need for pertinent information on factors that affect adoption smallholder farmer led irrigation. Furthermore agricultural financiers require information in order to make sound decisions regarding the funding of small holder farmer led irrigation initiatives in terms of economic viability concerns which would more likely improve the livelihoods of resettled farmers especially A1 model farmers. This paper undertook to analyse the factors that influence the adoption of farmer led irrigation under the A1 model of the FTLRP in Mazowe District in Mashonaland Central Province of Zimbabwe.

III. REVIEW OF RELATED LITERATURE

A. Farmer led irrigation

Woodhouse et al. (2017: 13) define farmer led irrigation development as a process where smallholder farmers assume a driving role in improving their water use for agriculture in so doing bring about changes in knowledge production, technology use, investment patterns, market linkages and governance over land and water resources. The development of smallholder farmer led irrigation has been noted across developing nations as being of highly significant value in mitigating the effects of climate change and being a catalyst to sustainable long term agricultural and national development (Chisango and Maphosa, 2016). Farmer-led irrigation is also further defined as an irrigation practice initiated, managed and financed by farmers themselves (Lefore, et al., 2019), mostly by individuals (de Fraiture and Giordano, 2014), but sometimes in small groups (Beekman et al., 2014). The irrigated areas are typically small (less than 2 ha), the technologies are generally low-cost (Lefore, et al., 2019), and the farmers produce both high-value horticultural crops and staple crops (Otoo et al., 2018).

B. Fast track Land Reform

Zimbabwe undertook a massive second land reform programme of 2000 which undertook to transfer over 10 million hectares from 6400 former commercial white farmers to indigenous black farmers. Due to its accelerated nature of implementation it was code named Fast Track land Reform (FTLRP) and was initially spearheaded by veterans of Zimbabwe's armed struggle (Mukodzongi, 2017)

Model variants under the FTLRP

Under the FTLRP, the government of Zimbabwe implemented two model variants, the A1 model and the A2 model (GoZ, 2003). According to Zikhali (2008), the A1 model just like the other earlier (A) model in phase 1 was undertaken on a villagized model or self-contained model. The same author further

notes that under the villagized model, a beneficiary is allocated 3 – 6 hectares of arable land, half a hectare for residential space and 16 – 30 hectares for communal grazing (Mukodzongi and Lawrence, 2019). The design of the A2 model variant was to accommodate medium to large-scale commercial farmers with the ability to mobilize own resources (Mukodzongi, 2017). In all the resettlement models, the government's purpose was that of improving production of food to ensure food security in the country by allocating, the peasants, larger pieces of land than the previously owned (Scoones and Warmer, 2002).

Smallholder farmer led irrigation and farmers' livelihoods

The study as a result, explored the role that smallholder irrigation farming plays on A1 resettled farmers' livelihoods. The FTLRP was implemented in an accelerated manner and radically transformed the county's land ownership and agrarian structure (Zikhali, 2008). The FTLRP drastically reduced the land within the white dominated large-scale commercial sector and expanded the black dominated small-scale farming sector (Njaya, 2015).

In general, there has been progress of the FTLRP from 2000 to date in terms improving farming methods, decongestion of rural areas and redressing of land inequality. The causes and the subsequent consequences of the FTLRP have been widely debated and there is a significant contribution to academic literature regarding this program (Deininger et al., 2002; Matondi, 2012; Masiwa, 2004; Moyo, 2004; Mukodzongi, 2019; Richardson, 2004; Rukuni et al., 2006; Sachikonye, 2003; Scoones, et al., 2019; Zikhali, 2008). To its credit, FTLRP addressed the Zimbabwean land question. The land ownership dispute as noted by Munyoro et al. (2018) centers on colonial policies (land husbandry act of 1930 and the land apportionment acts of 1951) that allocated most of agricultural prime land to the white minority while depriving land ownership to the black majority making them landless or crowding them in the less productive areas of the country. This has positioned a significant sector of the population of the indigenous Zimbabweans to contribute more meaningfully to the national growth agenda. The FTLRP has been associated with loss in agricultural productivity and economic collapse and violence in the manner in which it was implemented (Sadomba, 2008). These narratives have created a picture of pessimism about the FTLRP. These negative impacts, often overly highlighted, overlook the positives that such a massive programme can have on the livelihoods of the resettled small-scale farmers. Some pertinent questions that arise are: Have there been any welfare and income gains for smallholder farmers under the A1 scheme of the FTLRP? What are the perceptions of A1 farmers with regards to productivity under the FTLRP?; What then are the factors that have influenced the adoption of farmer led irrigation initiatives by A1 model farmers?

Previous studies on smallholder irrigation in Zimbabwe focused on examining the association between smallholder irrigation and livelihoods but did not deal with the factors affecting the adoption of this new type of irrigation system under the redistributed lands. (Kabongo, 2020; Mhembwe and Dube, 2017; Tshuma, 2015). Therefore this paper notes that the level of farmer led irrigation adoption under A1 schemes under the FTLRP is not well documented.

Studies of smallholder irrigation schemes have mainly been focused on communal areas where irrigation schemes were

developed by either the pre-independence or post-independence governments (Chazovachii, 2012; Manzungu, 1999; Mombeshora, 2003; Rukuni and Eicher, 1994). In such schemes Makadho (2008) notes that, the land is state-owned but managed by groups of farmers who share water resources, infrastructure, and each family has an area of not more than 0.5 hectares. This is supported by other studies in smallholder irrigation schemes in Zimbabwe (Chazovachii, 2016; Manzungu, 1999; Mombeshora, 2003; Rukuni, 2006). Historically, small-scale irrigation schemes were regarded as insurance against crop failure that leads to famine in the absence of other means to access food (Makadho, 1994).

The beginning of the FTLRP redefined the dynamics of smallholder irrigation. According to Scoones et al. (2019). The land reform of 2000 in Zimbabwe redistributed about 10 million hectares once owned by approximately 6400 white commercial farmers. This, according to Ministry of Lands (2022), has resulted in establishment of around 146 000 A1 and 16 000 A2 scheme units. Land allocations to smallholder farmers under A1 scheme were in the range of 3-6 hectares of arable land and the majority of these plots can be deemed to be having access to irrigation water from both old and new sources on the farms (Scoones et al., 2019). Some of the plots are located in areas where there exist irrigation infrastructure like water pipes, water reticulation and water pumps left by former commercial farmers. This land is mostly fertile land and in most cases there is access to water sources previously used for irrigation by the former white commercial farmers under the previous agricultural land dualistic setup before the onset of the FTLRP (Tshuma, 2007). This radical reconfiguration of the agrarian structure according to Scoones et al. (2019), has given rise to the need to reestablish different agricultural production scales particularly under irrigation. The resettlement models implemented to date are a useful starting point in understanding the present models of A1 and A2 under the FTLRP.

C. Factors influencing the adoption of farmer led irrigation in Africa

The issues of crop productivity are naturally preceded by the question; do A1 farmers invest in irrigation? The general view is one that it is only the more secure commercial farmers that invest in irrigation is at variance with studies from the region. According to Woodhouse et al. (2017), there is evidence that, contrary to the belief that is generally held, A1 farmers invest in irrigation.

There is evidence of farmer investment in agriculture according to studies carried out on the continent (Woodhouse et al., 2017). Farmers invest in irrigation at both household and aggregate level (Woodhouse, et. al., 2017). The small investments at household level have a significant cumulative effect on overall irrigation development. Wamara et al. (2014) report that in Ghana the official import data show that over USD8 million was used to import over 65000 pumps and accessories between 2003 and 2010. This investment figure was at par with the official figure in large scale irrigation investment. Wamara et al. (2014) further posit that irrigation farming is done on vast tracts of land by using water lifting technologies.

Approximately 115 000 hectares of undocumented farmer-led irrigation may exist in Mozambique (Beckman, et al., 2014). This figure would officially double the recorded national statistics

on developed irrigable land in use which in 2012 stood at 118 000 hectares in Mozambique (Beekman, et al., 2014). The same pattern of use also obtains in Tanzania and Zimbabwe. Scoones et al. (2019) in a study in Masvingo District, Zimbabwe found out in their study of FTLRP farms that farmer-led irrigation development was three times more than the official irrigation statistics thereby challenging the national figures for the same presented by Manzungu et al. (1999).

Smallholder irrigation farmers are also known to interact with external actors and this influences the rural economies (Scoones, et al., 2019). In this regard, Woodhouse et al. (2017) noted that investments in small holder farmer led irrigation initiatives are influenced by the broader socio-economic environment. Financial investments by farmers on farmer led irrigation initiatives are not guided by what Woodhouse et al. (2017) term agro-ecological potential or irrigation potential but by economic factors.

Labour mobility is an additional critical aspect of rural economies. According to Hill (1963) and Swindell (1978), migrant labour plays a key role in the intensification of agriculture in Africa. This has been noted in schemes like Gezira in Sudan (Robertson, 1987), the Senegal River Delta (Woodhouse et al., 2017). A large number of immigrants made irrigation construction in farmer-led irrigation development possible for instance, Zimbabwe immigrants in Penhalonga in Mozambique (Beekman, 2014). Use of shallow wells for irrigation has caused reversal of rural-urban migration in Ghana as youths got involved in horticultural production given the attractiveness of horticultural products in attracting market and good competitive markets (Wamara, et al., 2014).

The third factor influencing how farmers invest in irrigation development is that of land tenure. Land has always been a subject of intense debate in Zimbabwe. These issues have been mostly directed at the A2 commercial model scheme leaving out the A1 model scheme. According to World Bank (2010) the prevailing paradigm is one that formalized land rights constitute a pre-condition to investment in agriculture. On the contrary, agricultural intensification was not inhibited by customary land holding systems in many countries and this is supported by studies on farmer-led irrigation development across SSA (Beekman et al., 2014). In Ghana peri-urban agriculture is expanding owing to increase of dam constructions around towns. This is despite lack of secure land rights for the cultivated land. The same farmers continue to expand their cultivation areas despite threats of housing construction projects in these areas. In countries such as Mozambique, farmers acquire land outside of traditional land tenure governance through seasonal land lease arrangements (Beekman et al., 2014). This is also done in the framework of customary authority, consistent with what Chimowa and Woodhouse et al. (2017) termed the vernacular land markets. These farmers make entrepreneurial decisions that are highly influenced by existing customary land tenure authority and national state governance institutions.

The widely held belief that irrigation can only be feasible with state or donor support is highly disapproved by events on the ground in most of SSA (Woodhouse et al., 2017). Farmers are

investing even in areas where there is no security of land tenure. This may be explained in part by the high returns from irrigation agriculture compared to dry land farming. Irrigation conditions allow households to cultivate during the wet and dry seasons, giving the land a high augmentation effect (Dube, 2019).

Efficacious irrigation schemes allow for intensive crop production and increases in land productivity. As a result smallholder irrigation schemes allow for a certain degree of crop diversification which is not possible with rain fed agriculture (Liao, et al., 2008; Tan, et al., 2009). In studies to assess the impact of irrigation in Asia, Lipton et al. (2003) note the direct impact of irrigation on output levels. In the same studies it was found that irrigation enhances crop yield through mitigating against mid-season droughts. Secondly, irrigation permits multiple cropping and as a result increases annual outputs. Thirdly, irrigation allows for the greater use of land for crop production where rain fed production is minimal or marginal.

IV. METHODOLOGY

The current study utilized a mixed method research design with a target population of 3441 Smallholder A1 irrigation farmers in Mazowe District. The sample size for the study for quantitative

data was 310 smallholder farmer practicing farmer led irrigation while 5 public officers were for qualitative data. For purposes of quantitative data stratified random sampling and convenience sampling were used while purposive sampling was employed for the 5 key informants (qualitative data). Data collection instruments used were a questionnaire for quantitative data, interview guide for key informant interviews and focus group discussions while observation was applied on transect walks. Processing of data was done using iNvivo version 12, SPSS version 20 before being analyzed by the researcher in line with the research objective.

V. RESULTS

A. Demographic profile

The demographic characteristics considered were gender, age, level of formal education, religion, and marital status, and household size, position in home and type of occupation.

Table 1. Frequency and validity percentages of the demographic characteristics, gender, age, level of education, religion, marital status, household size, position in home and occupation of the A1 farmers sampled in the Mazowe District in Zimbabwe during the month of February 2021.

		Frequency	%	Valid %	Cumulative %
GENDER	Male	189	61.0	61.0	61.0
	Female	121	39.0	39.0	100.0
AGE	18 – 30 years	70	22.6	22.6	22.6
	31 – 40 years	101	32.6	32.6	55.2
	41 – 50 years	89	28.7	28.7	83.9
	51 – 60 years	38	12.3	12.3	96.1
	61+ years	12	3.9	3.9	100.0
	LEVEL OF EDUCATION	No formal education	32	10.3	10.3
Primary Education		51	16.5	16.5	26.8
Secondary Education		143	46.1	46.1	72.9
Diploma		37	11.9	11.9	84.8
Degree		47	15.2	15.2	100.0
RELIGION	Christian	215	69.4	69.4	69.4
	Muslim	31	10.0	10.0	79.4
	Traditional	42	13.5	13.5	92.9
	Others	22	7.1	7.1	100.0
MARITAL STATUS	Single	80	25.8	25.8	25.8
	Married	103	33.2	33.2	59.0
	Divorced	56	18.1	18.1	77.1
	Separated	9	2.9	2.9	80.0
	Widowed	62	20.0	20.0	100.0
HOUSEHOLD SIZE	1 – 3 members	62	20.0	20.0	20.0
	3 – 5 members	151	48.7	48.7	68.7
	6 – 9 members	66	21.3	21.3	90.0
	10+ members	31	10.0	10.0	100.0
POSITION IN HOME	Husband	122	39.4	39.4	39.4
	Wife	72	23.2	23.2	62.6
	Child	87	28.1	28.1	90.6
	Others	29	9.4	9.4	100.0
OCCUPATION	Farmer	140	45.2	45.2	45.2

Farmer	108	34.8	34.8	34.8
Farm worker	34	11.0	11.0	45.8
Trader	40	12.9	12.9	58.7
Casual	22	7.1	7.1	65.8
Civil servant	92	29.7	29.7	95.5
Private firm	5	1.6	1.6	97.1

Zikmund and Babin (2013) exemplifies that if farmers are the respondents in a research, their demographic characteristics need also be considered, rather than it be covertly presumed that they are a homogenous group with similar qualities.

Gender: The gender of respondents was included because of its importance in shaping the power of making decisions in the farming industry particularly under farmer led irrigation initiatives. More than 50% of the respondents within the final sample were males (61.0%) while 39.0% were females. This is a reflection of the historical disparities which elevated the male child ahead of the female in terms of ownership of assets like land as a result of patriarchal nature of the culture of Zimbabwe as noted by Chitongo (2017).

Age: The age of respondents was also determined in order to assess whether the responses varied with age. The respondents' age was as follows: 18 – 30 years (22.6%) of the sample, 31 – 40 years, (32.6%) 41-50 (28.7%) 51-60 years (12.3%) and 50 years and above constituted 3.9%. The proportion of the different age groups is consistent with results reflected by the national census of 2012 which shows that Zimbabwe has a young population where 67 % is below the age of 40 years.

Level of Education: In the sample, 10.3% had no formal education, 16.5% of the respondents had completed primary education, (46.1%) of the respondents had completed secondary education, 11.9% were holders of diplomas in various fields that included finance, education, administration and agriculture and 15.2% were holders of degrees in areas that also include education, agriculture and administration.

Religion: Religion may affect the response of an individual to certain questions and was therefore considered as a demographic characteristic. The majority were Christians (69.4%), followed by Traditional (13.5%), Muslim (10.0%) and

finally other minority religious practices constituted the remaining 7.1%.

Marital Status: The majority were married and constituting 33.2%, followed by those who were single constituting 25.8%, those who were widowed constituted 20.0%, then those who were divorced were 18.1% and finally respondents who were separated from their spouses were 2.9%.

Household Size: The majority of families had 3 – 5 members with 48.7%, followed by those with 6-9 members constituting 21.3%, those household with 1 – 3 members were third with 20.0% and lastly those with 10 or more members had 10.0%.

Position in Home: Of those interviewed from the families sampled, 39.4% of the respondents comprised of husbands, 23.2% were wives, 28.1% were children and 9.4% were others.

Occupation: The majority of respondents were farmers (34.8%), followed by civil servants with 29.7%, those who were traders constituted 12.9%, Farm workers had 11.0%, those who performed casual work were 7.1% and finally private firms had 1.6%. Civil servants were mainly from Mazowe district were also involved in the FTLRP in Mazowe under their different departments.

The next section dealt with opinions of the sample farmers on their views on the adoption of farmer led initiatives under the A1 schemes of the FTLRP in Mazowe District, Zimbabwe.

B. The opinion of the sample on factors influencing adoption of farmer led irrigation

Thirteen items that influence the adoption of farmer led irrigation were identified and the ranking of the factors is presented in Table 2.

Table 2 Ranking of factors influencing adoption of farmer led irrigation among resettled farmers in the A1 model in the Mazowe District, Zimbabwe in 2021.

Code	Factor	RII ^a	Degree of rating	Rank ^b
AFLI1	Access to capital	78.10	high influence	1
AFLI9	Access to technology	66.06	high influence	2
AFLI3	Irrigation knowhow	65.03	high influence	3
AFLI8	Support programs	63.48	high influence	4
AFLI7	Agricultural policy	63.68	high influence	5
AFLI12	Rainfall to fill rivers and dams	63.42	high influence	6
AFLI10	Extension support services	62.06	high influence	7
AFLI5	Access to markets	61.87	high influence	8
AFLI4	Knowledge of agronomic practices	61.61	high influence	9
AFLI6	Supportive institutions	60.84	high influence	10
AFLI11	Soil fertility	58.06	average influence	11
AFLI2	Diversity among schemes	57.35	average influence	12
AFLI	Adoption of farmer led irrigation	63.78	high influence	-

a RII-Relative Importance Index is an index used in ranking factors whose scores derived from

b Rank - five point Likert scale: Little influence (1), Some influence (2), Average influence (3), High influence (4) and Very high influence (5)

The factor that ranked highest at influencing the adoption of farmer led irrigation was access capital with an RII factor of 78.1% (Table 4.9). In contrast, “Soil fertility” and diversity among schemes were the least important factors at influencing the adoption of farmer led irrigation with a RII of 58.06 % and 57.35 % respectively (Table 1).

Access to capital ranked first with an RII of 78.10% in influencing adoption of farmer led irrigation. Access to technology ranked second (RII=66.06%) (Table 4.7) in influencing adoption of farmer led irrigation. Irrigation knowhow ranked third with an RII of 65.03% in influencing adoption of farmer led irrigation. Support programs ranked fourth with an RII of 63.48% in influencing adoption of farmer led irrigation.

Furthermore, agricultural policy ranked fifth with an RII of 63.68% in influencing adoption of farmer led irrigation. Rainfall to fill rivers and dams ranked sixth with an RII of 63.42% in influencing adoption of farmer led irrigation. Extension support services ranked seventh with an RII of 62.06% in influencing adoption of farmer led irrigation. Access to markets ranked eight with an RII of 61.87% in influencing adoption of farmer led

irrigation. Knowledge of agronomic practices ranked ninth with an RII of 61.61% in influencing adoption of farmer led irrigation. Moreover, supportive institutions ranked tenth with an RII of 60.84% in influencing adoption of farmer led irrigation. Soil fertility ranked eleventh with an RII of 58.06% in influencing adoption of farmer led irrigation. Diversity among schemes ranked twelfth (last) with an RII of 57.35% in influencing adoption of farmer led irrigation.

C. Presentation and analysis of the qualitative data for objective one- key informants

Key informant interviews, in this study, were undertaken to get several viewpoints. As noted by Braun and Clarke (2006), thematic analysis is employed in such circumstances in identifying and analysing themes in a dataset. The data collected from key informant interviews were analysed through transcribing, reduction and coding as suggested by Creswell (2018).

A question was posed to the participants on Factors influencing adoption of farmer led irrigation and the themes are shown in Table 4.10 below

Table 3: Summary of codes and themes for factors influencing the adoption of farmer led irrigation model interviews under the A1 model in Mazowe District in 2021.

OPEN CODES	AXIAL CODES	SELECTIVE THEMES
1. Poor cropping		
2. Lack of capital		
3. Lack of genuine support	1. Own capital	
4. Transport	2. Diversity among schemes	1. Political
5. lack of knowledge	3. Knowledge of agronomic practices	2. Economic
6. Poor Rainfall	4. Rainfall to fill rivers and dams	3. Social
7. Poor lending	5. Weak institutions	4. Natural
8. Poor technology	6. Access to technology	
9. Lack of interest in farming	7. Lack of interest in farming	
10. Poor support from government		
11. Poor soil fertility		
12. Cash liquidity		

The analysis of key informant interviews reports on Factors influencing adoption of farmer led irrigation through open coding had twelve, axial coding seven and finally four main themes. Participants view the factors influencing adoption of farmer led irrigation in their contexts to be political, economic, social and natural aspects. Lack of Capital under the economic context still topped the view of sample farmers with regards to factors affecting adoption of farmer led irrigation initiatives. This was also noted under the quantitative analysis. Together with lack of support from

government in areas of infrastructure development, these factors need attention to encourage adoption of farmer led irrigation in the A1 schemes under the FTLRP.

D. Presentation and analysis of the qualitative data for objective one – transect walks

During the transect walk in the study sites, it was observed that both new and old farm infrastructure was evident on A1 plots and examples are presented in Figure 4.1.



Figure 1: Existing old farm infrastructure

Old dams were part of the infrastructure that was left behind by former white farmers. A1 farmers had developed new irrigation infrastructure with Chinese pumps evident in most plots. The use of plastic tubing as conveyance pipes was common. In farmer led irrigation farming, Woodhouse et al. (2017) and Scoones et al. (2019) indicate that farmers utilise government infrastructure

which would otherwise remain not utilised and act as dead capital to engage in farmer led irrigation initiatives. In a way infrastructure motivated the adoption of farmer led irrigation. New irrigation infrastructure, roads and new farm houses were common features in the infrastructure construction in addition to that for irrigation. This is shown in figure 2 below:

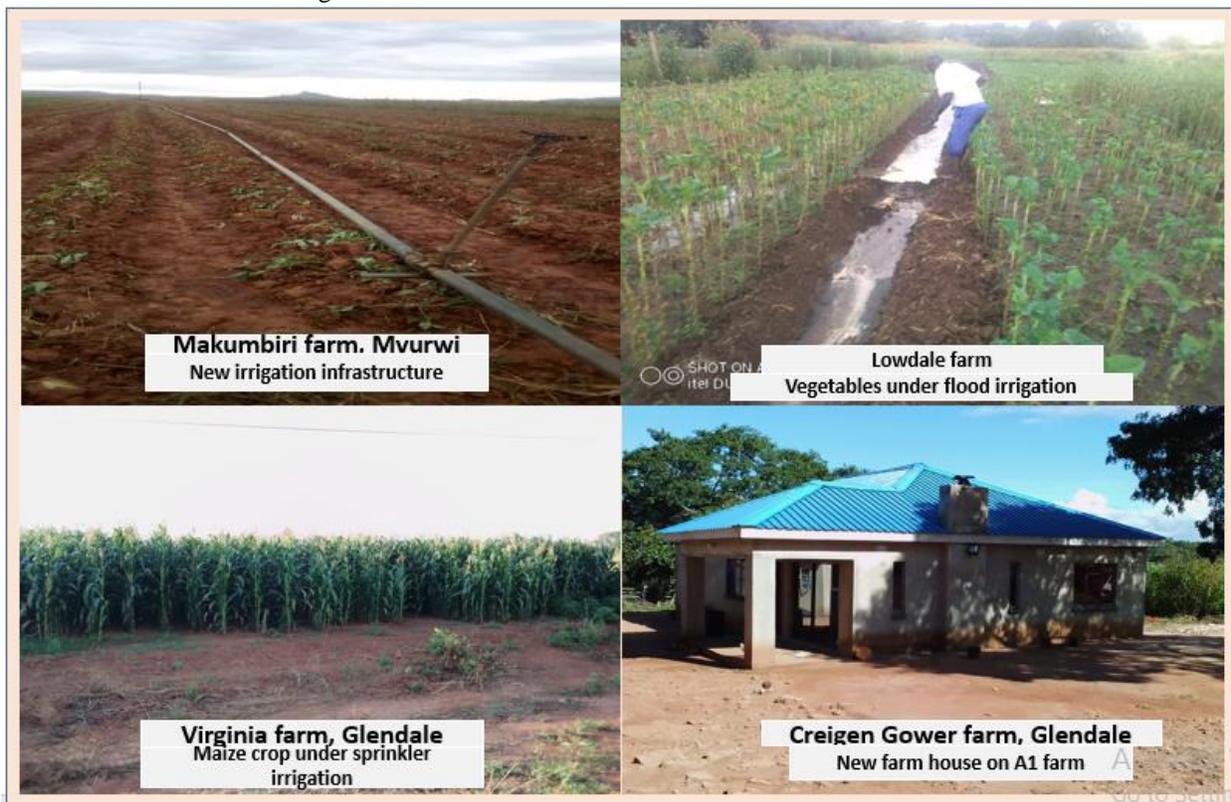


Figure 2: Irrigation infrastructure, roads and new farm house

Simple direct observation was used to compare and compliment data collected through the questionnaires and other sources. Socio-economic activities observed were crop production which had a direct influence on the livelihoods of A1 resettled farmers in Mazowe District.in 2021 as shown in figure 1 and figure 2 whilst livestock was procured as a result of increased income realised from farmer led irrigation farming activities practised by A1 resettled farmers in Mazowe District.

Most of the irrigation infrastructure that had been left behind by the former white farmers had been vandalised and lying idle as

the A1 farmers without the support of Government and NGOs did not afford the cost of irrigation rehabilitation. Farmer led irrigation calls for the initiation, funding and management of the irrigation infrastructure as compared to the Government schemes that have been shown to fail over the years due to group cohesion problems and failure to raise capital for operating the schemes. As a result group schemes have been vandalised and irrigation rendered in effective (figure 3 and figure 4). One of the initiatives that farmers have engaged in to continue irrigation farming outside the normal block irrigation schemes is the farmer led irrigation farming initiative.



Figure 3: Vandalised irrigation infrastructure
Source: primary data, (2021)



Figure 4: Vandalized irrigation infrastructure

The results from qualitative analysis and from transect walks confirmed the quantitative results which indicated that there were thirteen items that affected the adoption of farmer led irrigation in the A1 resettlement model in Mazowe District.

VI. RECOMMENDATIONS

Government support to A1 smallholder farmers

According to Munyoro et al. (2018), access to funding, markets, information and technology impact feasibility in terms of smallholder farming and this is supported by the current findings that established access to funding as one of the major challenges in smallholder farmer led irrigation farming ventures. Mobilizing and increasing rural credit lines to smallholder farmers including A1 irrigating farmers in Zimbabwe should be prioritized during policy formulation. As a result, the land bank (Agricultural Finance Cooperation) needs to be quickly operationalized to offer medium to long term capital borrowing to allow farmers to borrow for irrigation development. Irrigation accessories such as water pumps and engines, solar panels and piping should be exempt from paying duty on being imported into the country. These irrigation accessories form an important driver in the attainment of a viable smallholder farmer led irrigation development in the resettlement and the communal areas of Zimbabwe.

Information Communication Technology (ICT) development

Success of smallholder farmer led irrigation farming efforts largely depends on the information and new technology adoption like smallholder farmer led irrigation initiatives. In this regard the Government of Zimbabwe will need to develop well-equipped agricultural resource centers in all provinces of the country in order to demonstrate new technologies which assist smallholder farmers improve their crop productivity especially for those resettled under the A1 model of the FTLRP. The research findings of this study indicate this need for new information centres for A1 smallholder farmers in the areas of farmer led irrigation farmers as the study pointed out the need for new innovation, the ability to organize resources and sourcing for information at a cost.

ICT could accelerate productivity of Zimbabwean smallholder farmer led irrigation farming especially under the A1 scheme of the FTLRP in the areas of weather forecasting and irrigation scheduling. Knowledge backed by adequate technological infrastructure can transform development of A1 irrigation farmer productivity. Several studies have shown that agricultural extension is a major source of knowledge and information to farmers. This study has shown that there is a need to shift towards delivering knowledge and information.

Government interventions through extension and agricultural training

This study has shown that A1 smallholder irrigation farming has the potential to transform households through smallholder farmer led irrigation farming as noted in all the four objectives and the empirical findings therein. There is sufficient evidence on smallholder farmer led irrigation farming contribution to rural livelihoods through household income. Thus the implication of this research's findings is that A1 plot holders need to participate in smallholder farmer led irrigation farming. There is need for Government interventions through extension services which is

provided by the department of Agritex and this study has noted from key informant interviews that Agritex field officers lack in up to date information in the areas of agricultural innovation, farmer led irrigation included.

Improving access to irrigation water

Access to water by A1 smallholder households helps them realize most benefits from smallholder irrigation farming. Improved irrigation water access is part of the strategy that enhances irrigation farming access in the NDS 1 in pursuit of Zimbabwe Vision 2030 which aims to improve the status of its citizens to the level of upper middle class status. This also suits well in the attainment of SDG (*No one is left behind*). Investment in agriculture water will also allow intensification and diversification of crop production by A1 farmers under farmer led irrigation farming and small scale gardens thus increasing farm output and household incomes.

Provision of security of tenure

In this study, security of tenure documents for A1 farmers is varied and a segment of A1 resettled farmers do not have land tenure documents. This process of land tenure documentation is slow thereby curtailing the will by A1 irrigating farmers to invest sustainably. Studies elsewhere show that smallholder farmers invest even in the absence of tenure documents but the Zimbabwe situation is different in that farmer evictions happen regularly especially after elections. Banks have also been reluctant to offer funding where there are no tenure documents.

VII. AREAS FOR FURTHER RESEARCH

Even though the study had meaningful results, there are other areas requiring further researches. Firstly, selection of irrigation practices was not exhaustive. Farmers interviewed had a bias towards farmer led irrigation which utilised small irrigation pumps at the expense of other forms of farmer led irrigation like use of buckets and utilisation of dambos.

Secondly, it is widely understood that in empirical research, the results are always based on self-reported data of the respondents. As much as it was assumed that the respondents were adequate for reliable and valid data. It could be useful to put together farmers' responses to questionnaires with views held by their customers, competitors and distributors. In fact there could be exaggerated positions given that secondary data was lacking for cross validation. Therefore future researches could put together the views of other major farming stakeholders with the results of farmers' self-assessment in order to get more valid conclusions.

VIII. CONCLUSION

Therefore the results of this study indicate that of the thirteen factors that influence the adoption of smallholder farmer led irrigation under the A1 model of resettlement under Mazowe District, access to finance had the highest influence in the adoption of farmer led irrigation farming. It will be important for Government to offer funding to A1 model farmers since most of the irrigation funding in the past has been tailored for A2 farmers who are considered to farm on commercial basis compared to their A1 counterparts. This study has also shown that technology

transfer is also an important factor to both A1 model farmers and extension officers in the adoption of farmer led irrigation. This therefore calls for more exposure for both smallholder A1 farmers and extension officers to be exposed to new smallholder technologies through continuous training and use of ICT for information gathering.

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The Impact Of Farmer-Led Irrigation On Zimbabwe's Model A1 Land Reform: A Review

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Abstract- This article acknowledges that land reform is critical in the development and transformation of economies especially in Sub Saharan Africa. (SSA). Land reform is a planned purposive change in the way land tenure is held or owned. It also includes the methods of cultivation that are employed and in a way, defines the relation of agriculture to the rest of the economy. Like most economies in Sub Saharan Africa (SSA), agriculture in Zimbabwe plays an important role in the country's economy and also on the livelihoods of the rural populace whose quest for food security and nutrition, income and expansion of their rural economies is embedded in agriculture. This is clearly spelt out in the economic blue print, National Development Strategy One (NDS1) where agriculture forms the important enabler for the country's transformation by the Second Republic of Zimbabwe. The skewed nature of land distribution at independence that was in favour of a few white commercial farmers triggered the onset of the Fast-track Land Reform Programme (FTLRP) in 2000. This programme was implemented under two models namely the A1 and A2 Model. The A1 Model is the smallholder variant where the beneficiaries were allocated 3 to 6 hectares purely reserved for arable purposes while the A2 Model is the commercial model where the land sizes vary from 30 to 2000 hectares and is dependent on the agro-ecological region in which that the farm is situated. In a sense land and water are two natural resources that can enable land reforms to attain their intended goals. Chief among these goals is the goal of increasing crop productivity that invariably enhances small holder farmers' livelihoods. Rainfall agriculture has proven to be unreliable in the face of climate change. Debates on the appropriate scale of irrigation under land reform have been ongoing in Zimbabwe. Farmer-led irrigation concept has strongly emerged in this debate. The hypothesis informing this review is that farmer-led irrigation is key if Zimbabwe is to enhance smallholder farmers' livelihoods. This new emerging narrative should also be captured in the Zimbabwe's new land policy. This article focuses on farmer-led irrigation in Zimbabwe as it unfolds and other parts of Africa and how livelihoods of smallholder farmers can be enhanced. The theoretical framework informing the nexus between land reform and irrigation is also reviewed in the context of smallholder farmers.

Index Terms- farmer-led irrigation, land reform, livelihoods, Zimbabwe, crop productivity

I. INTRODUCTION

The global pandemic of COVID-19 currently affecting all countries in the world is another indicator on how human kind has become very vulnerable to the forces of nature. Global economies have been badly shaken, big or small. From the global super powers like the United States of America, the European giants under European Union (EU) banner to developing countries in Africa like Zimbabwe. Economies have been on lockdown for the over two years and the question of recovery post COVID-19 is so important for all global governments. Before these economies could recover, the Ukraine-Russian war has also added to global economic misery. In this regard the degree of how much people's livelihoods have been affected depends on the economic strength of different nations before the onset of the economic lockdowns. For agro-based economies, agricultural planning for a quick recovery will be very critical.

The case of Zimbabwe that from the year 2000 embarked on a massive land reform programme code named the Fast-track Land Reform Programme (FTLRP) provides an interesting case on how the new normal is likely to shape up. This is made more importantly by the fact that small holder farmers under the A1 Model have been adversely affected by the two global pandemics. The same resettled A1 farmers if given the right conditions will also be able to improve their livelihoods and those of others who depend on agriculture.

According to Grebrewot, Mesfin and Nyseen (2015), the engagement of small holder irrigation is an essential developmental policy meant to eradicate poverty and improve livelihoods for farmers that depend on agriculture as the case with many farmers across the continent of Africa. This is further supported by Magaramombe (2017) who asserts that in Zimbabwe irrigation increases crop production and in that manner supports rural smallholder livelihoods and ensures that they are also food secure.

Chazovachii (2016) further posits that smallholder irrigation allows farmers to practise crop production throughout the year. Smallholder irrigation has been proven to be viable attractive option for poor resourced farmers in most developing countries (Woodhouse et al., 2017).

Under the new agrarian transformation in Zimbabwe, Scoones et al. (2019) poses three critical questions about what types of irrigation will be appropriate for the smallholder A1 farmers. His questions infer to what type of irrigation technology will be appropriate inclusive of the appropriate financing options and governance regimes in respect of land and water. As shown in other studies in Africa, farmer-led irrigation is more flexible in approach and highly adaptive in approach for use by small-scale farmers despite the fact that it is sometimes less recognized (Scoones et al., 2019, Woodhouse et al. 2017; Beekman, 2014) In Zimbabwe despite its extensive practice in smallholder sector, farmer-led irrigation is not readily realized by both policy makers and planners alike (Scoones et al., 2019).

This article will dwell on the issue of how farmer led irrigation is likely to impact on the livelihoods of resettled smallholder farmers under A1 schemes of the FTLRP. Examples of farmer led irrigation initiatives and literature reviews will be used to highlight the impact that farmer-led irrigation can have on land reforms across Africa.

II. STATEMENT OF PROBLEM

The progress of Zimbabwe's Fast Track Land Reform Programme (FTLRP) of 2000 has been varied in terms of progress (Njaya, 2015). The initial causes and the resultant consequences of the FTLRP have been debated widely and now significant body of literature of the programme exists (Masiwa, 2004; Moyo, 2000, 2004; Njaya, 2016; Richardson, 2004; Sachikonye, 2003; Scoones, et al., 2010, 2019; Zikhali, 2008). The programme is credited with addressing the historical land imbalances and broadened the base of economic participation (Mukodzongi, 2017). Despite being credited with the overhauling the racial inequalities in land ownership in Zimbabwe, the program is associated with losses in agriculture production and economic collapse (Richardson, 2004). The negative impacts often highlighted create a negative picture of the FTLRP. However, there has been lack of solid empirical research on how such an extensive land redistributive programme has impacted on the livelihoods of smallholder farmers especially those that have gone on to engage in farmer-led irrigation farming (Njaya, 2016) and how this has affected the livelihoods of the resettled smallholder farmers.

III. METHODOLOGY

This paper relied on secondary data from land reform experiences in Zimbabwe, Government of Zimbabwe land documents like the Utete (2003) commission and Rukuni commission (1994) reports together with land audit Reports of 2006 and 2020. Analysis of case studies of how farmer led irrigation has been taking place in Zimbabwe Mozambique, Tanzania, Ghana helped in analysing the current farmer led

irrigation initiatives taking place under the A1 model of the FTLRP. Studies that dealt with the Asian experience under the Green Revolution experience helped analyse the African context.

III. REVIEW OF RELATED LITERATURE

A *The fast track land reform and agrarian changes in Zimbabwe*

This paper starts off by dealing with the land issue in Zimbabwe. According to Masello, Oates and Jobbins (2017), Zimbabwe's political matrix and economic prosperity and invariably that of its population has over time immemorial linked to the land issue. Rukuni (1984) further posits that the issues of land and water are the two most important issues that have shaped Zimbabwe's history. In this regard to Mosello et al. (2017) posit that it would be economic for Zimbabwe to start from the land perspective to bring about those changes that deliver on the National goals of food security and nutrition, poverty reduction and improvement of rural economies considering that Zimbabwe is a country with a higher population that is currently living below the national poverty line and it is projected that 4.3 million people in Zimbabwe will be food insecure in 2022 (ZIMVAC, 2022).

In Zimbabwe, before 1890, land belonged to the black people of Africa, who practised crop rotation and animal husbandry on rotation basis (Maruve et al. 2019).. According to Weiss (1991), during the colonial period blacks were removed from Zimbabwe's fertile soils for the benefit of the white settlers who wanted productive farms. Oppressive Acts like the notorious Land Apportionment Act of 1931 and the Land Tenure Act were used to displace blacks of their more fertile lands in favour of whites (Moyo 2011). As a result, a dualistic economy was created that mainly favoured the whites. This continued well after independence in 1980.

The current resettlement phase code named Fast Track land Reform (FTLRP) started in the year 2000 but was formally acknowledged to have begun with the land acquisition Act of 2002 (Mukonzongi and Lawrence, 2019). The Government of Zimbabwe adopted two implementation models under the FTLRP namely the A1 scheme and A2 schemes The A1 Model was undertaken as a villagized model or self-contained unit. The villagized model allocated each resettled farmer between 3-6 hectares set aside for arable purposes and between 16 to 30 hectares of communal grazing. Half a hectare was allocated for housing development (Ministry of Lands and Rural Resettlement, 2019). The A2 Model was intended for those that were able to mobilize their own resources. (Ministry of Lands, Agriculture, Fisheries, Water and Rural Development 2022). The A1 Model was simply a modification of the original Model (A) adopted by the Government of Zimbabwe after independence and implemented under the Phase one land reform model while A2 is the commercial model that was meant to create a new cadre of farmers who could engage in commercial farming using their own resources. Under the A1 Model, twenty percent of all A1 Model allocations were reserved for war veterans of the liberation struggle (Government of Zimbabwe, 2003).

The land redistribution programme in essence was geared towards ensuring food security and improvement of livelihoods for the resettled farmers (Magaramombe, 2010).

B Viability in the context of A1 model under FTLRP

According to Scoones and Cousins (2010), the term 'viability' has become a key term in land reform debates and policies in Southern Africa, Zimbabwe included. The understanding of viability has also influenced state policies on land reform as a result. To understand how the A1 Model was conceptualised by the Government of Zimbabwe, it will be prudent to interrogate historical happenings in the agricultural sector of Zimbabwe in the last century.

As noted by Cousins and Scoones (2010), in Southern Africa debates of viability tend to focus on two aspects of levels of farm productivity and farm economic returns. The preferred model in this regard is the commercial large-scale farms despite the fact that other scales of farming could be accommodated. Viability in this regard is defined as technical recommendations that include 'minimum farm' sizes, economic units and carrying capacity. A case in point is Zimbabwe Statutory Instrument 288 of 2000 that gives the maximum farm sizes for A2 farm based on Zimbabwe's agro-ecological regions I to IV. The range of land allocations stretches from 150 hectares in agro-ecological I to 1000 hectares in natural agro-ecological region V. For the A1 Model the standard is 3-6 hectares reserved for arable land and 16-30 hectares of communal grazing. This is a standard across all agro-ecological regions.

These farming models give a picture of the policy narrative that deems the A2 Model as a commercially viable enterprise and the A1 Model as an expansion of communal areas where the concern is only on food security. According to Cousins and Scoones (2010), the key ideas in the Zimbabwean policy is one based on welfare concerns for model A1 and commercial viability concerns for model A2. This article notes that the overarching views on agricultural development have been influenced by the concept of modernisation. Farmers got identified as modern or progressive and as a result farming was to be a linear model of economic development that involves transitioning from agro based economies to industrial economies (Rostow, 1960, Schultz, 1964). "Scientific farming practice according to Scoones and Kholmer (2002) became a preserve of the A2 Model.

In the historical perspective, the A1 Model can be viewed as subsistence and framed for subsistence farming. There are striking similarities between colonial prescription on modern agricultural development that emphasized on the need to modernise and the more recent narratives about the need for a new business model driven commercial agriculture to replace older smallholder subsistence models (World Bank, 2010).

In Zimbabwe the FTLRP at policy level, there remains a clear distinction between a household food security objective for A1 schemes and business targeted commercial objective for the A2 Model (Scoones et al., 2010). The events however happening

on the ground that policy seems not aware of is that owing to the adoption of irrigation under the A1 Model, the narrative of viability farming in Zimbabwe is fast changing.

This article further deals with the emerging narratives that outline the importance of irrigation on livelihoods for rural farmers.

C livelihoods under irrigation

Studies globally have shown that smallholder irrigation systems are critical in increasing land productivity and sustain livelihoods in semi-arid regions (FAO, 2015). Mutiro and Lautze (2015), further contend that improvements in agriculture at any given scale and enhancing the productivity of the land through small holder irrigation is one of the key path ways for alleviating poverty and improving the livelihoods of rural communities in agro based economies. The majority of the poor resourced smallholder depend directly or indirectly on agro systems. Food Security concerns are the main imperatives that have driven the construction of small-scale irrigation schemes in many of the less developed economies particularly in SSA. (Muzerengi and Mapuranga, 2017). In addition, it is argued that smallholder irrigation schemes for smallholder farmers in Zimbabwe is a mitigatory measure especially against climate change induced droughts and mid-season dry spells where moisture stress severely affects crop growth (Chazovachii, 2016).

In Zimbabwe the policy imperative of pre-independence smallholder irrigation was mainly focussed on enhancing the food supply matrix particularly in the drier regions of IV and V (Chazovachii, 2016). The need to allocate the fertile lands to the commercial white farmers led to a policy shift in the 1960 where irrigation was to be established for black people removed from the fertile lands (Hughes, 1974). With the onset of the land reform programme at Independence, the irrigation model of small-scale producers were created on the same line as the communal schemes to supplement dry land farming (Scoones et al., 2019). These schemes were initially run by the Department of Rural Development (DERUDE). The Government of Zimbabwe provided financial support for the development of irrigation infrastructure and Ministry of Water provided irrigation water. Under the Fast-track Land Reform Programme only two models were operationalised that are the A1 Model and the A2 Model. Unlike the communal areas where donors were willing to finance irrigation projects, the 'new lands' under A1 and A2 were considered 'contested lands' and were not eligible for funding. With the Government of Zimbabwe under economic sanctions, treasury support to irrigation has been very minimal from the start of the FTLRP.

Evidence on the ground in Zimbabwe points to a picture where farmer led irrigation initiatives are taking place without formal government support under the FTLRP. The concept of farmer-led irrigation is far more extensive in Zimbabwe than is recorded by policy makers and irrigation planners, (Scoones et al., 2019). According to Woodhouse et al. (2017), farmer-led irrigation is as a process where smallholder farmers assume a driving role in improving their water use for agriculture purposes in the process bringing about changes in their knowledge

production, technology use, investment patterns and market linkages for their agricultural produce and the same time dealing with governance issues of land and water.

In sub Saharan Africa, many studies have pointed to sizeable potential for further increase in the area under farmer-led irrigation and this has the potential to increase crop yields and generate additional household revenues (You et al. 2011, Giordano et al. 2012, Xie et al. 2014).

Farmer-led irrigation has been taking root in the new transformed agrarian landscape taking place in Zimbabwe after the FTLRP. A study in Masvingo district, Zimbabwe by Scoones et al. (2019) indicates that farmer-led irrigation is taking more root than previously recorded.

D Crop yield improvements under irrigation

Crop yield improvement from smallholder irrigation in SSA have been found to increase by 141 to 195 percent compared to rain-fed yields based on ex cute smallholder irrigation technology assessment (Domenech and Ringler, 2013).

Table 1- Potential yield improvement from agricultural water management investments in SSA

Crop	Low Input- Rain-fed Yield (t/ha)	High input- irrigation yield increase
Maize	1,4	140 – 195
Groundnuts	0,7	235 – 251
Sweet potatoes	4,3	200 – 212
Tomato	20	76 – 79

Source: Giordano et al. (2012)

Domenech and Ringler (2013) also posit that the type of crops farmers grow will also change with irrigated agriculture.

D Investment in Smallholder Agriculture

The general view is one that it is only the more secure commercial farmers that invest in irrigation is challenged by studies from the region. According to Woodhouse et al. (2017), there is evidence that contrary to the general held belief, small holder farmers invest in irrigation. The following gives a summary of farmer investment in agriculture according to studies carried out on the continent (Woodhouse et.al. 2017)

a) Small holder farmers invest substantially in irrigation initiatives

Farmers are known to invest in irrigation at both household and aggregate level (Woodhouse, 2017). The small investments at household level have a major effect on overall small holder irrigation development in Africa. According to Woodhouse et al. (2017), a case in point is that of the Fadama irrigation development in Ghana that was further supported by the World Bank. Wamare et al. (2014) indicate that the official importation data in Ghana showed that over USD8 million was used to import over 65000 pumps and accessories between 2003 and 2010. This investment

figure was at par with the official figure in large-scale irrigation investment.

In Mozambique, about 110,000 hectares of unregistered farmer-led irrigation initiatives may exist in the country (Beckman, Veldwish and Bolding, 2014). This figure would officially double the recorded national statistics on irrigable land in Mozambique that in 2013 stood at 118 000 hectares (Beekman, Veldwish and Bolding, 2014). The same scenario also obtains in Tanzania and Zimbabwe. In a study in Zimbabwe, Scoones et al. (2019) found out in their study of FTLRP farms, that farmer-led irrigation development was three times more than the official irrigation statistics thereby challenging the national figures for the same presented by Manzungu et al. (1999).

b) Farmer interactions with the external actors and influence on rural economy

Woodhouse et al. (2017) posit that a dichotomy between what they termed ‘outside’ and ‘inside’ investments need to be substituted by an understanding of smallholder irrigation initiatives at a mix of interactions between government and non state actors. In this regard, investments by small holder farmers rarely happen in isolation but are influenced by the broader socio-economic environment. Investments by farmers are not guided by what Woodhouse et al. (2017), term agro-ecological potential or irrigation potential but by economic factors. Production for the market may also be accompanied by food security considerations for smallholder irrigators (Woodhouse et al. 2017). This view however locates farmer led irrigation within increased household food security matrix and increased income throughout the year (Hope, 2014). Issues like reduced taxes from government and increase in access to markets have all influenced farmers’ investment on irrigation initiatives. Increase in lift pumps in Burkina Faso has been associated with the existence of more than 100 reservoirs in the country. These had been built by government and developmental partners. (Verox and de Fraiture, 2012). This shows the importance of synergies between smallholder farmers and government in developing smallholder farmer led irrigation initiatives.

Access to markets is also very critical in farmer-led irrigation development. These market networks may not be formal or state registered. As was noted by Nkoka, Veldwish and Bolding (2014), farmer-led irrigation initiatives increased rapidly in Tsangano area near Mozambique’s northern border with Malawi as a result of sale of potatoes in neighbouring countries.

Labour mobility is another critical aspect of rural economies. According to Hill (1963) and Swindell (1978), migrant of labour has in the past played a key role in extensive development of agriculture in Africa. The following are cases in point, Gezira in Sudan (Robertson, 1987), the Delta of the Senegal River (Engerhart and Ben Abdallah, 1986). Large number of immigrants made irrigation construction in farmer-led irrigation development possible e.g. Zimbabwe immigrants in Penhalonga in Mozambique (Beekman et al., 2014

c) Registered Formal land tenure is not a pre-requisite for small scale irrigation development

Land tenure issues have been subject of intense debate in Zimbabwe. These issues have been mostly directed at the A2 commercial model scheme. The prevailing paradigm is one that formalized registered land rights are a pre-condition for smallholder irrigation investment (World Bank, 2010). To the contrary, agricultural intensification was not affected by traditional land holding rights. Studies on farmer-led irrigation initiatives across Africa also support this view (Beekman et al., 2014). In Ghana peri-urban agriculture is expanding despite lack of secure land rights mainly due to threat of construction projects in these areas in countries like Kenya where petrol pumps are used in farmer led irrigation initiatives on rented land (Woodhouse et al., 2017). In countries like Mozambique, farmers acquire land outside of traditional governing of land tenure rights (Bolding, 2010). This situation is however different in Zimbabwe where the Fast Track Land Reform availed over 10 million hectares on a free lease basis to over 185 000 farmers under both the A1 and A2 schemes (Ministry of Lands, Agriculture, Fisheries, Water and Rural Development, 2022).

d) Agricultural Innovation in broad socio-technical networks and agricultural systems

In developing irrigation systems, farmers are influenced by maintenance and operation costs and whether the farmer should operate as an individual or within a small group. According to Woodhouse et al. (2017), this has led smallholder farmers developing irrigation initiatives on agricultural land which is on steep slopes, using small streams or wetland areas also called dambo and *bani* in Southern Africa. This in a way shows the technological and irrigation acumen without the help of trained engineers is possible contrary to the widely held view that irrigation planning is a highly specialized field for engineers.

These different case studies highlight that irrigation innovations are integral part to social networks that involve landholders, pump owners, traders, mechanics and agents from governmental and international organisations, knowledge brokers in knowledge on irrigation systems as farmers copy water management technologies. In countries like Ghana, pumps can be leased for a day (Wamara et al, 2014).

e) Positive and negative impacts of farmer-led irrigation initiatives

It has been noted that as farmers benefit from the concept of farmer-led irrigation, other farmers may be negatively affected especially in what Woodhouse (2003) defines as customary land tenure rights and water rights assume a new meaning and contested. Woodhouse et al. (2017) define three types of negative impacts that are downstream effects, reduced food prices and benefits accruing to the household as a results of irrigation.

The widely held belief that irrigation can only be feasible with state or donor support is highly disapproved by events on the ground in most of SSA. Farmers are investing even in areas where there is no security of land tenure. This may be explained in part with the high returns from irrigation agriculture compared to dry land irrigation. Smallholder farmer led Irrigation conditions allow

households to grow crops throughout the year giving the land a high productivity value (Dube, 2016).

E THE NEXUS BETWEEN IRRIGATION AND SUSTAINABLE LIVELIHOODS

The disruption of livelihoods during the COVID-19 pandemic has been felt globally. The effects have been more pronounced in Africa where economies were already shaky owing to a plethora of external and internal induced economic knocks like poor governance and corruption. In the same economies, the rural folk and smallholder farmers have been worst hit. Global remittances that used to be their safety nets have ceased to flow owing to job losses induced by COVID-19.

In this regard African governments where most economies are agro-based, irrigation offers a 'silver bullet out of this pandemic. The need to deal with people's livelihoods is therefore very critical. Academics highlight that intensive farming is made possible by farmer led irrigation initiatives that in turn increases land productivity and subsequently crop output per given unit area (Dube, 2016). Smallholder farmer led irrigation allows a degree of crop diversification that cannot be achieved using rain-fed agriculture. (Liao, Zhang and Bengtson, 2008, Mwaba, 2013). The need to increase productivity in Zimbabwe is a priority after two consecutive dry years from 2018/19 season to 2021/22 farming seasons. Infrastructural Development becomes very important as a result. Rukuni and Eicker (2006) reiterated that since independence in 1980, the government has undertaken a host of initiatives in the communal areas. These include infrastructure development, increased irrigation funding and crop price guarantees.

Besides the common cereal crops grown under most communal irrigation schemes, smallholder farmers under A1 Model may venture into horticulture, tobacco production and fruit production.. Tobacco production from irrigated Model A1 plots in the Mvurwi area of Mashonaland Zimbabwe have been show to attain higher and better paying grades that tobacco grown under dry land in the same area. Dube (2016) posits that irrigation farming is also an income source for the disadvantaged rural people. This is a category of irrigators who use buckets to irrigate their gardens and Scoones et al. (2019) terms this typology of irrigators as homestead irrigators. This group forms the biggest group of former farm workers whose livelihoods was affected by FTLRP when their jobs were terminated after the eviction of their former pay masters. Equally more affected by COVID-19 pandemic and historical injustices associated with the FTLRP, irrigation is the only hope for them to build their livelihoods. Sachikonye (2003), estimates that their number at the start of the FTLRP was around 350 000 workers supporting around 1.8 million other family members. Smallholder irrigation schemes have been known to curtail migration owing to the wide range of livelihood benefits. Chitsiko (1999), argues that small-scale irrigation schemes are important in communal areas of Zimbabwe in controlling rural to urban migration. In his study of Hama Mavhaire irrigation schemes in Masvingo, Zimbabwe, the scheme provided a source of income and livelihoods to youths who felt that there was no need to migrate to towns.

Irrigation is a known economic avenue to rural economy expansion. Chazovachii (2016) noted that a crop income earned from small-scale irrigation in Zimbabwe was far more than what is earned from dry land farming or from a non-skilled worker. As a result, irrigators were better positioned to invest in capital assets compared to non-irrigators. Rural infrastructure like clinics, shops and roads have been developed as a result of irrigator's income.

Food security and nutrition besides been areas of emphasis under Sustainable Development goal 2 where Zimbabwe is also a signatory will be an area of higher concern post COVID-19.

F Theoretical frameworks informing irrigation efficacy on land reforms

This article will review three important theoretical frameworks that inform studies dealing with the nexus between smallholder farmer led - irrigation and livelihoods of resettled farmers under redistributed lands of Zimbabwe. The neo classical frame work deals with the question of how efficient production is on resettled land and then addresses returns to factors of production such as land, labour and capital while the new institutional economics deals with the factors and conditions that influence the efficiency of different scales of production under land reforms. It emphasises the issue of small-scale farm efficiency, distribution of income, poverty impacts and growth multipliers. The sustainable livelihood frame work identifies the various sources of livelihoods for farmers resettled under Zimbabwe's land reform. It also deals with issues that affect food production and welfare of households under redistributed lands of Zimbabwe.

Neo classical economics.

The main concerns of neo classical economics are properly functioning markets and the *pareto optimal* efficiency outcome that are assumed to be achievable if market failures and market distortions are minimized (Scoones and Cousins, 2010). Government planning and interventions are viewed as being accompanied by corruption (rent seeking) especially in Africa and therefore inefficient (Scoones, 2010). This is true and evident in African governments. The major motive under neo classical economics is profit, where the concept of modernization of utility is paramount and evident in smallholder farmers who produce commodities for self-consumption (subsistence farming) or for sale (commercial purposes). These operate as a firm (farm) in order to maximize profit. Efficiency is very important as is evaluated by assessment of factor productivity. This is further defined as the how productivity the land, labour and capital are. In this article irrigation whether formal or informal (traditional) is perceived to increase efficiency of land acquired through the land reform program especially at small-scale holding. The interconnectivity of the same land to other factors of labour and capital implies they are effectively affected the same by the irrigation factor.

New institutional economics

The view by new advocates of institutional economics which is however contested is one that neo classical paradigm and its associated policy prescriptions are inadequate in addressing the issues of power and institutions assume a much more central role

in dealing with power relations. In this view, all categories seen as rational decision markers. Real markets assumed to being absent or thin because of inadequate information or high transaction cost e.g. cost of enforcing contracts (Lipton, 1993). To reduce these risks that are associated with lack of information and high transaction costs, institutions such as rural money markets and share cropping come into being (Lipton, 1993: 641). In this regard, Engle et. al (2007) posit that the humans are not like machines when it came to problem solving and instead of focussing on processing available information will resort to actions that provide the greatest utility. People will then rely on given rules and roles when deciding what to do on a given situation. They may resort to bring in information technology or expects to provide advice (Lipton, 2003)

Livelihoods Framework. (LF)

According to Cousins and Scoones (2009) the livelihood thinking to development has framed policy formulations with regards to land reform, as well as the informing of many non-governmental donor policies on land reforms. The policy emphasis is mostly on reducing vulnerability of the rural poor households by allowing them to have access to productive assets and resources (2009). Here land reform is strongly associated with development initiatives the Sustainable Development goals (SDGs). A key concept in the LF approach is various and diverse livelihoods pathways that combine diverse range of smallholder farmer capabilities, assets and farming activities in order to stresses and shocks such as climate change induced droughts. (Chambers and Cornwall, 1992).

In this article irrigation under the A1 scheme of the FTLRP enhances a household's capabilities to use irrigation as an asset to deal with climate change. This is made more relevant by the advent of climate change in the farming sector that has made rain-fed farming riskier. Ellis (2004) asserts that positives of the livelihoods approach includes its holistic and integrative aspects in its approach that has made it more suitable in comparison to other approaches that deal only with crop production and household income.

Table 2: Summary of Theoretical framework for informing the viability of land Reform.

	Neo classical economics	New institutional Economics	Livelihoods
Central Focus of framework	Well-defined and functioning markets compared to non-functional markets.	How equity and productivity are inter connected	Development based on livelihood improvement and dealing with poverty
Key informing concepts	Efficiency in factors of Production.	Reduction of Transaction cost,	Multiple and diverse livelihoods of smallholder farmers.
Land and agriculture in a global context	Role of agriculture under globalisation and agro food markets.	Economic growth can be constrained by skewed land distribution	Growth initiated by Agriculture with the aid of. Globalisation
Land Reform Policies advocated for	Market led reform is best coupled with property rights.	Market assisted land reform has bias towards large scale commercial farmers	Subsidies can aid production.
Intended Beneficiaries	All productive farmers at all scales of production.	Efficient smallholder farmers who maximize returns to land and labour	The smallholder rural farmers with multiple livelihoods.
Assumed Measure of validity	Farm efficiency and rate of return on investment.	Farm efficiency and Poverty impacts on smallholder farmers.	Improved Livelihoods for smallholder farmers.
Key informing questions	How efficient is production on redistributed land?	What are the factors and conditions which influence the efficiency of different sizes of farms under the land reform models?	What are the various sources of livelihoods options for land reform beneficiaries?

Adapted from: Cousins and Scoones (2009)

IV. CONCLUSION

The issues of water control for sustainable and successful agriculture are very critical under Zimbabwe’s land reform. The Fast-track Land Reform Programme (FTLRP) in Zimbabwe was implemented against a backdrop of understanding that commercial agriculture under the A2 Model would drive the economy. This paradigm was informed by colonial and immediate post-independence era where commercial agriculture was the backbone of the economy. This position had influenced agriculture planning in Zimbabwe for the last century. The new emerging issues under the A1 Model of Zimbabwe’s FTLRP makes a strong case for those smallholder farmers (Model A1) as has been the case in Asia and other parts of Africa where land reform has taken place, can drive economies and enhance smallholder livelihoods. After all, the tag of ‘ regional bread basket’ attained by Zimbabwe in the early 80’s was as a result of massive maize and cotton production by smallholder farmers under the communal areas and new resettlement areas under land reform phase one.

Case studies on farmer-led irrigation have shown cases of improved and diversified crop production scenario under the smallholder sector. This has led to improved livelihoods of smallholder farmers and the enhancement of the local economies in the respective countries and localities. In the same case studies, smallholder farmers have been shown to invest in irrigation in situations where commercial farmers because of fear of insecure land tenure would have failed to invest. The context of what financing options smallholder farmers would resort to, is an

important issue in Zimbabwe’s land reform considering that international donors have ceased to finance all land related projects under FTLRP as it is considered ‘contested land’. The government of Zimbabwe cannot fill in the financing gap as it alleges that under the current sanctions all its lines of credit have been closed down and this has rendered its treasury incapacitated.

In order to effectively irrigate under the new land reform, policy makers and irrigation engineers should not be guided by the modernist views and the theoretical engineering underpinnings that have gone to define what a standard in irrigation is. In fact, these experts should be pragmatic and appreciate the new reality on the ground where farmers have taken the initiative to adopt farmer-led irrigation initiative. The developments on the ground should also assist in drawing out the new irrigation policy that captures the reality on the ground. This article therefore dealt with the case studies that inform the importance of appreciating what farmer-led irrigation can do in transforming livelihoods under different land reform scenarios and the FTLRP in Zimbabwe is no exception.

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Job Related Stress and Organizational Commitment among Bank Employees in India: An Empirical Analysis

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Abstract- In this study, the goal is to determine what causes Indian bank employees to be stressed at the job and how stress affects their commitment to the organization. For this purpose, 345 people who work at public and private banks in the northern part of India were asked to give us their responses through a structured questionnaire. To figure out what causes job-related stress, an exploratory factor analysis (EFA) was done with SPSS version 21. This led to four factors: Performance, Workload, Organizational design and Responsibility/Authority, and Decision-making. To test the hypothesized relationship, PLS-SEM 3 was employed. The findings demonstrated that people who work at a bank are less likely to remain committed if they are stressed out at work. In addition, the findings show that managers need to take numerous different steps to lessen the effect of job-related stress on bank employees.

Index Terms- Job-related stress, Organizational commitment

I. INTRODUCTION

Job stress has become a common occurrence in today's workplaces. It has recently become the focus of fresh articles and the topic of conversation (Padmanabhan, 2021). Selye (1936) came up with the term "stress" in the health sciences, explaining it as a mental and physical condition induced by unexpected disparities in an individual's capacity to fulfill such demands. Daily activities, whether work, societal, or interpersonal, are bound to cause stress (Kumar and Kumar, 2014). The modern world is full of people who are stressed out, and nearly half of Indian employees are feeling this way. Stress may be defined as an unpleasant emotional state that occurs when we are unable to meet both our work-related and non-work-related requirements at the same time (Halkos and Bousinakis, 2009).

Stress affects both individual and organizations. All organizations deal with a lot of job stress because of lot of work, not enough promotion, conflicting roles, and a bad working environment (Chaudhari and Lodhwal, 2017). "The harmful, physical and emotional responses that occur when the requirements of job do not match the capabilities, resources or needs of the worker" as per with one definition of job stress (National Institute for Occupational Safety and Health, 1998). Additionally, it may also be termed as a "misfit between a person's skills and abilities and demands on the job and a misfit in terms of a person's needs supplied by the job environment which poses a threat to an individual" (Chand and Koul, 2012). Employees also had a lot of job stress because of work, not enough promotion, conflicting roles, and bad working conditions (Sidhu et al., 2019). According to Bhatti et al. (2016), there are a lot of things that can make a job stressful, as the content of the job, the work pressure, the overtime hours, non-supportive supervision, lack of professional growth chances, un-involvement in decision-making, and not having a good relationship with your co-workers etc.

Bank employees are no exception to this. In banks, jobs are structured in such a way that an employee is exposed to both workloads and work under acute time pressure. When businesses adopted the work-from-home concept, notably and throughout the COVID-19 outbreak, the banking staffs was required to report to the bank due to the restricted usage of online banking services. The risks in the workplace not only divert employees' attention away from their work, but they also put their jobs at risk by generating health concerns. Consequently, bank personnel are very susceptible to experiencing extreme stress, which has been associated with lower work satisfaction, increased absenteeism, and a lack of organizational commitment. A loss of self-confidence, poor motivation, high/low blood pressure, sadness, a decreased level of contentment, and an intention to leave work are all symptoms of this (George and Zakkaria, 2015).

Considering that, retention of talented staff in the banking industry is the main concern for Human Resource Management (HRM). So, this study intends:

- To ascertain the factors contributing to job-related stress among Indian bank workers.
- To explore the effects of job-related stress on bank employees' organizational commitment.

II. LITERATURE REVIEW

A. *Organizational commitment*

Organizational commitment can be characterized as an attitude that expresses feelings about the relationship between oneself and one's employer (Mowday et al., 1982). "Organizational commitment is a psychological state that characterizes the employee's relationship with the organization, and has implications for the decision to continue or discontinue membership in the organization" defined by Meyer and Allen (1997). According to him, it might be categorized as affective, continuous, or normative commitment. Positive sentiments of attachment and participation in the organization are characterized as affective commitment (Meyer and Allen, 1984). Continuous commitment is how dedicated employees are to their company because of the expenses they perceive to be involved with quitting their jobs (Meyer and Allen, 1984). The feeling of obligation that an employee should have to stick with the firm is known as normative commitment (Meyer and Allen, 1990).

B. *Job-related stress and organizational commitment*

This research looks at how job-related stress affects organizational commitment. On an individual and organizational level, job-related stress may generate a slew of problems, and it has a detrimental impact on employee commitment (Bhatti, 2016). It is assumed that when employees are under a lot of stress, their job satisfaction will suffer, and they will be less dedicated to the company (Aggarwal, 2015).

Several studies have connected workplace stress to lower levels of organizational commitment. As shown by Michael et al. (2009), job stressors considerably influence affective organizational commitment. However, it does not affect organizational continuance or normative commitment. Masihabadi et al. (2015) discovered that stressed employees at work were less happy with their occupations and were more likely to leave the organization. This research was conducted in Tehran and Mashhad. Similarly, Vkola and Nikolaou (2005) showed that stressed people had the less organizational commitment and were less willing to embrace change.

As shown by Ackfeldt and Malhotra (2012), role stressors have been observed to have a detrimental effect on affective commitment among frontline travel service organization employees in the United Kingdom. Empowerment and professional development, on the other hand, have been identified as essential management measures that may be utilized to mitigate the negative consequences of role stress on organizational commitment. As claimed by Khatibi et al. (2009), affective and normative commitment is negatively impacted by occupational stress. But there was no indication that stress at work was linked to a commitment to the organization.

As per Biswas and Biswas (2010), employees in perceived vulnerable organizations have a lower level of organizational commitment, are more stressed, and have a worse perceived organizational health. Ekienabor (2016) also found that academic professionals in Nigeria are less productive and committed to their jobs because of job stress, according to his research. A study by Saadeh and Suifan (2019) looked at how perceived organizational support at Jardon hospitals affected job stress and commitment to the job (POS). Job stress was negatively correlated with POS, although organizational commitment was positively correlated. Cicei, a, b (2012) revealed a negative link between occupational stress and affective and continuous commitment in Romanian public organizations.

According to Jagdish (1987), occupational stress associated with various job aspects results in a negative attitude toward the job and management. Addae et al. (2008) studied public employees in St. Lucia. Role stresses, including uncertainty and conflict, weakened emotional and normative commitment but not continuation commitment. Bhatti et al. (2016) studied Pakistan's banking industry and discovered that stress is a key factor impacting an employee's commitment to the organization. N Ngirande (2021) found that academic staff at South African universities were less committed to their jobs when they occupational stress and uncertainty.

Previous research has found a statistically significant negative connection among both job stress and organizational commitment. The following hypothesis has been produced as a result of the researcher's evolution of literature:

H1: Job-related stress has a negative influence on organizational commitment

III. RESEARCH METHODS

A. *Data collection*

Around 500 questionnaires were delivered to employees of private and public banks at all levels – junior, middle, and executive throughout northern India. To collect data, the researcher distributed structured questionnaires individually and via Google form. After deleting 155 incomplete replies, the survey received 345 responses, giving a response rate of around 70%.

B. *Measurement scales*

The measuring scales employed in this study are based on those used in earlier research. These scales have undergone extensive testing and are reliable.

Job-related stress: We utilized "Job-Related Tension Index (JRTI)" devised by Kahn et al. (1964). It is a 15-item scale numbered "1 (never bothered) to 5 (bothered nearly all the time), and 6 (does not apply)". Except for six, all replies are averaged in the scoring procedure. A higher score implies increased job-related stress. We selected JRTI because of its strong internal consistency, ranging from 0.80 to 0.92 (George and zakkaria 2015; Rogers et al., 1994).

Organizational Commitment: To assess organisational commitment, a nine-item abbreviated form of "Organizational Commitment Questionnaire (OCQ)" developed by "Mowday et al. (1979)" was administered. The internal consistency of this scale spans from 0.82 to 0.93 (Cronbach, 1951). Each response is rated using a seven-point scale, with "1 (strongly disagree) to 7 (strongly agree)".

C. Data analysis technique

The researcher employed both EFA and PLS-SEM 3 to assess the factors linked to job-related stress and to investigate the likelihood of a linkage across job-related stress and organisational commitment.

IV. RESULTS

A. Demographic Profile

Table1. Population characteristics (n=345)

Variables	Category	Frequency	Percentage
Gender	Male	187	54.2
	Female	158	45.8
Age	20-35 years	195	56.5
	35 and above	150	43.5
Years of experience	Less than 5 years	126	36.5
	5-10 years	136	39.4
	More than 10 years	83	24.1
Marital Status	Single	129	37.4
	Married	216	62.6
Education	Graduate	126	36.5
	Post-graduate	219	63.5
Nature of bank	Private	205	59.4
	Public	140	40.6

B. Common method bias

Our findings indicated that only 32.69 percent of the variation could be accounted for by a single component, indicating that none of the responses was biased (Padsakoff et al., 2003).

C. Exploratory Factor Analysis

For the purpose of quantifying job-related stress among bank workers, we conducted exploratory factor analysis (EFA) on the job-related tension index (JRTI), to investigate the components that influence job-related stress. When 15 components were submitted to Principal Component Analysis (PCA) utilising varimax rotation in order to determine the origins of job-related stress, a conclusion was reached. As seen in table 2, results of Bartlett's test of sphericity were statistically significant, with a (chi-square value = 2669.471; degree of freedom = 105, p-value = 0.0001). Having received a score of 0.915, the Kaise-Mayar-Olkin (KMO) measure of sample adequateness was considered to be good. Because it exceeded the suggested threshold of 0.6, the KMO of 0.915 is considered outstanding. The total variance explained by all variables is shown in Table 3. There are four main factors to consider in this investigation. Seventy per cent of the construct could be described by these four factors altogether, which is deemed adequate. The factors with an eigenvalue greater than one were kept, indicating importance. The degree of variation associated with a factor is represented by an eigenvalue. Approx. Seventy per cent of the overall variation was explained by four variables. Factor 1 reports for 45.668 percent of the variation, factor 2 serves for 9.649 percent, factor 3 counts for 8.165 percent, and factor 4 contributes for 7.179 percent. After that, varimax rotation was used to rotate these factors. The rotated component matrix for each item and their factor loadings and commonalities are shown in Table 4. Only items with loadings larger than 0.5 were kept in this study since this indicate the effectiveness of the items in measuring the specific construct. For readability's sake, factor loadings less than 0.40 are removed. To do further research, all 15 items will be broken down into four dimensions or parts of the job-related stress construct. All of these items have a loading greater than 0.5. We employed identical factor names, such as "Performance", "workload", "organizational design and responsibility/authority", and "decision-making", as stated by Rogers et al. (1994) in their research of stress precipitators among 146 female senior executives, with differing factor loadings. In the present study, "performance" was the first factor discovered, and it was made up of four items: JRTI7, JRTI8, JRTI10, and JRTI11. The second component discovered was "workload", which had four items: JRTI4, JRTI5, JRTI13, and JRTI15. The "organizational design and responsibility/authority", is

the third factor, and it consists of four items: JRTI1, JRTI2, JRTI3, and JRTI12. The fourth factor, “decision-making” was loaded with three items: JRTI4, JRTI6, and JRTI19.

Table2. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.915
Bartlett's Test of Sphericity	Approx. Chi-Square	2669.471
	Df	105
	Sig.	0.000

Table3. Total variance explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of	Cumulative	Total	% of	Cumulative	Total	% of	Cumulative
		Variance	%		Variance	%		Variance	%
1	6.850	45.668	45.668	6.850	45.668	45.668	2.970	19.799	19.799
2	1.447	9.649	55.317	1.447	9.649	55.317	2.669	17.791	37.591
3	1.225	8.165	63.482	1.225	8.165	63.482	2.642	17.614	55.205
4	1.077	7.179	70.661	1.077	7.179	70.661	2.318	15.456	70.661
5	.612	4.082	74.743						
6	.536	3.570	78.313						
7	.487	3.244	81.557						
8	.438	2.919	84.477						
9	.430	2.866	87.343						
10	.361	2.404	89.747						
11	.344	2.293	92.040						
12	.338	2.256	94.296						
13	.317	2.115	96.411						
14	.303	2.021	98.431						
15	.235	1.569	100.000						

Table 4. Rotated Component Matrix^a

Items	Component				Commonalities
	1	2	3	4	
13. Thinking that amount of work you have to do may interfere with how well it gets done.	.826				0.712
15. Feeling that your job tends to interfere with your family life.	.784				0.671
4. Feeling that you have too heavy a workload, one that you can't possibly finish during an ordinary work day.	.781				0.634
5. Thinking that you will not able to satisfy the conflicting demands of people over you.	.749				0.687
11. Feeling you are unable to influence your immediate supervisor's decisions and actions that affect you.		.793			0.695
7. Not knowing what your supervisor thinks of you, how he evaluates your performance		.766			0.705
8. Fact that you can't get information to carry out your job.		.703			0.719

10. Feeling you may be liked and accepted by people you work with.	.689	0.801
2. Being unclear on just what the scope and responsibly of your job.	.777	0.700
3. Not knowing what opportunities for advancement or promotion exist for you	.771	0.754
1. Feeling that you have too little authority to carry out the responsibility assigned to you.	.745	0.760
12. Not knowing just what the people you work with expect from you.	.694	0.690
6. Feeling that you are not fully qualified to handle your job.	.797	0.708
9. Having to decide the things that affect the lives of individuals, people that you know	.795	0.700
14. Feeling that you have to do the things on the job that are against your better judgement.	.742	0.663

Note:

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.

- a. Rotation converged in 6 iterations.

D. Measurement Modal

The lower order components' internal consistency reliability, convergent validity, and discriminant validity are explored using the measurement model.

Internal consistency Reliability: The constructs' validity was assessed using Cronbach's alpha and composite reliability. Their values for all lower-order constructs vary from 0.781 to 0.901, as seen in Table 5. The findings are all above 0.70 threshold, which means that the measures are very accurate and reliable (Hair et al., 2014).

Convergent Validity: Convergent validity is demonstrated when the outer loadings and average variance extracted (AVE) are both 0.50 or higher (Chin, 2010). This study's first-order construct and AVE outer loadings are all more than the minimal threshold value, as shown in Table 5.

Table5. Reliability and convergent Validity

Construct	Items	Outer loadings	Cronbach's alpha	Composite reliability	AVE
Performance	PERF1	0.853	0.834	0.833	0.559
	PERF2	0.702			
	PERF3	0.782			
	PERF4	0.633			
Workload	WL1	0.831	0.876	0.874	0.635
	WL2	0.861			
	WL3	0.762			
	WL4	0.726			
Organization Design and Responsibility/Authority	OD1	0.730	0.825	0.819	0.533
	OD2	0.707			
	OD3	0.658			
	OD4	0.832			
Decision-Making	DM1	0.816	0.781	0.782	0.551
	DM2	0.818			

	DM3	0.562			
Organizational Commitment	OC1	0.612	0.901	0.901	0.508
	OC2	0.711			
	OC4	0.827			
	OC5	0.569			
	OC6	0.680			
	OC8	0.567			
	OC10	0.800			
	OC13	0.890			
	OC14	0.682			

Note: AVE represents average variance extracted

Discriminant validity: Fornel and Larcker criteria were used to look at discriminant validity. The Heterotrait-Monotrait (HTMT) ratio was also looked at. AVE square root is bigger than non-diagonal values in both rows and columns in depicted in Table 6. Additionally, table 6 also documented that link between each pair of constructs was not above the recommended value of 0.85. Hence, the results confirmed that the study established the discriminant validity.

Table6. Discriminant Validity

	Decision-making	Organizational commitment	Organizational design	Performance	Workload
Fornell and Larcker Criterion					
Decision-making	0.761				
Organizational commitment	-0.192	-0.251			
Organizational design and responsibility/authority	0.753	0.733	0.712		
Performance	0.625	-0.685	0.643	0.746	
Workload	0.533	0.661	0.634	0.661	0.797
HTMT Criterion (HTMT_{.85} Criterion)					
Decision-making					
Organizational commitment	0.193				
Organizational design and responsibility/authority	0.761	0.284			
Performance	0.640	0.321	0.646		
Workload	0.558	0.319	0.64	0.665	

E. Higher order construct

Job-related stress was postulated as a (type I) higher-order (reflective-reflective) construct in this study. To quantify job-related stress, a disjointed two-stage technique was adopted. The researcher needs first save the latent variable scores for the lower order components (i.e., performance, workload, organizational design and responsibility/authority, and decision-making) created using PLS and thereafter include such scores in a data set to look at the higher-order construct (Sarstedt et al., 2019). Tables 7 and 8 provide the findings for the higher-order construct, which reveal that the construct's reliability, convergent validity, and discriminant validity all fulfilled the threshold requirements.

Table7. Higher-order constructs reliability and convergent validity

Construct	Items	Outer loadings	Cronbach's alpha	Composite reliability	Average variance extracted
Job-related stress	Performance	0.810	0.831	0.830	0.552
	Workload	0.793			

Organizational design and responsibility/authority	0.731
Decision-making	0.621

Table8. Discriminant Validity (Higher-order construct)

	Job-related tension	Organizational commitment
Fornell and Larcker Criterion		
Job-related tension	0.743	
Organizational commitment	-0.323	0.709
HTMT Criterion (HTMT_{.85} Criterion)		
Job-related tension		
Organizational commitment	0.316	

F. Structural model

Following the verification of the measurement model, the hypothesized value was verified using a structural model. One of the first things we needed to make certain that multi-collinearity was not a significant concern between the constructs (Hair et al., 2017). Overall, there was no evidence of collinearity in the present analysis, owing to VIF values ranging in-between 1.289 to 2.903, which under beneath the specified range of 3 in the current inquiry (Hair et al., 2019). Then, using bootstrapping technique at 5000 subsamples for 0.05 significance threshold (two-tailed), we evaluate the path-relevance coefficients for testing postulated correlations. The outcomes of the structural model are depicted in figure 1 and table 9 indicating that job-related stress aspects significantly impact organizational commitment. As shown by PLS-SEM 3, job-related stress ($\beta = -0.285$, t-value = 4.803, CI = [-0.412; -0.182], $P < 0.000$) had unfavorable considerable effect on organizational commitment, hence corroborating H1. Furthermore, we also calculated R square and Q-square (predictive relevance) to analyze the structural model. In this study, the R square shows the model's weak explanatory power, demonstrating that job-related stress accounts for just 0.107 per cent of the variance in job satisfaction. Moreover, the Q square is calculated, representing the model's predictive relevance (Geissor, 1974; Stone, 1974) based on the blindfolding procedure. The value of Q square should be larger than zero in order to be valid (Chin, 1998; Henseler et al., 2009). In our investigation, the Q square value is 0.045, demonstrating that the model is predictively valid.

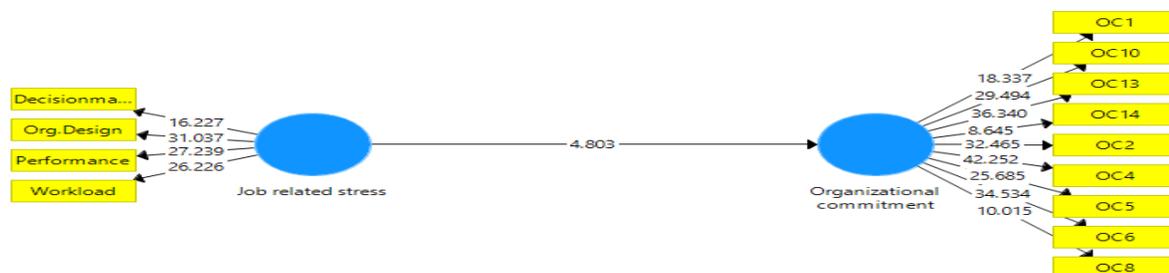


Figure1. Structural Model

Table9. Path-co-efficient and hypothesis testing

Hypothesis	Path co-efficient (β)	T-value	Confidence Interval	P Values	Remarks
H1: Job-related stress \rightarrow Organizational Commitment	-0.285	4.803	[-0.412, -0.182]	0.000	Supported

Notes: $p < 0.05$ (Two tailed)

V. CONCLUSION AND DISCUSSION

In the current study, researcher was trying to figure out the factors associated with job related stress and what that stress does to their commitment. An exploratory factor analysis (EFA) was executed on Kahn's (1964) Job-related tension index (JRTI), yielding four stress precipitator components - Performance, Workload, Organizational Design and Responsibility/Authority, and Decision-making. Our research findings corroborate the findings of previous researchers who also find out the almost similar factor structure of JRTI (Dominguez ad Scherer, 1998; Rogers et al., 1994).

Besides that, the study also looks into how job-related stress affects people's level of commitment to their company. PLS-SEM 3 results revealed that job-related stress factors negatively influence bank employees' commitment, which supported our proposed hypothesis. In other words, when employees are under a great deal of stress at work, their willingness to put in their best effort decreases. Likewise consistent with previous researchers' findings, which demonstrated a negative association between job-related stress and organisational commitment; these findings are also in accord with other researchers' findings. (Michael et al., 2009; Jagdish and Jagdish, 2010; Vkola and Nikolaou, 2005; Bhatti et al., 2016; Khatibi et al., 2009; Masihabadi et al., 2015). Employees' productivity diminishes due to being overworked, which may be a contributing cause to their lack of commitment to the company (Ekienabor, 2016). As a result, companies should provide ground for stress reduction and management opportunities.

VI. IMPLICATIONS

The study's conclusions will be relevant for bank policymakers to formulate their policies. Bank executives may utilize the data to identify the elements contributing to employee stress and decreased organizational commitment. Also, it is crucial to monitor job-related stress and the creation of an atmosphere that allows people to work productively while being healthy. Employees' commitment to an organization largely depends on their ability to work in an atmosphere free of stress. Therefore, management needs to come up with plans to take significant steps to make employees happy and committed to the company, such as providing career growth opportunities, flexible working hours, developing good relationships with co-workers and supervisors, introducing spiritual practices etc. Banks are expected to lessen workplace stress and increase employees' commitment as a result of this.

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Maturity Indices Color Chart and Quality Assessment of Mango (*Mangifera indica* cv. *Mallika*)

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Abstract- Conspicuous color, quality, taste and flavor highly depend on maturity stages of mango which differ with varieties. Both farmers and consumers confused to determine the exact stages with visual estimation due to nonexistence of pricy and arduous colorimeter. An android based mobile software “On Color Measure” (developed by PotatotreeSoft, Version 3.0) was experienced to detect fruit color for maturity indices of “Mallika” mango with physiochemical quality assessment. The dark olive green peel color was marked as earliest physiological maturity (stage-1), while the subsequent maturity stages determined at 2-days intervals as stage-2 (olive), stage-3 (apple green), stage-4 (brown), stage-5 (saddle brown) and stage-6 (dark golden rod color). Fruit quality was measures on physical (peel color, firmness and weight loss) and biochemical (anthocyanin content, titratable acidity, pH, total soluble solids, ascorbic acid, reducing sugar, non-reducing sugar and total sugar) parameters for each stage. At stage-6 (dark golden rod color), pH (4.54), anthocyanin content (470 mg/100g), TSS (23.97%), reducing sugar (5.03%), non-reducing sugar (7.76%) and total sugar (10.80%) were significantly the highest, while titratable acidity (0.45%), ascorbic acid (29.08 mg/100g) were significantly the highest in stage-1 (dark olive green). Firmness and ascorbic acid (Vitamin C) diminished gradually whenever the flesh color turned dark olive green to dark golden rod with the progress of ripening. Total soluble solids and total sugar increased while TA gradually decreased with maturity. Significant relationship between fruit quality and fruit peel color was exhibited. Therefore, stage-1 (dark olive green) might be suitable for the harvesting and stages-6 (dark golden rod color) for the consumption. Moreover, android software along with mobile device could be used by farmers and consumers to detect the deserve maturity of Mallika mango.

Index Terms- Color chart, mallika mango, maturity indices, physiochemical quality

I. INTRODUCTION

Mango (*Mangifera indica* L.) under the family Anacardiaceae is familiar as “king of fruits” (Nunes et al., 2007). It is believed to be originated in South East Asia, Indo Burma region (Mukherjee, 1997; Kothiyal et al., 2021). More than 80 countries

of the world grow 69 species of *Mangifera* genus and mostly restricted to tropical Asia (Gulcin et al., 2004). The leading mango producing countries of the world were India, Pakistan, Mexico, Brazil, Haiti, Philippines and Bangladesh (Ara et al., 2014). In 2020-2021 fiscal year, Bangladesh became the 7th largest mango producer country in the world having produced nearly 1.5 million tons (Ahmad, 2022). But the export earning is only 50 thousand US dollar through exporting only 791 tons which is much beyond the top earning countries like Thailand and India (734 and 137 million US dollar, respectively). Several quality assurances are to be emphasize to address boost exporting of mango.

In Bangladesh mango is considered to be the best among indigenous fruits having excellent flavour, attractive fragrance and color, delicious taste and nutritional value (Roy et al., 2011). Mango fruit has a greater health benefit due to the high nutritional value as well as important components. These components are grouped into macronutrients (carbohydrates, proteins, amino acids, lipids, fatty, and organic acids), micronutrients (vitamins and minerals), and phytochemicals (phenolic, polyphenol, pigments, and volatile constituents) by Maldonado-Celis et al. (2019). One cup of mango (225 gm) contains 105 calories, 16.9% CHO, 24% soluble sugar, 76% vitamin C, 25% vitamin A, 11 % vitamin B6, 9 % copper, 7% potassium, 4% magnesium, considerable amount of carotene (the precursor of vit. A), niacin, riboflavin, iron and others (Nilish & Banik, 2005). Although fruit consumed from green to maturity stages, nutritional value varies from variety to variety and developmental stages including mature and ripened stage (Leghari et al., 2013). Being a climacteric fruit, generally mango harvested at mature green stage and ripens up during the marketing as well as export process (transport, storage etc.). Sometimes, these desirable harvesting for higher economic return may result in loss in fruit yield due to earlier harvesting of underdeveloped fruits (Kour et al., 2018). The reduction in post-harvest losses, suitable harvesting stage of fruit (maturity) and optimum ripening conditions to have the best quality and longer shelf life has not been recognized in developing countries (Baloch & Bibi, 2012). However, these maturity indices for harvesting, ripening for quality mango varied with variety to variety (Ara et al., 2014). Determination of exact maturity indices of mango almost difficult due to the “biological variability” between

mangoes from the same batch as mentioned by Penchaiya et al. (2020).

The color of the fruit peel is an important factor of mango maturation indices and quality, which changes from green to orange, yellow, or red flush, depending on the type of cultivar. This green color attributed to chlorophylls (Sudhakar et al., 2016; Nelson & Cox, 2017), where blue-green for chlorophyll a and yellow-green for chlorophyll b in a 3:1 ratio (Medlicott et al., 1986; Saengnil & Kaewlublae, 1997; Lee & Schwartz, 2005). Hunter (L*, a*, b*) is most commonly used color system for measuring color (Manasa et al., 2019), which is illusory in farmers and consumers' level. Therefore, based on our previous study on Amrapali mango variety (Jaman et al., 2017), we also practiced android based mobile application software namely "On Color Measure" (developed by PotatotreeSoft, Version 3.0) to measure different maturity stages along with physiochemical quality of fruits as to develop a standard maturity color chart of 'Mallika' mango varieties.

II. MATERIALS AND METHODS

2.1 Experimental site

The experiment was carried out at the Postharvest laboratory of Horticulture, Patuakhali Science and Technology University (PSTU), Patuakhali, Bangladesh.

2.2 Atmospheric conditions of the laboratory

A digital thermo hygrometer (THERMO, TFA, Germany) was used to regular monitoring of the storage temperature and relative humidity during study. The average minimum of 24.0°C and maximum of 33.0°C were recorded during study. The minimum and maximum relative humidity were 82% and 90%, respectively.

2.3 A brief description of plant materials

Mallika is a hybrid from a cross of Neelum and Dashehari. Its fruit is medium large in size, oblong elliptical in shape and cadmium yellow in colored fruit having good keeping quality. Average fruit weight is 410 g. It is a mid-season variety.

2.4 Selection of the fruits

Uniform size, shape and colored 100 healthy fruits were selected from a tree of Mallika located at the residential area of PSTU.

2.5 Fruit harvesting

Fruits were harvested when they attained in light green color with uniform size and shape having apparently no defect. These were cut off with a sharp knife keeping about 2 cm stalk intact and carefully transferred to the Horticulture Laboratory.

2.6 Experimental design

Completely randomized design (CRD) with three replications was followed to conduct this study.

2.7 Determination of physical characteristics

Weight loss

Fruit weight was measured in every alternative day by weighing individual fruit with a top pan electronic balance (Model-668ALED, RFL). Weight loss was intended using the following formula:

$$\text{Citric acid (\%)} = \frac{\text{Titre (mL)} \times \text{NaOH normality (0.1 M)} \times \text{Vol. made up (50 mL)} \times \text{Citric acid eq. weight (64 g)} \times 100}{\text{Volume of sample for titrate (5 mL)} \times \text{Weight of sample taken (10 g)} \times 1000}$$

$$\text{Weight loss (\%)} = \frac{F_1 - F_2}{F_1} \times 100$$

Where, F_1 = Initial weight of the fruit

F_2 = Weight of fruits at various ripening stages

External peel color

The peel color of fruits was determined using an Android based Software namely "On Color Measure" (developed by "PotatotreeSoft", Version 3.0) with an aim pointer equipped. "On Color Measure" is an amazing way to recognize color by using the camera of mobile device. It affords to store the color information in the easiest way. Color sensed at the stem end, equatorial region and blossom end of each face of the fruit and mean value was calculated. Detected peel color was stored in chromaticity values of Red (R*), Green (G*) and Blue (B*). The camera was aimed and cross hair pointer clicked to capture the target point with little movement. The information displayed to dashboard was captured with Grab button. All detailed color information including RGB, HSV, color names, hex code and screen image was saved for the future enquiry.

Firmness

Firmness of mango was sensed by the method mentioned by Hassan (2006). Touch feeling was rated as 1-5, where, 5= mature hard, 4= sprung, 3= between sprung and eating ripe, 2= eating ripe and 1= over ripe.

2.8 Determination of chemical characteristics

Anthocyanin content

The total anthocyanin content of peel and the carotenoid content of pulp were determined by the method of Sims & Gamon (2002). Five gram of pulp were properly homogenized with 10 ml (1:2) 80% cold acetone (80:20 vol:vol, pH = 7.8) and then centrifuged at 800 rpm at 4°C for 4 min. The supernatant was diluted with additional acetone to make the volume of 5 ml. The absorbance of the extract was perceived 529 nm and 650 nm wave length with double beam spectrophotometer (Dynamica HALO-DB-20S UV-VIS Double Beam Spectrophotometer). Content of anthocyanin was counted by using the following formula:

$$\text{Anthocyanin (\mu mol/ml)} = A_{529} - 0.288 A_{650}$$

$$\text{Anthocyanin (\mu mol/g} \times 207.247 = \mu\text{g/g)} = A_{529} - 0.288 A_{650}$$

Where, A_x is the absorbance of the extract solution at respective wave length.

Titratable acidity

Titratable acidity (TA) was determined according to the method by Ranganna (1979). Ten gram of pulp tissue was homogenized with 40 ml of distilled water using a kitchen blender for two minutes and filtered through a Whatman filter paper No.2. Five milliliters of the filtrate was transferred into a 100 ml conical flask with 1% phenolphthalein indicator solution (two drops). The sample was titrated with 0.1 M sodium hydroxide (NaOH) solution until the color changed to pink and persistent at least 15 seconds. The titre volume was recorded and the result was expressed as percentage citric acid by using Ranganna (1979) formula:

pH

The remaining filtrates after TA estimation was used to sense the pH of the fruit pulp. A glass electrode pH meter (PHS-25 Precision pH/mV meter, LIDA Instrument) was used for the purpose. Before being used, the pH meter was calibrated with buffers at pH 4.0 followed by pH 7.0. After that, the glass electrode was placed into the filtrate to measure the pH and stabilized reading was recorded. For accuracy of the reading, the glass electrode was washed after each reading with distilled water and wiped to dry with soft tissue paper.

Total soluble solids concentration (TSS)

With the help of a digital refractometer (BOE 32195, BOECO Germany) remaining filtrates from TA estimation was used to measure the TSS. The refractometer was calibrated with distilled water each time before any measurement. Only 1-2 drops filtrate was placed on the prism glass and noted the refractometer reading as TSS, which multiplied by dilution factor to obtain an original % TSS. To overcome error from temperature, each reading was standardized to a temperature of 20°C by adding 0.28% to obtain % TSS at 27°C.

Ascorbic acid (Vitamin C)

Ascorbic acid was determined with dye method as expressed by Ranganna (1979). Ten gram of pulp tissue was homogenized with 40 mL of 3% cold metaphosphoric acid (HPO₃) using a blender for two minutes and filtered through Whatman filter paper no. 2. Five milliliters of aliquot was titrated with the indicator dye 2, 6-dichlorophenol-indophenol (DCIP or DPIP) until the filtrate changed to pink color at least for 15 seconds persistency. The titre volume of dye solution used was recorded and ascorbic acid content was calculated as follows:

$$\text{Ascorbic acid (mg /100 g)} = \frac{\text{Titre (mL)} \times \text{dye factor} \times \text{vol. made up} \times 100}{\text{Aliquot used for estimation (5 mL)} \times \text{sample weight (10 g)}}$$

Five milliliter standard ascorbic acid solution + 5 ml of 3% cold HPO₃ together was incorporated to standardize the dye. Then titrated with DICP as to convert into pink color at least for 15 seconds. The dye factor was calculated as follows:

$$\text{Dye factor} = \frac{0.5}{\text{Titre (mL)}}$$

Total sugar

Sugar content of fruit was estimated by the following procedures described by the Lane & Eynon (1923).

Standardization of Fehling's solution

Fehling's solution A and B was mixed together to 50 ml volume in a beaker. From this mixture, only ten milliliter was taken into a 250ml conical flask and 25ml distilled water was added to it. A burette was loaded with standard sugar. On the other hand, mixed solution in conical flask was heated on a hot plate until fully boiled. Then three drops of methylene blue indicator solution were added to mixed solution and titrated by standard sugar solution. We stopped whenever decolorization of the indicator occurred. Fehling's factor was calculated as below:

$$\text{Fehling's factor (g of sugar)} = \frac{\text{Titre} \times 2.5}{100}$$

Preparation of sample

Mixing of 50 ml fruit juice + 100 ml of distilled water + 5ml of neutral led acetate solution was then kept for ten minutes for homogenized. Then the intermingled was transferred to a 250 ml volumetric flask and filled up to the mark with distilled water. The solution was then filtered.

Estimation of reducing sugar

Ten ml of mixed Fehling's solution was intermingled with distilled water to reach the volume up to 250 ml in a conical flask. Filtrated pure juice was loaded into a burette, while conical flask was on a hot plate for boiling. Whenever boiling started, 3-5 drops of methylene blue indicator dropped into the boiled solution and titrated with burette juice. Decolorization of indicator was the end point of titration. Percent reducing sugar was expressed as follows:

$$\text{Reducing sugar (\%)} = \frac{F \times D \times 100}{T \times W \times 1000}$$

Where, F= Fehling's solution
D= Dilution
T= Titre,
W= Weight of sample

Estimation of total invert sugar

Fifty ml of filtrated pure solution + 5 ml citric acid + 50 ml distilled water poured into a 250 ml capacity conical flask which was boiled for inversion of sucrose and cooled. Consequently, transferred to a 250 ml capacity volumetric flask to neutralized with 1N NaOH using an indicator namely phenolphthalein. Additional distilled water was added to fulfill up to the mark of flask. Then the mixed Fehling's solution was titrated with previously revealed procedure of invert sugar (reducing sugar). Finally, total invert sugar was projected as follows:

Estimation of non-reducing sugar

Non-reducing sugar was estimated by using the following formula:

$$\text{Non-reducing sugar (\%)} = \text{Total invert sugar (\%)} - \text{Reducing sugar (\%)}$$

Statistical analysis

By implementing a statistical programme MSTAT-C recorded data on different parameters were analyzed following CRD with 3 replications (Gomez & Gomez, 1984). All means were envisioned and the analysis of variances (ANOVA) were compared using Duncan's Multiple Range Test (DMRT) at 1% levels of significance.

III. RESULTS AND DISCUSSIONS

3.1 Studies on the physical characteristics at different stages of the fruits

Peel color

Color is one of the most important criteria of quality of most fruits. The changes in color of mango peel dark olive green to dark

golden rod are the most obvious changes which occur during different ripening stages of fruits.

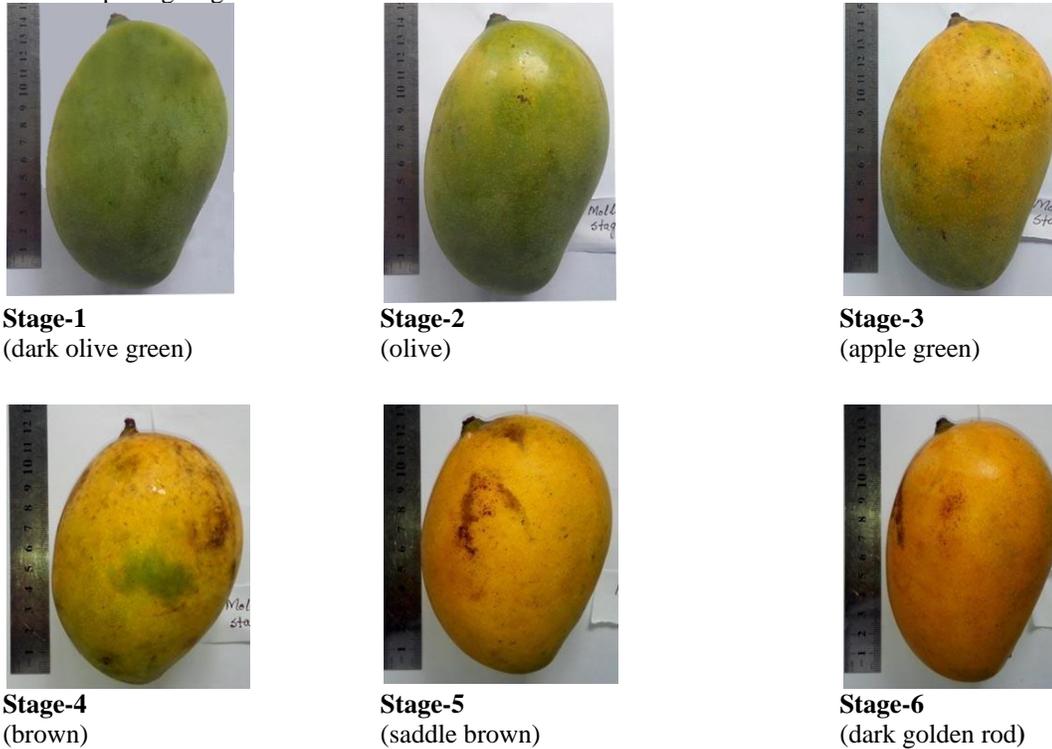


Figure 1. Different maturity stages of Mallika mango

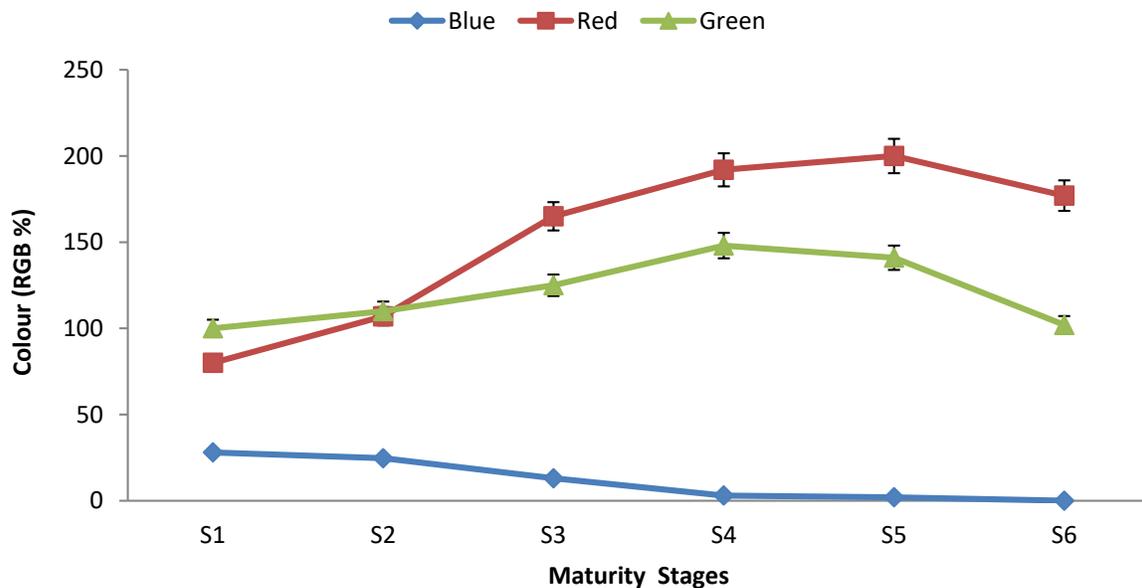


Figure 2. Colour (RGB %) of Mallika at different maturity stages.

At early stage, green (G) color is prominent and gradually decreased with maturity. At stage-1, RGB % was 80, 100 and 28 respectively. The red (R) color contain was highest at stage-5 (RGB %- 200, 141, 2). Then value of RGB % was decreasing due to deterioration of color pigment.

At stage-1, an abundance of chlorophyll masks the carotenoids expressing dark olive green. These carotenoids are unmasked when chlorophyll degraded during ripening leading to

yellow appearance (Charoenchongsuk et al., 2015). Chlorophyll degradation is attributed to ethylene, which up-regulates the de novo synthesis of the enzyme chlorophyllase in the peel during ripening (Mir et al., 2001; Choo, 2018). Besides, the peroxidase activity able to open the porphyrin ring, oxidative system, pH change may loss the green color (Kato & Shimizu, 1985, Doreyappy-Gowda & Huddar, 2001).

Firmness

Hardness considered as important post-harvest quality of fruits at storage. The firmness is changed obviously during storage of mango. These changes in firmness were witnessed from stage-

1 to stage-6 which afflicted the pulp become softer and sweeter as a consequence of starch conversion to sugar in a higher ratio with pleasant aroma and color.

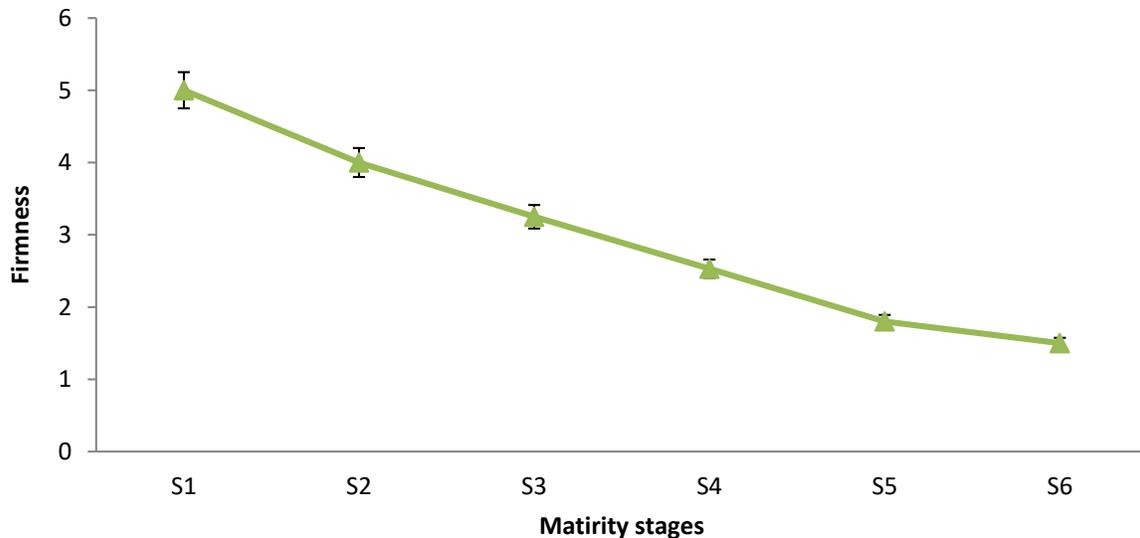


Figure 3. Firmness at different maturity stages of Mallika mango.

Significant variation was comprehended relating to firmness of mango pulp at different stages (Figure 3). The highest firmness was recorded at stage-1 (5), then the firmness of mango was decreased may be due to deviations in cell wall composition, pectin, cellulose and hemicellulose along with carbohydrates structures (Goncalves et al. 2006). The cell wall digested by pectinesterase, polygalacturonase, and other enzymes (Narain et al., 1998). The trend of decrease in firmness might be also due to loss of moisture by transpiration and respiration, conversion of

organic and inorganic metabolites. As a consequence, middle lamella of cell wall, its strength and degrade cell to cell bonding led to cellular swell as well as reduce puncture force of firmness (Sogvar et al., 2016; Arnon et al., 2014).

Weight loss

The changes in weight loss are one of the important indicators for maintaining the quality of fruits. The weight loss is shown in Figure 4. Weight loss of fruits were varied from 1.98 – 9.12%, which increased with the time being (ripening).

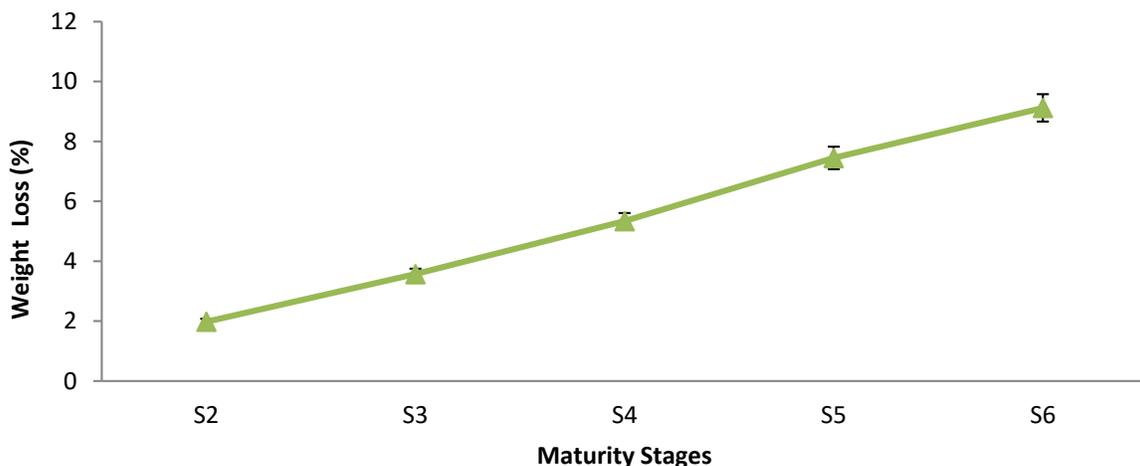


Figure 4. Percent weight loss of Mallika mango was perceived at different maturity stages

The highest weight loss was 9.12% at their stage-6. The weight loss of the fruits was befallen due to the upshot of water

loss from the fruits, microbial dwindling and harsh storage environment like uncomplimentary temperature and humidity.

High temperature boosted the weight loss but low temperature declined it during ripening and storage. Such weight loss during ripening might be from water loss consequences of the fruits through various metabolic processes alike respiration and transpiration (Kour et al., 2018).

3.2 Biochemical characteristics at different stages of the fruits

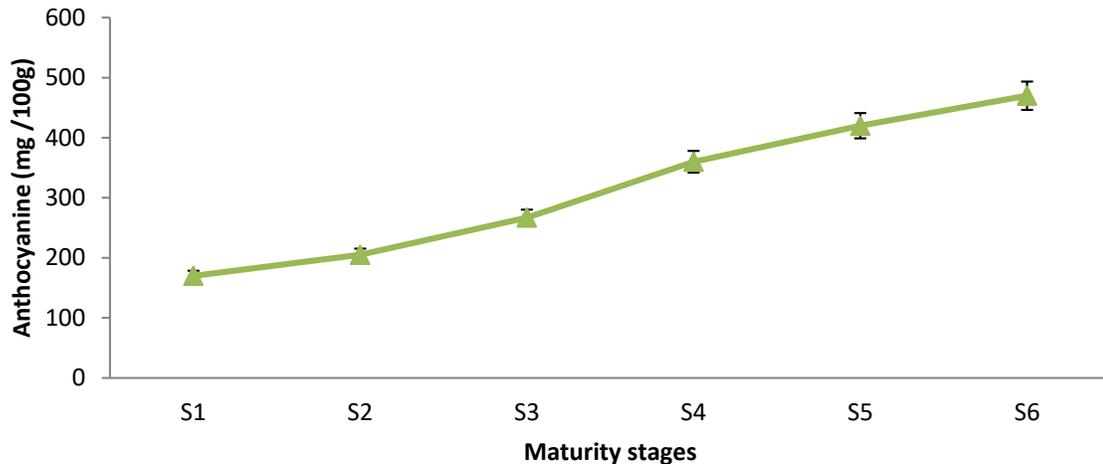


Figure 5. Anthocyanin content in Amrapali and Mallika mango varieties

Mango fruits rich in carotenoid compounds. These molecules are lipid-soluble stains contributing to yellow-orange colors of mango fruit and red colors when mango is ripe, although the reddish color of peel in several varieties is due to anthocyanins (Masibo & Qian, 2008; Sivankalyani et al., 2016). Anthocyanins are a group of phenolic compounds in the plant kingdom and they exhibit good antioxidant properties (Takeoka & Dao, 2002). Chromoplast is the place where carotenoids are sited which sometime masked by chlorophyll and non-photosynthetic plant tissues (Tanaka et al., 2008; Choo, 2018). Meanwhile, carotenoids harvest light as a accessory pigment and as in the chloroplast antioxidants converting the triplet chlorophyll to the singlet ground state in the chloroplast (Arafat, 2005; Alcaíno et al., 2016). This transition of chlorophyll during ripening stages increases carotenoids in mango which varied from variety to variety (Ellong et al., 2015; Haque et al., 2015).

Titratable acidity

The titratable acidity content of fruits significantly diverse among the maturity stages during study period (Table 1). At earlier maturity stage-1, the highest titratable acidity was encountered (0.45%), which was followed by stage- 2 (0.42%) and stage-3 (0.40%). Then the titratable acidity was declined towards completely ripen. Subsequently, the lowest titratable acidity (0.26%) was discovered from stage-6. A gradual decrease in titratable acidity with the advancement of maturity might be due to the transformation of citric acid into sugars and their additional deployment in metabolic process (Velez-Rivera et al. 2014;). A similar result was also reported by Kour et al. (2018) which is the corroboration of this study.

pH of fruit juice

Total anthocyanin content

Anthocyanin increased with ripening stages. Ripe mango peel gratified more anthocyanin at stage-6 and that was 470 mg/100 g. Meanwhile, it was only 170 mg/100g in early maturity stage-1 (Figure 5).

The pH of the fruit pulp under the study varied from 3.96-4.54 contingent on maturity stages (Table 1). The lowest pH (2.80) came across at earlier green stage-1, which was followed by stage-2 (2.90) and stage-3 (3.08). Then pH was amplified with the maturity progress and ripening and significantly the highest pH (4.09) was noted at stage-6. This variation of pulp pH was mainly due to the alteration of citric acid and ascorbic acid into sugar and other products during ripening physiology (Rathore et al., 2007; Baloch & Bibi, 2012).

TSS of fruit juice

The TSS content of fruit under the study varied from 15.52-23.97% contingent on maturity stages (Table 1). The lowest TSS (15.52%) was documented at early green stage-1, which was followed by olive green stage- 2 (16.50%) and apple green stage-3 (18.63%). Then the TSS was increased up to the highest maturity stage-6 and the highest TSS (23.97%) was recorded at stage-6. Ripened mango fruit is a major source of sugars (glucose, fructose, and sucrose) and other carbohydrates such as starch and pectins (Bello-Pérez et al., 2007). Starch remains in higher quantity during green stage which hydrolyzed to glucose (Derese et al., 2017). On the other hand, pectin also remains in abundant quantity in green mango which loss molecular weight during ripening (Saleem-Dar et al., 2016). As a consequence of phosphorylation, glucose phosphate enters the hexose phosphate pool and fuels a “futile cycle” of sucrose synthesis and degradation (Geigenberger & Stitt, 1991). that controls the content of glucose, fructose, and sucrose (Moscatello et al., 2011). Thus, glucose, fructose, and sucrose generally increase during ripening (Bernardes et al., 2008). Several researchers also exhibited increased monosaccharides and disaccharides during maturation in different cultivars (Tasneem, 2004; Yashoda et al., 2005).

Ascorbic acid

The ascorbic acid within the fruit was varied from 10.19-29.08 mg/100g unlikely to different maturity stages (Table 1). At stage-1, the highest ascorbic acid (29.08 mg) was logged, which was followed by olive green stage- 2 (25.50 mg/100g) and apple green stage-3 (23 mg/100g). Then the ascorbic acid was lessened towards wholly ripening stage-6 and which was the lowest (10.19 mg/100g). Presence of higher amount of vitamin C in less ripen fruit exhibited by Matheyambath et al. (2016) and Hu et al. (2018). These decreased rate with ripening may be due to the involvement of different metabolic pathways such as ethylene, oxalate, and tartrate biosynthesis because vitamin C is a coenzyme of their respective enzymes (Singh et al., 2011).

Reducing sugar

The reducing sugar was also varied from 1.90-5.03% as per different maturity stages (Table 1). The lowest reducing sugar (1.90%) was note down from dark olive-green stage-1, which was followed by olive green stage- 2 (2.03%) and apple green stage-3 (4.90%). Then the reducing sugar was boosted abundantly to completely ripen stage-6 where it was chronicled as the highest (5.03%). This steady accumulation of reducing sugar with the advancement of ripening maturity might be due to numerous enzymatic activities.

Non reducing sugar

Similar increasing trend in respect of non-reducing sugar was also noticed as the maturity increased which varied from 2.50-

6.20% (Table 1). The lowest non reducing sugar (2.50%) was also tested from dark olive-green stage-1, which was followed by olive green stage- 2 (3.16%) and apple green stage-3 (3.60%). Then the non-reducing sugar was abundant towards complete ripening stage-6 and significantly the highest non reducing sugar (6.20%) was verified at stage-6.

Total sugar

The total sugar was fluctuated from 4.40-11.37% based on the progress of maturity toward ripening (Table 1). At dark olive-green stage-1, the lowest total sugar (4.40%) was detected followed by olive green stage- 2 (6.83%) and apple green stage-3 (8.13%). Then the total sugar was encountered enormous in completely ripen stage-6. The highest total sugar (11.37%) was prominent in stage-6. Conversion of all carbohydrates and acids into sugar might be reason of increased total sugar in fully ripen mango. Taste of mango is the combination of sugar and acids where increased sugar with reduced acids is always desired (Kays, 1991; Malundo et al., 2001). Hydrolysis of polysaccharides into soluble sugar for climacteric mango fruits during ripening might be another reason of such higher quantity of total sugar. “Transition of chlorophyll into carotenoids, biochemical conversions of starch into sugar, insoluble protopectin into pectin and loss of organic acid through oxidation altogether are responsible for the increase in sugar and carotenoids” (Campestre et al., 2002; Kays, 1991; Martinez et al., 1997)

Table 1. Biochemical characteristics at different maturity stages of Mallika

Maturity stages	TA	TSS	AC	pH	RS	Non-RS	TS
Stage-1	0.45a	15.52d	29.08a	2.79f	1.90d	2.50e	4.40e
Stage-2	0.42ab	16.50cd	25.50b	2.89e	2.03cd	3.16de	5.19de
Stage-3	0.40ab	18.63c	23.00b	3.00d	2.40bc	3.60cd	6.00cd
Stage-4	0.33abc	21.50b	17.00c	3.38c	3.12b	4.13c	7.26c
Stage-5	0.28bc	23.40ab	11.92d	3.91b	4.42a	5.63b	10.06b
Stage-6	0.26c	23.97a	10.13de	4.09a	5.03a	6.20a	10.80a
LSD _(0.01)	0.084	1.32	2.45	0.02	0.81	0.63	1.42
CV%	13.29	2.87	4.79	8.26	7.55	6.23	13.43
Level of Sig.	**	**	**	**	**	**	**

Means in a column followed by the same letter(s) are not significantly differently at 1% level of DMRT, **= Significant at 1% level of probability, TSS= Total soluble solids concentration, AC=Ascorbic acid, TA= Titratable acidity, RS= Reducing sugar, Non-RS= Non reducing sugar, TS= Total sugar

IV. CONCLUSIONS

The physical quality such as color, firmness and percent weight loss were the highest at earlier maturity stage-1 (dark olive green). This stage is suitable for harvesting as to transportation, marketing and exportation purpose from the farmers point of view. All biochemical parameters such as TSS, pH, reducing, non-reducing as well as total sugar content were found promising with decreased TA, vitamin C and increased carotenoids as well as anthocyanins. Therefore, stage-6 (dark golden rod colour) is the

most suitable for consumption. Android based mobile software like “PotatotreeSoft”, Version 3.0 could be alternative of expensive colorimeter for farmers and consumers both. More android software along with different varieties of mango might be practiced in future for the maturity indices for harvesting, transportation, marketing and consumption.

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Teacher Related Factors Affecting Afghan EFL Undergraduates' Speaking Skill

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Abstract- Reading, writing, listening and speaking are the four primary and required skills of every language. Of the four skills of a language, speaking is the skill that always matters the most for a language learner, and it is considered essential. According to Nazara (2012), speaking is an important and essential skill of the four language skills, and as an EFL student, one needs to master the speaking skill. However, the majority of Afghan EFL undergraduates face difficulties in this all-important skill of the language. According to Zia and Sulan (2015), for most of Afghan undergraduate EFL learners, reading and writing are easy, but in oral communication, they are not accurate and fluent. Hence, this study was conducted to investigate the factors that affect the Afghan EFL undergraduates' speaking skill at Sayed Jamaluddin Afghani University Kunar, Afghanistan. The study specifically investigate teacher-related factors that affect students' speaking skill. A mixed method was used for this study, i.e., quantitative (questionnaire) as well as qualitative (interview). The data of the questionnaire was descriptively analysed in SPSS version 20 and presented in figures and tables. The interview data were thematically analysed and presented. A total of 90 students (40 junior and 50 senior) were purposively selected and participated in this study. The findings revealed that the rare use of speaking activities like pair work, group work, role-plays, group presentations and improper method of teaching were some of the factors on the part of teachers that affected students' speaking skill. It is hoped that the findings of the current study will help teachers as well as educators to be attentive toward their related responsibilities to reduce the factors that affect students' speaking skill.

Index Terms- Afghan EFL Undergraduates, Speaking Skill, Teacher-related Factors

I. INTRODUCTION

The concept of speaking is not a new one, and almost everyone is somehow familiar with the concept. However, it is challenging to cover the concept of speaking in the size of few words or sentences. According to Aouatef (2015), speaking is the way of conveying of one's ideas, thoughts, and feelings.

Similarly, Bygate (1991) considers speaking skill as the skill of using oral language for delivering ideas, thoughts, feelings, and intentions to others and to make them understand. "Speaking is a multi-sensory activity as it deals with paralinguistic features, i.e., eye-contact, facial expressions, body language, tempo, pauses, voice quality changes and pitch variation which affect conversational flow" (Thornbury, 2005, p.9). This is backed by Aouatef (2015), who assert that in speaking the speaker needs to take the context of the speech, facial expression, gestures and body language into consideration which will make it easy for the speaker to pass on the message.

For better understanding of the challenges Afghan EFL undergraduates face, it is necessary to have a look over the Afghan EFL undergraduates' background of English language. According to Nov 2009 BBC News report, the last three-decade of civil war and disorder in the country (Afghanistan) has damaged every sector including education. The invasion of Soviet Union in 1979 till 1989 has severely affected every sector of the government. Around 562000 to 2000000 of civilians were killed, and millions of Afghans have left the country and went as refugees to different countries, mostly to Pakistan and Iran (Lacina & Gleditsch, 2005). After the fall of Soviet Union, the civil war erupted in the country for almost six years which finally ended with the rise of the Taliban government in 1996. The education system was in a deplorable and critical situation in all these periods. However, after 2001, with the establishment of new government and with the help of international community the conditions started to improve for education. According to Sep 2016 World Education News, and Reviews, before 2001 nearly one million students were going to school, and this number rose up to 9 million since then. In the past, English as a subject was studied at grade seven, but the new government introduced English as a subject to the curriculum of grade four (Ministry of Education of the Islamic Republic of Afghanistan, 2010). With the arrival of international communities for the developmental works of Afghanistan, interest in the English language learning increased, and the English language became a requirement for jobs. Reacting to the situation the Ministry of Education brought necessary changes in the school syllabus for improved English subject.

Similarly, looking at the importance of English language and for enabling students to deal with English language environment nationally and internationally, the Ministry of Higher Education (MOHE), Afghanistan has also taken stern steps. The Ministry of Higher Education has introduced and emphasized the English language in all departments of different faculties. New departments of English language are introduced in every university which offers BA (honor) degree (Ministry of Higher Education Afghanistan, n.d).

However, with all these efforts, the students are still faced with certain challenges in the English language. One of the significant challenges, Afghan EFL undergraduate, are faced with is the speaking skill. They are outstanding in other language skills and achieve high marks in their exams, but in speaking, they are not performing well. This not only affects their grades but hinders their self-belief and self-confidence which frustrate them as well as their teachers. It is a point of immense concern and needs to be solved as it puts questions on their future career.

Studies have been done in the field but not in the context of Afghan EFL undergraduate. There is one related study so far in the Afghan context conducted by Zia and Sulan in the year 2015. The study carried by Zia and Sulan (2015) state that most of the Afghan undergraduates faced problems in speaking is due to the anxiety they had while participating in classroom speaking activities.

This study aims to investigate the possible factors that affect Afghan EFL undergraduates' speaking skill in the part of the teacher which will help teachers to be attentive towards their particular responsibilities and to make speaking classes more vivid and productive.

1.2 Research Objectives

The objectives of the research are:

- i. To identify the speaking activities used by the teacher in the speaking class.
- ii. To identify the learning strategies used by the teacher in the speaking class.

1.3 Research Questions

The research questions are:

- i. What are the speaking activities used by the teacher in the speaking class?
- ii. What are the learning strategies used by the teacher in the speaking class?

1.4 Conceptual Framework

The role of the teacher is always pivotal in the process of learning speaking. However, there are certain downsides on the part of teachers that ultimately affect students' speaking skill (Pal, 2015). For a better outcome, a teacher should use proper teaching method for the speaking class. Grammar translation method which significantly involves the use of the first language will not be a better choice for teaching speaking as compared to the direct method. The direct method which significantly involves teaching in the target language appeared as a reaction to the grammar-translation method for its ignorance to spoken language (Samah & Zohra, 2015). Another issue is teacher

inexperience for the speaking class. Gashaw (2014), states that the lack of proper pronunciation knowledge and lack of material design are some of the issues on the part of the teacher. Likewise, some teachers miss a number of in-class activities that are considered vital for improving speaking skill.

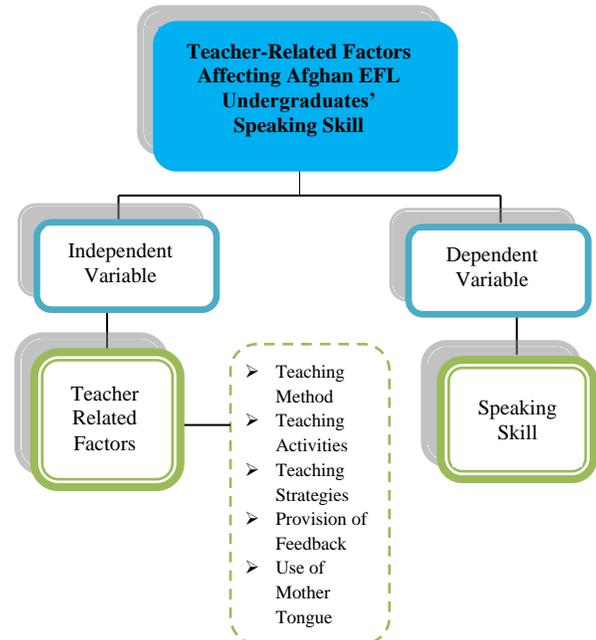


Figure 1.1 Conceptual Framework

II. LITERATURE REVIEW

2.1 Speaking Skill

Baker and Watsrup (2003) define speaking skill as using language for a purpose. According to Oxford Advanced Dictionary (2015), speaking is to express or communicate opinions, feelings, ideas, and thoughts by talking. It involves activities - psychological, physiological (articulator) and physical (acoustic) - on the part of the speaker. Speaking is considered the most essential skill of a language that uses verbal and nonverbal symbols to convey meaning. According to Chaney and Burk (1998), speaking is the process of building and sharing meaning through the use of verbal and non-verbal symbols, in a variety of contexts. Huebner (1960) says the language is essentially speech and speech is communication by sounds. He adds that speaking is a skill which one can use in daily life communication whether at school or outside.

2.2 Factors Affecting Speaking Skill

There is a number of studies (Shteivi & Hamuda, 2016; Afshar & Asakereh, 2016; Juhana, 2012; Mezrigui, 2011) carried in the field of speaking skill and these studies have come up with several different findings. The significant factors affecting students' speaking skill found were an improper method of teaching, students' psychological factors, the use of mother tongue in speaking class and the limited opportunities for the learner to speak English inside the classroom. The following are

some of the findings from different countries that elaborate the major factors affecting students' speaking skill.

A study carried by Mezrigui (2011) shows that the major problem Tunisian EFL learners have in speaking is because of inadequate exposure to the English language inside as well as outside of the class and at the same time the use of the improper method of teaching for speaking class. The inadequate exposure to the English language as a factor of poor speaking skill was also found by Shteiwi and Hamuda (2016). Shteiwi and Hamuda (2016) conducted a research in the context of Libya and found that the majority of students at the English language department do not have enough opportunity to speak, and this is considered to have a primary defect while dealing with the English language. Likewise, Tuan and Mai (2015) had carried a study to investigate the speaking problem of the students at Le Thanh Hien High School and factors affecting their speaking performance. They achieved the same results like Mezrigui and Shteiwi's studies that the students either participated very little in the speaking or did not participate at all. They used a considerable amount of Vietnamese language instead of English while working in groups. They did not participate enough in the class and were not motivated enough to express themselves. Along with these findings, they also found that it was the students' constant fear that they will be criticized or they will lose their face in case they are wrong while speaking.

Similarly, Juhana (2012) carried a study and found that numerous psychological factors prevent a student from speaking fluently in the English class. She adds that the most notable factor affecting students' speaking skill is the psychological factor. They feel fear while speaking in English. This fear is caused because of the fear that in case of error, friends will laugh at them. Similarly, anxiety and shyness are the other factors that hinder students' speaking skill. These findings were supported by Afshar and Asakereh's study (2016), who carried a study in the context of Iran and revealed that along with other factors like a weak educational system of the country and linguistic factor, the major problem was the psychological factor that hinders students' progress in speaking. The findings of the study also report that there is no difference among Iranian EFL first-year students and seniors in having problems in speaking.

In short, studies (Shteiwi and Hamuda, 2016; Afshar & Asakereh, 2016; Tuan and Mai, 2015; Juhana, 2012; Mezrigui, 2011) show that topical knowledge, grammatical knowledge, listening ability, motivation to speak, teacher's feedback during speaking activities, confidence, pressure to perform well, and time for preparation are some of the significant factors that influence speaking performance of the students.

2.2.1 Teacher-Related Factors

The main aim of language learning is to communicate in that language, so it is essential to master the speaking skill to communicate correctly. However, there are some factors on the part of teachers that hinder students from effective speaking (Pal, 2015). Some teachers are unaware of their students' need for improving English pronunciation and the problems they encounter while speaking. The reason may be the lack of materials to teach, or they may have not enough information about pronunciation and what it involves (ALEMU, 2007).

ALEMU (2007) adds, teachers usually ignore essential exercises and class activities that could improve learners' speaking abilities and on contrary, students are blamed and discouraged by the teachers for not speaking correctly.

2.2.1.1 Method of Teaching and Class Activities

The use of proper method and class activities play a vital role in the success of students in speaking skill. There are several methods of teaching, and each method has its area of application. Without applying the proper method and in-class activities, it is impossible to have positive results from the speaking class. The proper method and in-class activities for speaking class are presented next.

According to Hughes and Reed (2016), the spoken form of language was usually ignored in the traditional language teaching methods. In the last few decades, a considerable reconsideration has been done in language studies, and some language teaching methods that insist on the importance of speech in language teaching emerged as a reaction to the drawbacks of the grammar-translation method. Among these methods is the direct method which prefers speaking the language in its pedagogy. Direct method uses the language lesson on speech-based interactions between students and teacher. Along with direct method, there are other methods, i.e., situational and audio-lingual method that give more emphasis to speaking the language and their pedagogy of teaching stresses on teaching and learning through speech. According to Samah and Zohra (2015), direct method came into existence as a reaction to the grammar-translation approach and its ignorance to the spoken language. The teachers who practice direct method believe that students learn how to communicate in the target language.

2.2.1.1.1 Warm-up Activity

According to Bourezzane (2015), the nature of warm-up activities is that they are short. Holmes (2004) suggests that it is a good idea to start a class with an activity of introduction where students introduce each other and make the classroom environment friendlier. This is possible by students interviewing each other and then with the help of collected information introduces his/her partner to the class. Teachers are required to provide students with vocabulary, expressions or idioms which can help them in the context. They should be very attentive in such activities to motivate students by asking them about the synonym, antonym or about the meaning to engage them in the class.

2.2.1.1.2 Pair Work and Group Work

Group work is an activity that allows students to work together as a team and it may consist of three to five students, who are asked to do certain tasks which need a group decision like writing a group story, role play or discussion on given topic (Harmer, 2001). Similarly, pair work is a form of learning with a partner to accomplish a task such as writing dialogue. It has several advantages in enhancing students' language fluency. Two heads are better than one, i.e., it increases students' amount of speaking in the classroom. It helps the students in developing autonomy and develop their speaking fluency. Byrne (1991) has

divided pair work into three categories, i.e., open pairs, fixed pairs and flexible pairs. In open pairs, learners talk to one another across the class under the teacher's control while in fixed pair learner goes on working with the same partner to complete a task and flexible pair involves the changing of partners, i.e., interviewing other classmates. Similarly, Raja and Saeed (2012), state that it was in the 70s that pair work and group work started to attract the attention of educationists. The educationists were in favour of more teacher talking time in the language classes. It was the period between the 1980s and 1990s where the communicative language teaching came with all important change in the student's role (Nunan & Lamb, 1996).

2.2.1.1.3 Drama

Drama is an appealing activity which promotes cooperation, collaboration, self-control, goal-oriented learning as well as emotional intelligence skills. The use of drama has undeniable benefits for the learning of language. It encourages students to speak, it provides students with a chance to communicate, even with limited language. Drama improves the oral communication of the students and provides students to have real communication (Zyoud, 2010).

2.2.1.1.4 Role-play

Role play is one of the activities that promote speaking. Through role play activities the students learn how to express ideas, opinions or feelings to others by the help of using words or sounds. Role play can improve a learner's speaking skill in any situation and help the learner to interact with each other (Susanti, 2007). Students imagine they are in various social contexts and have a number of social roles. The teacher usually provides students with information in role-playing, i.e., who they are and what they think or feel.

2.2.1.1.5 Oral Presentation

The oral presentation is an extension of the oral communication skill (Nadia, 2013). In an oral presentation, students come to the front of the class to give information or persuade other students about a topic that they know well about for a fixed duration of time. In oral presentation, the student can choose a range of topics. With the help of an oral presentation, EFL learners can increase their information, improve all of the four skills at a time and they can help encourage each other as well as help themselves to be autonomous (Bouezzane, 2015).

2.2.1.1.6 Discussion

The discussion aims to provide students with a platform to share their ideas so that they can freely speak with each other. Students are asked by the teacher to speak and provided them enough time to structure the materials they are going to say (Nadia, 2013). According to Thornbury (2005), the majority of teachers accept that the best discussion is the one where students naturally speak either about something personal or may be the topic of the course book to start the discussion.

2.2.1.1.7 Interviews

Students can conduct interviews on various topics with numerous persons. It will be a better idea that the teacher provides students with rubrics so that they know the type of question which can be asked or what path to follow, but it is the students who will prepare the questions. After that they have conducted their interviews, they should present their study to the class (Susanti, 2007).

2.2.1.1.8 Picture Describing

This is the activity in which students will create groups, and each group is provided with a different picture. Students discuss the picture with their groups, and then a representative of each group describes the picture to the whole class. This activity fosters creativity and imagination of the learners as well as their public speaking skills (Susanti, 2007).

2.2.1.1.9 Language Games

Language games allow the students to practice the language with the help of games (Bouezzane, 2015). According to Leo and Cely (2010), there are a number of games that encourage students to participate and improve the speaking skill of which include: picture games (involving compare and contrast), sound games (involving listening and speaking), words games (involving spelling, meaning), and memory games (involving talking about events).

2.2.1.1.10 Dialogues

Practicing dialogues has a very extended background in the teaching of language as the nature of language is dialogic. It is a very important way for making students to perform (Thornbury, 2005).

2.2.1.1.11 Storytelling

According to Pederson (1995), storytelling is the genuine form of teaching. Using storytelling in English classroom is one of the enjoyable activities to motivate students to study (Jianing, 2007). Storytelling plays an essential role in stimulating the students' imagination as well as in the development of language abilities (Koki, 1998).

2.2.1.2 Teacher Use of the Speaking Strategies

It is the teacher's job to provide students with such strategies by which students could speak efficiently and effectively. According to Shanthi, Pothan, and Rao (2014), the strategy is a procedure or techniques which are followed to accomplish the goal. For the teacher, it is essential to know various learning strategies and to use them in his/her teaching. If teachers, as well as the students are aware of the learning strategies used in the class, the learning will become more efficient. Hamad (2013) carried a study to investigate what affect speaking skills at Saudi colleges for girls in the south and along with other factors found that instructors did not use strategies that could help the student in developing speaking.

2.2.1.2.1 The Role of the Teachers to Help the Students

Teachers play a vital role in the progress of a student.

As a teacher, he/she can be a guide to help a student in the class. According to Byrne (1991), the role of a teacher is just like an actor and like an actor-teacher should act differently in different situations, i.e., in some activities he/she will work as a stimulator, manager, and consultant while in other activities he/she will work as a conductor, organizer and monitor. However, in all these roles the teachers will aim to set up the activities and be available to help the learners.

2.2.1.2.2 Provision of Feedback

According to Hattie and Timperley (2007), feedback plays an essential role in learning and achievement. Information provided by the teacher, peer, book, parent, and experience about one's performance or understanding and usually comes later to instructions meant for the improvement of a particular attitude. Based on behaviourist theories, positive feedback is more effective as compared to negative feedback, as positive feedbacks encourage students that they have done a certain task in the approved manner which directly boosts their motivation (Nunan, 1989). Oliver, Yeo, and Tucker (2012) promote that it is a student who needs to know that the main part of a teacher's job is to give feedback on the activities students do to reach the outcomes of learning.

2.2.1.2.3 The Use of Mother Tongue

There is a continuous debate, on how mother tongue affects EFL classes. However, Harmer (2001) states that it will not be a wise decision to eliminate the mother tongue from use. This will not work but instead will discourage the students who are with the idea that it is helpful in some areas. Hamad (2013) carried a study to investigate what affects speaking skills at Saudi colleges for girls in the south. Along with other factors, Hamad found that instructors allowed students to use their mother tongue in the class when the student was unable to speak English.

III. METHODOLOGY

3.1 Research Design

In order to collect in-depth data about the research problem, the researcher has used mixed method approach for the study. This means that the researcher has used both quantitative and qualitative methods for data collection. The researcher used mixed method for this study to see in detail the factors that affect the students' speaking skill. The practitioners of mixed method research argue that the use of mixed method provides the researcher with a complete understanding of the research problem than does the use of quantitative or qualitative approach alone (Fraenkel, Wallen & Hyun, 2016). The quantitative approach helps in quantifying the problem and helps in the understanding, how common is the possible result to the large population. It is also used to help in collecting the numerical data, since it is easy and fast to code, analyse and interpret to fully understand the research problem. The qualitative approach is put into action and provides the descriptive data. The descriptive data provide us with the ability to describe and explain in greater depth of the population characteristics or the

phenomenon which is studied.

3.2 Research Setting

The study is carried at the department of English language, Education Faculty, Sayed Jamaluddin Afghani University. The Sayed Jamaluddin Afghani University was founded in 2010 in the city of Asadabad, Kunar, Afghanistan. The university is among one of the fastest growing universities in Afghanistan. The university is named after Sayed Jamaluddin Afghani, the Islamic ideologist of the 19th century. The university started offering admission in three faculties: education, theology, and agriculture. Over the years, it expanded its services and currently is considered a reliable institution in the region for its fast educational and academic development and improvement in just seven years. The university offers admissions in five faculties, i.e., Education, Sharia, Agriculture, computer science and economics faculty. The university offers twenty-one-degree programs under the related faculties.

3.3 Subjects and Sampling

The population of the study is 190 EFL undergraduate English major students at the Department of English Language, Education Faculty, Sayed Jamaluddin Afghani University, Kunar, Afghanistan. There are 50 senior and 40 junior undergraduates at the department of English language. So, the total number (90) of junior and senior undergraduates was purposively selected as the sample for the study. The junior and senior undergraduates are purposively selected the participant of this study as they are studying for three and four years respectively in the English language department and can provide the researcher with detailed data. *"In purposively sampling the researchers do not simply study whoever is available but rather use their judgment to select a sample that they believe, based on prior information, will provide the data they need"* (Fraenkel, Wallen & Hyun, 2016, p.101). All these students are male. Their ages range from 22 to 24 years.

3.4 Data Collection Instruments

In order to get in-depth data, two instruments were used. These two instruments were questionnaire and interviews which help in the descriptive analysis of the data.

3.4.1 Questionnaire

In order to examine the learners' reaction to the teacher related factors that affect speaking skill, a four-page questionnaire is administered to the participants of the study. Using questionnaire as an instrument for research enables the researcher to provide systematic data for a study (Hammersley & Atkinson, 1983). The questionnaire is adopted and adapted from the study carried by Pal (2015). The questionnaire contains closed-ended questions with a five-point Likert type scale. The questionnaire contains a total of 20 items, and it is designed in such a way that it collects data in two parts, i.e. activities used by the teacher and strategies used by the teacher in the speaking class.

3.4.2 Interviews

The interview provides the qualitative data for this study. Qualitative interview data often gather more in-depth insights on particular attitudes, thoughts, and actions (Kendall, 2008). There is a total of 90 students as participants of this study, and only ten students are selected for the interview. The interview provides the researcher with additional information and helps to validate the data collected by the questionnaire. The interview took place after the questionnaire had been answered by the students. There are overall 9 questions that try to find information about the factors that affect students' speaking skill on the part of the teacher.

3.5 Data Analysis

As the study used both qualitative as well as quantitative data, their analyses are carried separately. For qualitative analysis, SPSS is used. For data analysis, descriptive statistics are used such as mean, standard deviation, frequency, percentage, and tabulations. The obtained data is organised, coded and tabulated under similar category and is analysed and interpreted using SPSS version 20.

The data obtained from the interview is analysed thematically. Thematic analysis is a type of qualitative analysis and used to analyse classification and present themes (patterns) that relate to the data (Alhojailan, 2012). Alhojailan (2012) further says the thematic analysis is considered the most appropriate for any study that seeks to discover something using interpretations. It provides a systematic element to data analysis. It allows the researcher to associate an analysis of the frequency of a theme one of the whole contents. This provides accuracy and intricacy and enhances the research's whole meaning. The thematic analysis gives an opportunity to understand the potential of any issue more widely (Marks & Yardley, 2004). It illustrates the data in great detail. Each interviewer is assigned with a code name. For example, "Y4S1" means fourth-year student 1, so in the thematic analysis, these codes are used to refer to the student while reporting the student response.

The process of the interview consists of four steps (Figure 3.1). First, the respondents' responses were recorded with a voice recorder. Secondly, the researcher listened to each response carefully and then transcribed each response in the Pashto language. Finally, the researcher translated the transcribed Pashto data into the English language.

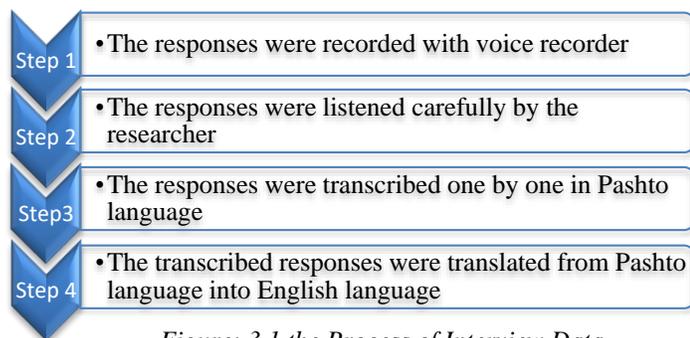


Figure: 3.1 the Process of Interview Data

IV. FINDINGS AND RESULTS

4.1 The Results Of The Questionnaire

4.1.1 RQ1: Activities Used by the Teacher in the Speaking Class

The following responses are about the activities and techniques which the teachers used in speaking class. The respondents were required to provide the information about how often their teachers used the following activities and techniques and the effect which these techniques have on their English-speaking skill. The results are shown in Table 4.1.

Table 4.1
The Frequency and Percentage Showing Teacher Use of Speaking Activities

No	My English Teacher:	Frequency	Alternatives				Total	
			Never	Rarely	Sometimes	Usually		Always
1	Uses questioning and answering	Fre	0	0	46	35	9	90
		%	0	0	51.1	38.9	10	100
2	Uses pair work	Fre	19	34	36	1	0	90
		%	21.1	37.8	40	1.1	0	100
3	Uses group work	Fre	24	46	17	3	0	90
		%	26.7	51.1	18.9	3.3	0	100
4	Uses role-play and drama	Fre	56	33	1	0	0	90
		%	62.2	36.7	1.1	0	0	100
5	Uses picture description	Fre	24	62	4	0	0	90
		%	26.7	68.9	4.4	0	0	100
6	Uses panel discussion	Fre	49	38	3	0	0	90
		%	54.4	42.2	3.3	0	0	100
7	Uses story telling	Fre	53	30	7	0	0	90
		%	58.9	33.3	7.8	0	0	100
8	Uses peer interview	Fre	47	43	0	0	0	90
		%	52.2	47.8	0	0	0	100
9	Uses individual presentations	Fre	0	0	13	54	23	90
		%	0	0	14.4	60	25.6	100
10	Uses group presentations	Fre	46	41	3	0	0	90
		%	51.1	45.6	3.3	0	0	100

Table 4.1 shows the frequency and percentage of the student's responses to items showing teacher use of speaking activities. 10% of the respondents responded to sometimes, usually and always respectively. The data shows that 19 (21.1%), 34 (37.8%), 36 (40%) and 1(1.1%) of the respondent responded never, rarely, sometimes and usually respectively to the question of using pair work in the class (item 2). From the responses of respondent to the question of the use of group work by the teacher in the class (item 3) revealed that 24 (26.7%), 46 (51.1%), 17 (18.9%) and 3 (3.3%) of the respondents responded to never, rarely, sometimes and usually respectively. 56 (62.2%), 33 (36.7%), 1 (1.1%) of the respondents responded never, rarely and sometimes respectively to the question of the teacher uses role-playing and drama in the speaking class (item 4). The responses of the respondents to the question of teacher use of

picture description in the speaking class (item 5) were 24 (26.7%) never, 62 (68.9%) rarely, 4 (4.4%) sometimes.

Likewise, the responses of the respondents to the question of teacher use of panel discussion in the speaking class (item 6) were 49 (54.4%) never, 38 (42.2%) rarely, 3 (3.3%) sometimes. The responses of the respondents to the question of the teacher using storytelling technique in the speaking class (item 7) were 53(58.9%) never, 30 (33.3%) rarely, 7 (7.7%) sometimes. The responses of the respondents to the question of teacher use of peer interviews in the speaking class (item 8) were 47 (52.2%) never, 43 (47.8%) rarely. The responses of the respondents to the question of teacher use of individual presentations in the speaking class (item 9) were 13(14.4%) sometimes, 54 (60%) usually, 23 (25.6%) sometimes. The responses of the respondents to the question of teacher use of group presentations in the speaking class (item 10) were 46(51.1%) never, 41 (45.6%) rarely, 3 (3.3%) sometimes.

4.1.2. RQ2: Learning Strategies Used by the Teacher in the Speaking Class

The following responses are about the learning strategies which the teachers used in speaking class. The respondents were required to provide the information about the strategies their teacher use in the speaking class. The results are shown in Table 4.2.

Table 4.2
The Frequency and Percentage Showing Teacher Use of Learning Strategies

No	My English Teacher:	Fre.	Alternatives					Total
			Never	Rarely	Sometimes	Usually	Always	
11	Allows me to ask for feedback	Fre.	81	9	0	0	0	90
		%	90	10	0	0	0	100
12	Allows me to ask for mistake correction	Fre.	26	62	2	0	0	90
		%	28.9	68.9	2.2	0	0	100
13	Present pronunciation points	Fre.	73	17	0	0	0	90
		%	81.1	18.9	0	0	0	100
14	Has good speaking activities design	Fre.	19	0	65	5	1	90
		%	21.1	0	72.2	5.6	1.1	100
15	Used learner-centered approach	Fre.	73	17	0	0	0	90
		%	81.1	18.9	0	0	0	100
16	Give time for speaking exercises	Fre.	85	5	0	0	0	90
		%	94.4	5.6	0	0	0	100
17	Does not scold students for not speaking correctly	Fre.	0	0	3	60	27	90
		%	0	0	3.3	66.7	30	100
18	Does not scold students for speaking with poor accent	Fre.	0	0	0	69	21	90
		%	0	0	0	76.7	23.3	100
19	Uses project-based	Fre.	79	9	2	0	0	90
		%	87.8	10	2.2	0	0	100

activities	Fre.	85	5	0	0	0	90
20 Uses monologues	%	94.4	5.6	0	0	0	100

According to Table 4.2, to the item the teacher allowing students to ask for feedback (item 11), the majority of the respondents 81 (90%) responded to never and 9 (10%) of the respondents responded to rarely. To the teacher allowance of the students to ask for mistake correction (item 12), 26 (28.9%) of the respondents responded that they were never allowed to ask for mistake correction while the majority of the respondents 62 (68.9%) replied that they were rarely allowed to ask for mistake correction and only 2 (2.2%) of the respondents responded that they were sometimes allowed to ask for mistake correction. To the teacher presenting pronunciation points (item 13), the majority of the respondents 73(81.1%) responded that they were never presented the pronunciation points by the teacher while 17 (18.9%) of the respondents replied that they were rarely provided with pronunciation points by the teacher. To the teacher designing speaking activities (item 14), 19 (21.1%) of the respondents responded that the teacher never designed speaking activities, while the majority of the respondents responded that their teacher sometimes designed speaking activities. 5(5.6%) of the respondents responded that their teacher usually designed speaking activities while 1 (1.1%) of the respondents replied that their teacher always designs speaking activities. To the approach used by the teacher in the speaking class (item 15), the majority of the respondents 73 (81.1%) replied that their teacher never used learner-centred approach while 17 (18.9%) of the respondents responded that their teacher rarely uses learner-centred approach.

Likewise, to the teacher giving time to speaking exercises (item 16), the majority of the respondents 85 (94.4%) responded that their teacher never gives time for speaking exercises while 5 (5.6%) of the respondents responded that their teacher rarely gives time for speaking exercises. Similarly, 3(3.3%) of the students replied that their teacher sometime does not scold the students for not speaking correctly (item 17), majority of the students 60 (66.7%) replied that their teacher usually does not scold them when they do not speak correctly while 27 (30%) of the students replied that their teacher always do not scold them for not speaking correctly. To the teacher does not scold students for speaking with poor accent (item 18), the majority of them 69 (76,7%) replied that their teacher usually does not scold them for speaking with poor accent while 21 (23.3%) of the respondents responded that their teacher always does not scold them for speaking with poor accent. To the teacher using project-based activities (item 19) the majority of the students 79 (87.8%) replied that their teacher never uses project-based activities while 9 (10%) of the respondents responded that their teacher never uses project-based activities and 2 (2.2%) of the respondents replied that their teacher sometimes uses project-based activities for speaking class. To the teacher using monologue in the speaking class (item 20), the majority of the respondents 85 (94.4%) replied that their teacher never uses monologue in the speaking class whereas 5 (5.6%) of the respondents responded that their teacher rarely uses monologue in the speaking class.

4.2 The Findings of the Interviews

4.2.1 The Teacher Use of Learning Activities

Concerning the teacher use of pair work in the speaking class, the majority of the students (Y3S1, Y3S3, Y3S4, Y4S1, Y4S3, Y4S4) replied that the teacher sometimes allows them to work in a pair in the speaking class. However, there were few students (Y3S2, Y4S5) who said that their teacher very rarely allows them to work in pairs and one student (Y3S5) replied that his teacher had not used pair work in the class yet. They advocated for the use of pair work in the class, and the majority of them said that pair work is a practical activity which plays an important role in the learning of a language. As pair work is done in by two students, both students get a chance to help each other and share their ideas with each other. The following excerpts are some of the examples of learners' responses to the question regarding the teacher use of pair work in the speaking class and the students' stances towards it.

Y4S1: "Aaaa, sometimes our teacher allows us to **work in pairs**. Mmmm, pair work is a part of practical activities that play an important role in the learning of a language. As **pair work** is done by two students, so both students get a chance to help each other and share their ideas with each other". (Line 1-8)

Y3S1: "In the whole semester we **work in pairs** just three or four times. **Pair work** is significant activity in the speaking class in which two students share their information with each other". (Line 1-3)

Y4S4: "Sometimes our teacher allows us to **work in pairs**. **Pair work** is very effective in case when two students of different ability **work in pair**, where the weaker students get benefit from the brilliant one". (Line 1-3)

Concerning the teacher use of group work in the speaking class, the majority of the students (Y3S2, Y3S3, Y3S4, Y3S5, Y4S1, Y4S2, Y4S3) replied that the teacher very rarely uses group work in the speaking class. A few students (Y3S1, Y4S5) said that their teacher had not used the group work activity up to now in the speaking class. Their comments about the use of group work in the speaking class were that it is one of the critical methods of practical learning, so it has a significant effect on the learners. Because there are students with different talent so when they work in a group, they help each other, share ideas with each other and take feedback from each other. This method is fun too for the students where students do not feel tired and bored. The following excerpts are some of the examples of learners' responses to the question regarding the teacher use of group work in the speaking class and the students stances towards it.

Y3S5: "Teacher does not usually allow us to **work in groups**. In my opinion **group work** is very important in speaking class". (Line 3-4)

Y4S1: "Mmmm, teacher rarely allows us to **work in groups**, and usually we work individually. **Group work** is also one of the important methods of practical learning, so mmm it has a great effect on the learners. Because there are students with different talent so when they **work in a group**, they help each other, share ideas with each other and take feedback from each other. Aaa, this method is a kind of fun too for students where students do not feel tiredness and boredom". (Line 9-19)

Y4S5: "Up to now we have not **worked in groups** in the speaking

class. **Group work** plays an important role in the building of confidence, and usually there are students of multiple talents in class so if they **work in a group**, will help to learn from each other". (Line 4-7)

In response to the question; how often their teacher allowed them to have discussion and dialogue in the speaking class, the majority (Y3S1, Y3S3, Y3S4, Y3S5, Y4S1) of them replied that their teacher rarely allows them for discussion and dialogue in the speaking class. Some students (Y4S3, Y4S4) said that their teacher sometimes allows them for discussion and dialogue, while there were three students (Y3S2, Y4S2, Y4S5), who said that their teacher never provides them with the opportunity to have a discussion and dialogue in the speaking class. In their answers to the question that how they feel about the discussion and dialogue in the speaking class, the majority of them advocated that discussion and dialogue play an essential role in the improvement of speaking. In dialogue, a student gets the chance to express what he or she has in the mind which can play a significant role in the articulation and fluency of the learner. The following excerpts are some of the examples of learners' responses to the question regarding the teacher use of discussions and dialogues in the speaking class and the student's stances towards it.

Y3S2: "We do not have **discussion and dialogues** in the speaking class, and I do not remember when the teacher allowed us for **discussion and dialogue**. **Discussion and dialogues** are very effective in the speaking class and these activities improve our boldness". (Line 6-9)

Y4S2: "Our teacher does not allow us for **discussion and dialogues**. The **dialogue and discussion** are important activities and help students to practically use what they have in their memory". (Line 5-7)

Y4S5: "Up to now we have not used **discussion and dialogue** in the class. **Discussion and dialogues** both helps a lot in the improvement of speaking, and it is an important mean of sharing information with each other". (Line 7-9)

In the students responses to the question; how often their teacher allows them to have a role play in the speaking class, the majority (Y3S1, Y3S2, Y3S3, Y3S4, Y3S5, Y4S3, Y4S5) of them replied that their teacher has never allowed them to have a role play in the speaking class. A few students (Y4S1, Y4S4) replied that they had done role play in the speaking class only once in the last six semesters. Their views about the use of role play in the class were very positive. The majority (Y3S1, Y3S2, Y3S3, Y3S4, Y3S5, Y4S2, Y4S3, Y4S5) of the students, expressed that role play, group work, pair work, debate or discussion provides a chance for the learner to practice speaking. Role play is a technique that provides the learner with a chance to practice daily life conversation i.e. he/she may play the role of a teacher, interpreter, an elder, shopkeeper, journalist, minister or president and when the students talk in the role of these personalities that definitely increase their vocabulary and make them confident. The following excerpts are some of the examples of learners' responses to the question regarding the teacher use of role play in the speaking class and the students' stances towards it.

Y3S5: "To be honest, we did not practice **role play** in the whole semester. **Role-play** is essential in speaking class as it provides students with the opportunity to **play the role** of different

personalities which help students to improve speaking skill". (Line 8-11)

Y4S1: "In the last six semesters, we have once had **role play**. **Role-play**, group work, pair work, a debate or discussion, all these methods provide a chance for the learner to practice speaking. **Role-play** particularly is a technique that provides the learner with a chance to practice daily life conversation, i.e. a teacher may **play the role** of a teacher, interpreter, an elder, shopkeeper, journalist, minister, or president and when we talk in the role of these personalities that definitely increase our vocabulary and make us confident". (Line 28-39)

Y4S5: "Up to now we have not done **role play** in the speaking class. **Role-play** is very important in speaking class as it gives a chance to students to practice the vocabulary of various roles which will definitely help them in the future". (Line 11-13)

The students' responses to the question; how often their teacher allowed them to listen to audio records, the majority (Y3S1, Y3S2, Y4S1, Y4S3, Y4S4, Y4S5) of the students replied that their teacher never provides them with the chance to listen to audio records. However, some (Y3S5, Y4S2) students said that their teacher sometimes allows them to listen to audio records in the speaking class. The majority of the students spoke in favour of listening to audio records in the speaking class. They said that listening to audio records is very important in the speaking class as it helps in the correction of pronunciation and makes them confident in their speaking. Similarly listening to audio records helps them to be familiarized with the accent of native speakers and they will be able to catch them easily. The following excerpts are some of the examples of learners' responses to the question regarding the teacher use of audio records in the speaking class and the students' stances towards it.

Y3S1: "Till now, we have not **listened to audio** records in the class. **Listening to audio** records is very important as it helps in the improvement of speaking skill and pronunciation. Similarly, it helps to be familiarised with the accent of native speakers, and we will be able to catch them easily". (Line 13-16)

Y4S1: "Our teacher has never allowed us to **listen to audio** records. **Listening to audio** records is very important in the class which helps in the correction of pronunciation and makes us confident on our speaking". (Line 40-45)

4.2.2 The Teacher Use of Learning Strategies

Concerning the teacher use of teaching method for the speaking class; the majority (Y3S1, Y3S2, Y3S3, Y4S1, Y4S3, Y4S4, Y4S5) of the students said that teacher uses different approaches, but most of the time he uses the grammar-translation method in the speaking class and gives the students chapters. The teacher usually translates everything from the chapter. The teacher rarely gives the students a chance to practice the dialogues. Similarly, the teacher gives them different topics, and they prepare for those topics in order to work on them in the next class. The following excerpts are some of the examples of learners' responses to the question regarding the teacher use of the method in the speaking class and the students' stances towards it.

Y3S2: "Our teacher usually explains from the chapters and usually works on the expressions. This **method** is very good for speaking class". (Line 16-17)

Y4S1: "In speaking class the teacher use **grammar translation method** and gives us chapters and translate everything from the chapter. He sometimes gives us a chance to practice the dialogues. Similarly, he gives us different topics, and we make preparations for those topics to practice that in the coming class. This **method** is very suitable for reading class. The teacher just gives us the chapter and then translates that chapter for us which has topics and dialogues which he translates it for us". (Line 46-57)

V. DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

The primary objective of the study is to carefully examine the factors that affect the students' speaking skill of Afghan universities especially, at the University of Sayed Jamaluddin Afghani, Kunar. The study investigated the activities and strategies used by the teacher in the speaking class.

Two research questions were used as the basis for this study: 1) what are the activities used by the teacher in the speaking class? 2) what are the strategies used by the teacher in the speaking class? A questionnaire and interview were the primary tools in which data were collected. The data of questionnaire was categorised and analysed quantitatively using SPSS version 20 and the data collected through interviews was qualitatively analysed by giving the thematic description. The simple narrative description was used for the analysis. Based on the research questions the discussion of research finding is presented next.

5.1.1. Research Question One

The first research question in this study is intended to explore the learning activities used by the teacher in the speaking class. The learning activities used by the teacher in the speaking class were identified from the students' responses to the questionnaire and interview protocol. The findings are discussed from the perspective of students' responses.

Table 4.1 in chapter 4, shows that the teacher rarely used speaking activities and strategies to improve the speaking skill of the students and that is probably one of the reasons why students are weak in their speaking skill. The results from the descriptive statistics, frequency and percentage, are presented and discussed next.

5.1.1.1. Teacher Use of Speaking Activities

Studies carried by Harmer (1991), Susanti (2007) and Jianing, (2007) shows that the use of speaking activities like pair work, group work, role play, drama, storytelling, peer interview, presentation etc. help in the learning and improvement of speaking skill. This is because these activities provide the student with a chance to take the initiative of their learning. Research has proven that students who take the initiative of their learning learn better as compare to those who are waiting for something to come from their teachers and wait to be taught (Raja & Saeed, 2012).

Table 4.1 in chapter 4 shows teacher-related factors that affect students speaking skill. It shows that pair work and group work is not the regular part of the teachers' teaching. The teachers sometimes use pair work and group work in the speaking class which was also supported by the students' responses in the interviews. According to Harmer (1991), pair work and group work provide the students with the opportunity to practice in an encouraging and facilitate environment. Group work stimulates the learner's experience of various types of interaction and works in the production of a more relaxed and cooperative classroom atmosphere (Gower, 1987). Similarly, from Table 4.1, it was revealed that teachers rarely use group work (51%), picture description (68.9%), panel discussion (42.2%) role-play (36.7%), drama (36.7%), storytelling (30%), peer interview (47%) and group presentation (45.6) in the speaking class. These responses were supported by the interviews. i.e. "In the whole semester we work in pairs just three or four times" (Y3S1: line 1) and "Sometimes our teacher allows us to work in pairs." (Y4S4: line 1) According to Hismanoglu (2005), the use of drama in EFL class increases creativity, originality, sensitivity, fluency, flexibility, emotional stability cooperation and examination of moral attitudes, while developing communication skills. Drama activities provide students with a variety of contextualised and scaffold activities that gradually involve more participation and more oral language proficiency; they are also non-threatening and much fun (Rieg & Paquette, 2009). The use of drama activities has obvious benefits for language learning. Role play can improve learner's speaking skill in any situation and help the learner to interact (Susanti, 2007). According to Krebt (2017), role plays improve the oral performance of students and prepare them for a situation which improves their speaking abilities. According to Nadia (2013), making students present orally in front of the class is an important technique to improve their oral proficiency. According to Lazaraton (2001), the discussion is perhaps the activity which is mostly used in the speaking skills classes and explains that students are given a topic on which they discuss in pair or group. According to Susanti (2007), picture describing promotes the creativity and imagination of the learners as well as their public speaking skills.

From the literature, it is apparent that speaking activities provide the learners to practice the language and master the speaking skill. However, these activities are missing in the context of this study. English is not the first or second language in Afghanistan, but it is studied as a foreign language. Besides this, the use of English language is insufficient in the province where this research was carried out. This means that the students have minimal opportunities to practice the English language outside of their English-speaking classes. As the classes are the only platform for the students to practice their English language, it is the teacher's responsibility to include speaking activities in the speaking classes.

5.1.1.2 Teacher Use of Learning Strategies

Table 4.2 in chapter 4 reveals that the teacher very rarely allowed the correction of students' mistakes. The teacher never presented pronunciation points. According to Hattie and Timperley (2007), feedback plays an essential role in learning

and achievement. Feedback encourages students that they have done a certain task in the approved manner which directly boosts their motivation (Nunan 1989). According to Oliver, Yeo and Tucker (2012), the central part of a teacher's job is to give feedback on the activities students do to reach the outcomes of learning. Table 4.2 also revealed that the teacher hardly used learner-centred approach and hardly gives time for speaking exercises. This was also revealed in the interview responses. The respondents reflected that the teacher usually uses grammar-translation method in the speaking class "In speaking class the teacher use grammar translation method and gives us chapters and translate everything from the chapter" (Y4S1: line 46) and rarely use communicative approach. According to Samah and Zohra (2015), the best approach for speaking class is the communicative approach. Communicative approach largely focuses on the function, notion, dexterity and fluency. It involves language learning by communication, and that is why it is also called communicative approach. It is believed that by applying this method, students can communicate efficiently. Similarly, the teacher hardly used project-based activities and never used monologues in the speaking class.

Making strategies for classes always have positive effects especially for speaking class. Speaking class involves certain extra activities and requires the teacher to have some strategies and to plan for the class beforehand. However, due to the limited number of teachers (7) at the department of English language, Sayed Jamaluddin Afghani University, the workload of the teachers is very heavy. Each teacher has a full schedule that does not allow the teachers to plan and devise proper strategies for every class especially speaking class. Similarly, the teachers are not supposed to teach one subject permanently but are required to teach a new subject each semester based on the department rules and regulations, which is why the teachers are facing problems to devise plan and strategies for the new classes properly. Likewise, the teachers are unable to implement certain strategies and plans due to the lack of some basic facilities in the classes like a computer, projector, the Internet and so on.

5.2 Conclusions of Discussion on Findings

This study has attempted to explore the teacher-related factors that affect students' speaking skill. To conclude, what have been analysed, presented and discussed in this study are presented next.

The role of a teacher in the learning process of a language is of paramount importance. In order to make students competent speakers of English language, the teacher has to work harder to organise his/her classes. He/she needs to act differently in different situations. He/she must allow students to perform certain activities to facilitate and improve learning of the speaking skill. Based on the findings, regarding teacher-related factors that affect speaking skill of the students, there was some shortcoming on the part of the teachers. Their role was not as active as it should be. They hardly allowed students to work in pairs and groups. They did not quite provide students with the chance to practice role-playing, dialogue, picture description, debate, storytelling and peer interview in the classroom. Similarly, they did not provide students with the chance to listen to audio recording in order to improve their listening

comprehension. These practices affected the students' speaking skill. Likewise, the teacher did not allow students to practice the English language through individual or group presentations and hardly provides the students with helpful pronunciation points to help them improve their speaking skill. Most importantly the teacher hardly used a student-centered approach which is considered an effective approach for teaching especially speaking class. They usually used a grammar-translation method which is not considered an appropriate approach for the speaking class. In the same way, they never provided the students with the chance to practice English through projects, monologues and other activities that could improve the students' speaking skill. Hence, these were some of the factors that affect students' speaking skill on the part of the teacher.

The teachers are unable to use speaking activities and strategies as they have too many classes. There are seven lecturers at the department of English language, Sayed Jamaluddin Afghani University, which is not sufficient for the required number of classes they have in a week. Each teacher has a full schedule of classes, and they could not find free time to devise plans and strategies for the speaking class properly. Similarly, the frequent changes of subjects among the lecturers because of the department policies also make the teachers unable to devise a plan, strategies and proper activities for their classes. Likewise, the teachers' everyday use of grammar-translation method in the speaking class which is not considered useful in the speaking class is another big issue. The students are unable to go along with the teachers when using other methods like direct method which involves the use of the first language. The teachers are compelled to use grammar translation method, which ultimately affects the students' speaking skill.

5.3 Recommendations

Based on the conclusion of discussions on findings, the following recommendations are reached.

As an English language teacher, a teacher must know the kinds of speaking activities and strategies to use in developing students' speaking skill. The teachers should develop and design learning activities and strategies to help students in the learning of speaking skill. The teacher must provide students with opportunities to practice speaking activities and should provide students with strategies and favourable conditions that could improve their speaking skill. It is the teachers' responsibility to provide students with speaking activities like pair work, group work, role-play, dialogues, picture description, debating, storytelling, peer interviews and so on. They should provide students with a chance to listen to audio and video records, in order to improve their listening skill which will ultimately improve their speaking skill. Similarly, it is the teachers' responsibility to plan and design speaking lessons and should motivate and supervise students in learning speaking.

Likewise, a teacher must use an appropriate method of teaching for speaking class. It will be a better choice to use the learner-centred approach in the speaking class as it is considered the best approach for speaking class, which involve students most of the time in the class. The teachers should devise strategies, how to improve students' speaking skill. They should

provide students with pronunciation points in the speaking class to build their English fluency.

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Unveiled Patriarchate Egoism In Current Literature: A Study Of Indonesia's Short Story Writers

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Abstract - this kind of research is qualitative descriptive research. The study is intended to identify, describe, and analyze images of patriarchy in current Indonesian short story writers. The data in this study is qualitative data and the source of the data is current Indonesian short story writers. The purpose of this study is to describe the position of women in the community and the views of the patriarchy male. Studies show the positions of women in patriarchy as reproductive objects, powerless, beneficiaries, sexual desires and easily conjured.

Index Terms - infertility, patriarchy, short story, women

I. INTRODUCTION

Women are human beings classified as multidimensional beings. The topic of women is interesting topic for discuss from any perspective. From subject to biology, psychology, sociology, politics, religion, even in the realm of culture. Women are more objects than subjects. This is because women's lives of ideals, images, stories, and love invariably contain and invite a variety of controversy. Women, on the other hand, were still viewed as members of society, where they were often viewed as small and insignificant. Women are assumed to be weaker creatures than men. Socially and culturally, women and men are distinguished in many ways. The male is considered "more" than the woman and thus gives up an inferior view of the existence of women in the community. Hence, women often exploit society especially by men as the dominant in the patriarchy order (Asmida, 2020:2).

According to Ruthven (in Sofia, 2009:12), the patriarchy is a system that enables men to dominate women in all social relationships. The men inherited a social order where they dominated the power and authority. So social activities are always associated with their actions. Patriarchy gives authority to men in social life, while women have very little influence in society. The patriarchy family provides opportunities for higher education for boys than for girls. Parents usually give their sons high school priority, while daughters are asked at home. So girls have a hard time getting access to knowledge. This system makes it possible for women to obtain employment inferior to men, so that women did not have the capacity when they got married even though they had the same education as men. This is because a woman has the twofold responsibility of caring for her children and a wife who serves her husband at home. This has resulted in gender inequality or inequalities between men and women in various ways.

One reality that takes place in a society packed into other literary products is the society's perspective and the male view of an ideal family endowed with children. Women have been thought of as reproductive objects where women who can't have children are labeled negative by society. Some think of it as a curse, karma, ill will, a lonely life, etcetera. Whereas from the standpoint of men, a woman who could not produce offspring was branded as a woman who had failed.

Infertility becomes a terrifying evil and carries psychological implications. Long absence from a child in marriage would be a problem, for there was confidence that this situation would threaten the integrity of the household. A problem like this or often called infertility involves not only physical health solely but also psychological and social effects on couples affected by it. Women are often associated with infertility compared to men. Therefore it became a reason for men to be polygamous and marry other women only to have offspring of the blood of the unborn.

In some areas within a country, infertility often triggers domestic discord, divorce or exclusion in society (symbolism). Hull and Tukiran (Demartoto, 2008:3) studies of infertility in Indonesia also reinforce the issue. Found that 1) infertile women are more likely to be divorced or polygyny; 2) was stigmatized; 3) infertile women have trouble finding a fullfill role in their community and thus blocking their increasing social mobility; 4) infertile couples spend much time and expense trying to find

"treatment" for their condition; And 5) infertility cases can be a source of "shame" in females who have married. Geertz's study (Demartoto, 2008:3) also shows that women with infertility deserve to be pitied.

Further, Demartoto (2008:3) explains in the context of such a dominant patriarchy culture that bearing is often blamed for women because of its inherent nature of being able to conceive. Whereas reproductive function actually does not belong only to women. Men have the same contribution. By observing such things, it suggests that a case of infertility in a high-gender socio cultural background contains a strong gender bias. Women tended to be blamed in almost all cases of infertility that suffered social and mental pressure on the female function.

This is also the concern of Indonesian cartoons as material objects from his narration. A cartoon has been able to describe how the story of the patriarchy society positioned women. For supporters of the feminist movement, literature as a part of art can be used as a tool for representing that reality and as an instrument of resistance, so it is not surprising that today there is a whole new narrative of resistance to patriarchy in literature (Baharman and Saguni, 2016:143).

II. RESEARCH METHODOLOGY

The design used in this research is qualitative. Researchers describe systematically and theoretically the facts and causal connections of the examined phenomena. Qualitative descriptive research is a qualitative study that offers a range of qualitative information with a scrutinized and nuanced description of a matter, phenomenon, and not limited to data collection but involves analysis and interpretation. The study is intended to identify, describe, and analyze images of patriarchy in current Indonesian short story writers.

The data in this study is a qualitative text of words, phrase, sentence found in the "Ocean of Unborrowed, She Steals" by Sasti Gotama who published by Kompas in 2020, "(Still) Love" by Mohammad Farid Fad who published by Jawa Pos in 2020, short story "What Does Paul McCartney Whisper in Janitra's Ear" by Sasti Gotama who published by Diva Press in 2020 and short story "Siplek" by Oka Rusmini who published by Grasindo in 2012.

III. RESULTS AND DISCUSSION

Wife who do not work and are homemakers are often viewed as helpless and idle women. The husband as the family head and breadwinner should be honored because of his hard work in order to provide for his family. Finally if there is even a moment when a husband is having an affair, there are fears he doesn't feel for himself. She also fears that this will affect her child that he may be unable to receive a more suitable education, sufficient amounts of allowance, a comfortable home, and so on.

Whereas such roles are not limited to gender. That's the result of the social construction of society all along. Women are charged with caring for and caring for the home, raising children, and receiving a living from their husbands. Her husband, on the other hand, was the very figure in charge of providing for their family. There are also circumstances in which the wife helps her husband with his work but also does not reduce the domestic domain of their home, while the husband remains only in his focus and rarely helps his wife with housework. In patriarchy society it is taboo for a husband to help out at home. In the end women are the creatures who have to be everything, be good children, a good wife, a good mother, and an obedient wife.

As in character on Me in the "Ocean of Unborrowed, She Steals" is described as a woman who finally stands helpless at her husband's hand in which she must give up her husband to marry again rather than lose her husband. She also fears that her child will no longer receive a proper education if she is abandoned by her husband in addition to her obedience to religious rules and good deeds that may lead to her becoming even more misguided. For him to do good was not simply to let go of his borrowed clothes without his knowledge by Eka and to understand their actions because of his misery. As in the following quotations.

Unfortunately, I couldn't do the same to my husband. I still need it. Otherwise, luna will never be able to practice the piano or go to international school again, or ride lessons again. So, as long as he's back home, it doesn't matter to me.

The control of the body in women is carried out not only by the patriarchy culture but also as to the doctrine of religion, and the cultural values that are espoused. Understanding religion with a patriarchy lens can give birth to a patriarchy culture that characterizes women always and always under men and men must always and always be above women, that is, in a position of leadership, order, and control, regardless of whether the male is able and qualified. Religious understanding with this lens leads to misrepresentation between male and female and serves as a shield under various circumstances.

"After all, god promises heaven to a wife who is willing to share. And I know you're a good woman." I didn't answer it. Unable. How can I defy what god allows? I remained silent for a few minutes that seemed permanent, and he took that as yes."

In this case the husband of the character of I is would like to remarry to another woman on the pretext that his wife would not tire out taking care of himself, when the causes of the itching my character suffered were caused by the stress of her own husband and the behavior of the servant who frequently borrowed items without her knowledge included her.

It also goes along with the subtitled "What Paul McCartney Whispered In Janitra's Ear", where women too are often positioned in unable to make his choice. Tells of how the mental conflict a mother feels when she is in her position of dilemma. Take care of his daughter or keep his job. Of course, Gupta - as Janitra's husband - wanted Janitra to take care of her daughter and Gupta as a boy to give subsistence.

The conflict occurred when Gupta's work was at the bankruptcy point. At that moment, he blamed Janitra's stopping by reversing the fact that he had never asked Janitra to leave work, only asking him to more specifically take care of his child, Nara. But due to Gupta's harsh treatment, Janitra finally had to put the Kumbang (Janitra's inner emotions) to sleep, even though it didn't work in the end.

In the account, Sasti wanted to convey that the woman was not a male doll; Women are whole men, but the men, who are good at holding grudges, are good at hiding sighing. Yet, men do not feel that way. Sasti represents a strong affirmation, that at certain times a woman's anger is more dangerous than a man's.

A summary of "all things that never happened" (p. 41). The problem is that women are marginalized by the husband. Laskhita as Barata's wife was treated harshly and very difficult to found love.

"God, what's more important? Serve or love yourself, Lord, a farewell is never easy for a woman. People would despise and blame her. She will be judged as a bitch who will not serve her master." (p. 46).

Here comes the contemplation, that Barata's death was something that never happened. And to avoid Barata-the harsh treatment of Laskhita - Barata's own death, because if separated, it was settled with the bitter realities of society's own perceptions.

Then, women often were also identified as able to give offspring. Otherwise, she will be branded a woman who has failed. The psychological burden of a woman's absence of a child is said to be heavier than that of a man for some reason: first, women are more likely to be cornered cause of fertility than men. In an Indonesian family that is not blessed with offspring, women are the first to blame for not being able to provide offspring in her family (Bennett, in Susanti and Nurchayati, 2019:2). Second, women also risk divorce or the loss of a husband who married another woman.

If a wife is indeed unable to produce offspring, the husband is justified as is governed by the 1974 republic of Indonesia's law on marriage chapter 4 verse 2 (c), which reads: "a husband is permitted to have more than one wife when she is unable to produce offspring in her marriage." That is, the psychological burden of married women with no offspring is considerable. Third, cultural pressure, one of which is a different way for unmarried women with children to marry. Geertz (Susanti and Nurchayati, 2019:2) says that the woman who was infertile and thus causing her childless state was to be pity as in the short story "(Still Love)" by Mohammad Farid Fad.

"It's a good thing you know Cinta by now, otherwise" that rotate Mirna can't continue his word.

"You have decide your mind now, Rud. Poor Cinta. Before it's too late."

"But what can I do about it, mir? "I asked.

"First you have to decide where to get married, Rud. If you're going to have to carry on with your legacy, leave Cinta. But if you mean to leave out of romance for the past five years, marry her." Mirna firmly.

The above dialogue shows that women with infertility problems deserve pity and that the man who marry the infertile woman is unlucky. In patriarchy it is an obligation to have offspring and if one does not have one, then the family is labeled as unhappy.

But how could Cinta have a child. While Mirna and I, who are both medically fertile, have had no children for seven years.

I don't know, I just let it go. To fate that knows no if. In life, there always seems to be events that are not meant to be understood.

Eventually Rudi did not marry Cinta and chose to marry her friend, Mirna. But even after seven years of marriage, they weren't given a child. It is evident that the male's success in being able to "impregnate" his mate may be viewed as a feat of might. But if the pregnancy does not materialize, then the blame and everything goes to women (wife). Even in some traditional tribes, women (wife) who were unable to provide children were often viewed as maledictions and were to be banished or ostracized. If a wife is able to provide a child to her partner, she does not escape cultural exploitation. The wife must quickly clean herself up to serve her husband by drinking herbs, medicine and the like, all down to her devotion to her husband and to the dissolution of the family (Demartoto, 2008:18).

In the context of such a dominant patriarchate culture, when sterility is often blamed for women because of its inherent nature of being able to conceive. Whereas reproductive function actually does not belong only to women. Men have the same contribution. Ironically, it is also thought that women should be diligent in their treatment. This can be seen from offers of

alternative medicine in various media that are being widely directed at women. While alternative medicine offered to men always leads to a solution to virility and manhood.

In the past when medical science was not developing as it is now, the case of infertility was thought to be only female. As medical science has progressed it has been discovered that men too have the potential for infertility that if their wives are fertile, they will still produce no offspring. The problem is, though, social construction is so strong that even today many families who have not yet had children will be inclined to blame their wife.

A different matter is that of a "Sipleg" in a short story collection by Oka Rusmini "Pule Roots" where Ni Luh Songi is trapped because of her husband's ambition to have a baby boy. Sipleg speaks of the past as his mother. Songi was unable to bear a son, all the children she bore were girls. I Wayan Sager, her husband, considered all the bad luck that had happened to her because Songi was unable to bear a son. The presence of boys was highly important because only boys could carry on offspring. It caused Songi to suffer. To follow her husband's ambition, Songi remained pregnant until her womb was damaged and otherwise unable to conceive. In this case women are seriously harmed. A woman who should have felt happiness in marriage had to let go of her womb for being so obedient to her husband. Being a demanding husband and never supporting a wife, sager was considered an irresponsible male, whereas songi's obedience to her husband cost him dearly for the damages of her uterus (Umniah, 2018:164).

Women's freedom is contained in cultural norms and systems of patriarchy. *First*, the productive or labor of women. Men control female productivity both inside and outside of household affairs. *Second*, men also control the reproductive power of women. In many cases in society, women do not have the freedom to determine the number of children they want, and the time to bear children. *Third*, male control also applies to female sexuality. Women are required to provide sexual services to men in accord with the male's wishes and needs. *Fourth*, women's motion is controlled to control their sexuality, production, and reproduction. *Fifth*, male also control other economic property and resources with the pathways of the inheritance system from male to male. Ni Luh Songi is considered to be women of restraint because of the patriarchy system without the right to control its reproductive power.

IV. CONCLUSION

Whereas such roles are not limited to gender. That's the result of the social construction of society all along. Women are charged with caring for and caring for the home, raising children, and receiving a living from their husbands. Her husband, on the other hand, was the very figure in charge of providing for their family. There are also circumstances in which the wife helps her husband with his work but also does not reduce the domestic domain of their home, while the husband remains only in his focus and rarely helps his wife with housework. In patriaki society it is taboo for a husband to help out at home. In the end women are the creatures who have to be everything, be good children, a good wife, a good mother, and an obedient wife.

Furthermore, the psychological burden of women resulting from a lack of children is said to be heavier than that of men for some reason: first, women are more likely to be cornered as cause of sterility than men. Second, women also risk divorce or the loss of a husband who marries another woman. Third, cultural pressure, one of which is a different way for unmarried women with children to marry. Women with infertility problems deserve to feel pitied, and men who marry infertile women are unfortunate. In patriarchy it is an obligation to have offspring and if one does not have one, then the family is labeled as unhappy.

In the context of such a dominant patriarchate culture, the often blamed of infertility are women because of its inherent nature of being able to conceive. Whereas reproductive function actually does not belong only to women. Men have the same contribution.

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The Nascence of Social Work Education in Somalia: Challenges, Opportunities, and the Way Forward

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Abstract: From clan-based politics in the years leading to independence to clan-shaped legislature and clan-oriented cabinets in the civilian governments following independence, military dictatorship and malfeasance dominated 1970s and 1980s Somalia. Early in 1991, the country became swamped in a clan-based civil war that crumbled state structures and the public services they provided. The ensuing lawlessness increased monumentally, making violence and abuse against women, children, minorities, and the vulnerable among the society very rampant. Social workers, in other words professionally trained people who could steer the provision of the crucially needed social services to the vulnerable ones among the society, most of whom were psychologically traumatized in one way or the other, either did not exist in the country or were barely known about. As the state of neglect became a major concern, UNICEF, the Ministry of Women and Human Rights Development of the Federal Government of Somalia, in conjunction with the Swedish government, created a platform to address the conundrum by contracting six selected universities in Somaliland, Puntland and Mogadishu in 2018 to start training the first batch of Somali social workers in certificate and diploma programs that culminated into a 4-year bachelor's degree study. From this background, this essay aims to contribute to the existing literature on social work by discussing the introduction of formal social work education in Somalia.

Index terms: Social Work Education, Social Work Practice, Social Work Profession, Somalia

I. Introduction

A General Overview of Social Work

Although every community had its own means of providing services to help individuals or groups among its members in times of difficulty, social work has become recognized as a credible profession for the provision of crucial social services during the past century or so. Passing through different stages, social work has developed in scope, practice, and performance, expanding both its depth and breadth academically and professionally. The expansion has reached the African continent as many vocational professional schools and higher learning institutions established various levels of programs offering qualifications from stand-alone professional certificates and diplomas to bachelors and master's degrees, although none of the institutions in the East African Community zone had a PhD program in their social work study by 2017, according to Spitzer (2019:571).

Chronicling a review of available literature on social work, Bhatt and Sanyaal (2019), whose work the current study invokes along with that of Umoren (2016), dispense a revelation of the development of the profession from its early days to the present. Their classification of the developmental stages of social work gives the reader an understanding of the ideological framework guiding the practice of the profession each at its own time and by its definition. According to Bhatt and Sanyaal (2019:6), the earliest philosophy of social work was shaped by its definition as a "charity or philanthropic" movement. During this early period of social work, from 1915 to 1940, "The entire focus was on curing a social disorder and changing human attitudes. Therefore, a more curative, charitable, philanthropic attitude for help was seen as social service and social welfare," (Bhatt and Sanyaal, p. 9).

As the profession moved into its second phase, 1941-1965, its definition has taken a different feature that interpreted it as a “welfare model”. It was in their discussion on the trends of social work in the 2nd phase of its history that Bhatt and Sanyaal interpolate how “the concept of social security, economic well-being and standard of living” emerged to be the central theme of the profession. In the same vein of thought, Witmer (1942) believed that the principal duty of social work was the provision of “assistance to individuals in regard to the difficulties they encounter in their use of an organized groups service or in their performance as a member of an organized group.”

The currency of the ideological dispensation of social work during the second phase since its emergence as a formal professional entity can be carefully gleaned from Gisela Konopka’s description. In her volume *Eduard C. Lindeman and Social Work Philosophy*, the second part of which discusses the values of social work from approximately 1920 to 1953, Konopka elaborates:

Social work is an entity representing three clearly distinguished but inter-related parts: a network of social services, carefully developed methods and processes and social policy expressed through social institutions and individuals. All three are based on a view of human beings, their interrelationships, and the ethical demands made on them. (Konopka, 1958:83)

Thus from 1966 to 1990, Bhatt and Sanyaal note that social work has framed itself in the “development phase”. Their presentation is reflective of the currency of the definitions and interpretations scholars and experts have attributed to the field. For instance, Moorthy and Rao (1970, cited in Bhatt & Sanyaal 2019:12) comment on social work as: “help rendered to any person or group, who is suffering from any disability, mental, physical, emotional or moral, so that the individual or group so helped is enabled to help himself or itself.”

Incubation of the Social Work Profession in Somalia

Similar to other African countries, I intend to place the practice of social work in Somalia well prior to the arrival of European colonialism or spread of Islam into the country. Indeed, the cultural practice, tradition, and customary institutions all provide a long history of social cohesiveness—call it family- or extended family-based work, tribal group work, clan or kin-based work, or just any other form of communal work done to contribute to the well-being of either an individual or a family or any group in need of the service concerned. I also take the opportunity to illuminate in this thesis of limited scope that while some of these services were paid for and purchased in one way or the other, similar to today’s provision of professional social work service, others were offered selflessly and purely on the basis of philanthropy and self-help, as was mentioned elsewhere by Ahmed (1995, 1996) and Eno (2008).

Caring for one another, in many cases without consideration of or regard to tribal, social or kinship background, represents the common traditional practice of the Somalis (Eno 2008; C. C. Ahmed 1995, A. J. Ahmed 1995, 1996). But with disregard to all these attributes, Lewis (1994), and about a decade later Kapteijns (2013), and a section of Western scholars calibrate the Somali society mainly on the basis of the horrendous situation of instability that engulfed the country and haunted it since the civil war. In fact, while the two preceding sentences represent the sharp contrast prevalent among the views of Somalist scholars, I note in my polite argument that the devastation which the country had experienced did neither significantly compromise nor fade away the Somali’s more sacrosanct humanistic philosophy, the reality of voluntarism, the selflessness and/or moral-based provision of services.

To present my argument more effectively, the community-based organization of activities among neighbors from different kinships and clan entities, transportation of the sick and the wounded to the medical facilities (Gargaar Newsletter 2015), accommodating strangers into a safe haven and within the ‘supposedly enemy family’, the caring for orphans and children strayed from their homes and parents during the escape from bombardment, all (but to name just a mere few) respond to the compassionate attributes of the Somali society and the cultural values sustained over the years—both in peacetime and wartime. Therefore, unlike the pessimistic view of the colonial writers mentioned above and other Western scholars of the same thought, the Somali people have neither abandoned the provision of social services to the needy nor have they become deprived of their hope and optimism for both the present and the future. However, finally, those years of traditionally oriented social service provision, and the need for coordinated social work education culminated into the robust action that paved the way for Somalia’s recent endeavor towards the professionalization of social work.

II. LITERATURE REVIEW

Brief on Social Work from an African Perspective

A section of African and foreign scholars associates the origination of social work in Africa with the arrival of colonialism in the continent. They write on how social work was introduced to tackle the various problems colonialism and its agents had brought to the continent (Mabeyo 2014; Muridzo et al 2021). According to this view, the general portrayal of the origination of social service itself is referred to as a practice that has been emulated from western countries in the 1900s (Mupedziswa 2020; Muridzo et al 2021). However, I concur with Umoren’s discussion problematizing social work from the perspective of its “informal” (if we may call it so), non-professional practice among the African communities that exercised/practiced aspects of social work within their communal structures, cultures, and traditions while following their indigenous approach to the delivery of social service.

To provide a more appealing description, Umoren (2016) conjoins the African and the European paradigms of social work in the continent while attributing the origination or existence of social work practice in Africa right to the African people. According to Umoren, the indigenous African's philosophy of social and communal practice was effectively in place prior to the European venture to conquer the continent while the latter is acknowledged for introducing the systematized feature of social work as scholarship and as a profession with a work ethic conducive to the contemporary time. Umoren's analysis supports that of Singh (2015) that people or communities anywhere always operated within the spirit and experience of social work before the practice was developed into its current scientific approach towards the end of 19th century. Hence, Umoren (p. 191) aptly pays each of the European and the African endeavor its rightful place by admitting: "The missionaries, other African mutual aid organizations, in partnership with Europe and other parts of the world came up with various activities that led to the colonization of the continent by external powers there by (sic) contributing to social work development on the continent."

Umoren (2016:192), paraphrasing Darkwa (2007), acknowledges that beyond their intervention in areas of religious proselytization, capacity and skills building of the African community, "the missionaries also projected, to a substantial level, an informal display of official responsibility in areas of service delivery and social work interventions—thus functioning as informal social workers." In a comparative view acknowledging the African perspective to social work, Umoren (p. 192) elucidates, "Family members accessed services from various mutual aid societies prior to the development of statutory welfare system." In this indigenous system, social work was implemented for the benefit of society, its welfare and well-being, where participation was often a "family" affair or a "kin-based" activity. Wairire (2014:94) brilliantly discusses the indigenous form of social work in the Kenyan context as follows:

In pre-colonial times, social support mechanisms in Kenya were embedded in the sociocultural practices of different communities. Social responsibilities were clearly defined for different community members through traditional socialization. Individuals with different needs requiring social interventions were, therefore, helped at the community and individual levels. ... household heads and village elders served many of the roles which modern social workers play today, particularly with regard to the enhancement of the social functioning of individuals in the society. Heads and mentors of age groups locally known as *rika* equally played significant roles that helped an individual or group to manage problems of living"

Despite the opinion attributing the coming of social work practice in Africa to simply the European arrival for colonialism; we need first and foremost to critically problematize the definition of social work and the scope of its practice regarding the African continent. Doing so will help us come to a basic understanding of what was and still is real of social work practice in Africa. Linda Kreitzer (2016) in her review of the book *Professional Social Work in East Africa: Towards Social Development, Poverty Reduction and Gender Equality*, denotes the contribution of both pre-colonial and post-colonial period by writing:

From clan and kinship networks of pre-colonial Africa, to the introduction of colonial social welfare institutions and to the post-independence struggles to offer social support to the continent, social work is a product of these influences and much more. In fact, today, social work is coming into its own on the African continent. (Available at: <https://www.ifsw.org/professional-social-work-in-east-africa/>)

A close analysis of available literature, as outlined above, permits us to distinguish between various factors that seem to have been taken for granted without really committing them to critical scrutiny—such as that of social work coming to Africa only at the wake of European missionaries and/or in the advent of colonialism. However, there is less dispute over the fact that the different trends the profession has taken during the past century elucidates "the changing patterns of ideology in the practice of the profession," to invoke Bhatt and Sanyaal (2019:6).

Cohesiveness of Somali Society

The spirit of Somali social cohesiveness stays alive—albeit the testing times of war and devastation. None has expressed this culture of cohesiveness better than Somali scholar and poet, Ali Jimale Ahmed of Queens College, and the Graduate School of City University of New York. Using versification as one among the several of his media of communication, Ahmed comments on this unique kind of national cohesion as a representation—

"... of a new mix, the splash of/ Colors, a mishmash of totems where/ The rooster mummy and the serpent mummy/ And the scorpion mummy and the skeletal crab/ Coalesce/ The convergence ushering in the era of a new totem/ With the body of a camel, the horns of a bull/ The udders of a cow, hooves of a horse, the/ Mane of a lion, the beard of a goat, the gull of a fish/ And the contours of red earth embroidered/ With fresh stem from galool berde yicib yaaq beeyo/ Murcood gob qare galley misego waambe qamadi/ Sarmaan shilan foodcad masaarojabis/ Isku dume, Isu dume, Molder of nations, where are you?— (Ali Jimale Ahmed 2012:17 [a further analysis of the poem is underway in a forthcoming volume one of the authors, Mohamed Eno, is coauthoring with Prof. Danson S. Kahyana of the Department of Literature at Makerere University]).

III. METHODOLOGY

This study uses observation as a data collection method. Data were collected during the 2021 Social Work Annual Review Meeting held in Mogadishu from 12 December to 14 December 2021. The participants consisted of stakeholders from the Ministry of

Women & Human Rights Development (MOW&HRD) of the Federal Somalia Government, the Ministry of Women Development and Family Affairs of the Regional Administration of Puntland, the Ministry of Employment, Social Affairs and Family of the Administration of Somaliland, UNICEF, universities offering the 4-year Bachelor Program, higher learning institutions from different Federal Member States, Ministries of Women & Human Rights Development from Federal Member States, selected local NGOs actively engaged in child protection (CP) as well as a selected number of beneficiary students of the social work education program. Data include notes taken by one of the authors (M. Eno) during the various sessions of the 3-day meeting where speakers dissected the challenges, lessons learnt and issues on the way forward. The study invokes discursive analysis by extracting various quotations selected from the presenters' speech discussants' view points as well as relevant opinions provided by other participants.

IV. Findings and Discussion

Collaborative Response

Social work, in its formal setting as a discipline in higher education and as a profession, came to birth in Somalia under the auspices of UNICEF, the Ministry of Women and Human Development of the Federal Government of Somalia and the Swedish government. It was therefore a coordinated collaborative initiative aimed at training and producing the first cluster of academically qualified young Somali men and women. The concept was built on the provision of world class education and professional potential to the trainees in order for them to spearhead a systematic implementation of a real-world social work practice.

At the preliminary piloting stage of the program, the joint effort of the government of Sweden and UNICEF, through the Ministry of Women and Human Development of the Federal Government of Somalia, "sponsored the first batch of Somali students in the Central and South-central regions to be professionally trained in the social work discipline and as the pioneering social workers" a social work lecturer stated. Dean of the College of Social Sciences and Humanities of the University of Hargeisa politely corrected by adding: "...although the University of Hargeisa in Somaliland, in spite of being one the implementing institutions, had in earlier years established its Department of Social Work." Six higher learning institutions including "three universities in the capital Mogadishu, two in Puntland and one in Somaliland were assigned to provide the training," according to an official of the MOW&HRD of the FRS. "Consultants hired from overseas with high expertise in Social Work education designed Somalia's first social work curriculum with careful consideration of cultural and religious aspects of the Somali society," the official from the MOW&HRD of the FRS stated. Inaugurated in 2018, the program is expected to graduate the first batch with a Bachelor of Social Work Degree around mid this year (2022).

Notwithstanding the urgency and sponsorship, almost all the chosen institutions embarked on delivering the new study without specialized faculty with qualifications in the social work discipline. However, they overcame the hurdles along the way with the expertise they had gained over the years in the higher education sector and the fact that "social work education," like other interdisciplinary or multi-disciplinary studies, borrows substantially from "other departments..." and fields of study—both in the social sciences and in the humanities, a participant submitted. Moreover, collegiality among the pioneering faculty, support from university administration, consultation with and monitoring by the Ministry of Women and Human Rights Development as well as a "constructive evaluation" of the program progress by UNICEF, not to undermine "motivation of the young talents undergoing the training," all contributed to illuminating the dark spots at the end of the tunnel and the shimmers of success realized, according to one of the participant lecturers.

Challenges of Social Work in Somalia

Social work is at its earliest stage in Somalia, a fact which can be based on the reality that as I write this paper "...the first intake of 2018 for the Bachelor of Social Work program has not yet graduated," though very close to the exit point, as was elaborated by a MOW&HRD official. Among the most crucial factors of the program is that of the orientation of the job market. From this perspective, "employability" is at the core of the profession as "after graduation the young professionals expect to climb up the ranks of professionalism," according to a female SW undergraduate. This is a tough task in several folds. First, social work is a new profession whose benefits a majority of the Somali society is not yet much aware of. Therefore, an avenue for a massive "awareness exercise needs to be implemented," a participant stated, in order to showcase the indispensability of the service of the newly graduated social workers.

Second, to embark on the fulfillment of the broader social work mission, the preliminary considerations of the actors and stakeholders must include "supporting the young graduates and acknowledging the need for their expertise and services," opined an eloquent undergraduate student representing one of the course-offering universities. The third point calibrates the issue from another perspective—that of a steady mind. A steadily growing conscious mind is that which observes critically and functions towards the delivery of good quality service—and that of the social worker is not an exception. Because the social problems social workers confront so daringly and attempt to resolve everyday are too many and more often than not complex in their nature. Therefore, "These young professionals need a decent employment of good middle-class income level—to say the least," emphasized the Executive President of the University of Southern Somalia. The fourth factor is the assumption that with all these considerations come the undeniable benefit of increased motivation, dedication, and amelioration of the quality of service provided—thus assurance of best practices.

The preservation of the professional social worker's dignity, therefore, needs to be thought of with a high regard. Allowing the social work profession to be approached with the disdain that marred Somalia's teaching profession (Eno 2018:81) will lead to the drastic failure of the delivery of the anticipated professional service. Furthermore, it will lead to the deterioration of the best practices as well as undermine dealing effectively with the social ills social work is sanctified to fight. The unfortunate impact of such a disdainful policy and practice will result in a brain-drain whereby the trained professionals will either abandon the profession for better paying jobs available in the local market or, worse still, leave the country and contribute their expertise to another country.

Streamlining an effective social work profession and the social services it provides depend on not only the adoption of a well-designed curriculum of study but the implementation of a sound strategic plan that renders sustainability of the overall goal of the program, including retention of the social workers. In economic, academic and professional terms, to name just a few examples, retaining those who have been trained, learning from what has been achieved, and addressing emerging problems promptly stand to be factors that deserve optimal consideration. A strategic policy, stakeholders' unreserved participation coupled with collective responsibility are needed to make the program successful. Learning from the experiences gained and lessons learned are factors paramount to the sustainability of the social work project and its practice professionally. Relatively, expanding social work education to other regional/state administrations and the appropriate strategy to follow pose another challenge the sponsors have to factor in (a separate study on the inception of Social Work Education in the Southwest State of Somalia is underway).

Nurturing the Social Work Profession: Towards a Promising Prospect

Professional social work means a people with a sound knowledge base, people who are well trained both in practice and theory, people who have a well-defined code of ethics, and people with a well-defined area of social responsibility. — (Wairire, 2021).

Aside from the trials and tribulations in the delivery of social services and particularly in social work practice, the prospect of social work in Somalia is very bright. From being an unknown or a little known about profession, several states/regions in Somalia currently have the pride of producing and qualifying well trained social workers ready to take over their professional leadership in their field of specialization. This ascertains that social work, when joined by young men and women academically equipped with basic and professional knowledge, has never had a better outlook in this war-ravaged nation. However, does that really end the need for more social workers? Or, said differently, can the acquisition of a bachelor's degree be the ultimate satisfaction/goal of a professional social worker operating in an ever-growing field with increasing demands? These questions tend to prefigure the possible challenges the profession is facing that need to be focused on by the stakeholders.

The aspirants willing to select and develop a career in social work deserve more insightful consideration. A more carefully approached training will help them enjoy a better learning environment and therefore a better quality of learning and professional growth. To solidify the foundation of the profession and its best practice, though, faculty with higher learning degrees at Master and PhD levels are the suitable workforce that can maintain the quality in question here. In other words, a Bachelor of Social Work, taught mainly by specialists in non-social work subjects and/or lecturers who themselves hold only a Bachelor's Degrees from other departments, neither promises the continuity of a quality social work program, nor produces a well-cultivated professional with critical outlook of his/her profession.

That said, furthering the social worker's or social work student's experience from traditional classroom or lecture hall interactivity to that of field experience, inquiry into cases or case studies and research in general will flourish the sophistication and academic prowess of the social work practitioner. In addition to all the above, accessibility to professional conferences, seminars and workshops by senior experts in the field are necessary for continuous professional development purposes. Here, I am referring to a reflective kind of learning, one that covers "the gamut from education through to professional training," as Watts (2020:2) puts it. Hence continuing professional development (CPD), "as an *ongoing and recursive process* that takes place throughout one's professional life," is so indispensable (italics as in the original). Opportunities for participating in CPDs address the "need for practitioners to continually update skills throughout their professional lives," (Devaney 2015:2) and gives "considerable pay-off for service users," (p. 4). Continuing Professional Development, according to the frequently cited definition by Madden and Mitchell (1993: 3), enriches professional practice because it articulates:

the maintenance and enhancement of knowledge, expertise and competence of professionals throughout their careers according to a formulated plan with regards to the needs of the professional, the employer, the profession and society.

Need for a Regulatory Body

Social expectation of social workers is one of professionalism, practitioners who are humanistic, empathetic, and sympathetic; people who can operate under extremely stressful and critically difficult situations. Therefore, social workers' encounter and interaction with vulnerable clients in need of multifarious approaches to treatment and wellbeing demands not just knowledge per se but a professional experience beyond training. More than anything else, it requires responsibility which comes with a sense of accountability to the clients and to the social work profession they belong to and are part of.

However, social work education and the social work profession are a new arrival to the Somali society. Unlike professionals and practitioners in the legal or medical occupations, which are among the earliest established trades in the country, social work education is just making its debut and growing into its 4th year as a degree offering program of study. This new endeavor or rather 'birth' makes social work the youngest profession to join the Somali job market soon as the students trained under the first 4-year academic program are expected to graduate in a few months' time (mid 2022).

To a great deal, therefore, the upcoming social work professionals and practitioners are expected to gain respect, recognition of their service and place in society, and the dignity they duly deserve. Therefore, like other professionals, social workers are expected to follow ethical principles that make them accountable for any professional misconduct, breach of ethics or confidentiality between them and their clients. But a caveat needs to be put in order here: that of the absence of a professional body, an association to oversee the Somali social worker's performance, attitude toward his/her clients, peers, profession and the society. An undesirable performance in a *laissez-faire* kind of practice runs a considerable risk of damaging the reputation and decorousness of the young profession, thus leading to loss of trust and therefore of credibility.

In order to establish and maintain credibility of the profession and society's good faith in it, an all-inclusive, legitimately created organization or association that provides oversight, designs ethical standards, and pursues compliance by its members is required as a necessary step. Through this approach, compliance and quality assurance measures for the social work professional will usher in adherence to ethics with a sense of accountability. To achieve the goal, related knowledge-base as well as expertise to move forward can be gained from already existing schools and professional bodies in the East Africa Region, institutions that have pioneered best practice in social work and have gained a considerable stretch of success over the years. The establishment of such an oversight body is also necessitated by the rationale that when all the ideals related to the social work profession are in one way or the other achieved, it remains the sole responsibility of the social workers to be steadfast in asserting their professional etiquette, values, ethics, and best practices. Without an oversight institution, the professional fabric will be like loosely-knit threads unable to hold together.

V. CONCLUSION

The inception of the social work education in Somalia aims to address the need for trained professionals who can deliver the required social work services. Expected to improve social services in child protection, gender abuse, counseling, poverty alleviation, and mental illness to access to social justice, the practice of social workers has never been more demanding. However, all the input made to the project may not yield fruits if the professional social workers cannot access decent jobs relevant to their training and practice. Likewise, the young social work professionals will not experience professional growth in an environment where either higher degree studies or continuous professional development programs are inaccessible and may therefore create early fossilization of the social worker, demotivation and migration from the profession and/or practice. For the profession to remain fostering and attractive, stakeholders can capitalize on the good initiatives taken so far and work on establishing a professional body that guides and oversees the professional performance of the social workers as well as caters for their concerns.

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Extraction of Virgin Coconut Oil from Dehydrated Coconut Meat using Mechanical Screw Press

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Abstract- Virgin coconut oil is becoming more widely known and used as a beneficial food oil. VCO is the purest form of coconut oil which is water like white in color. It is high in antioxidants (vitamin E) which help to prevent the peroxidation reaction. Mechanical screw press methods are used to extract virgin coconut oil in this study because the mechanical extraction is a greener and healthier way of manufacturing oil due to there are no solvent (chemical) residues in the oil. Small quantities of oil were required for analysis in the laboratory, hence it is desirable that a screw press that can be efficiently handle small amount of oil-seed/nut was provided. The VCO was obtained by pressing the best dehydrated coconut meat using a mechanical screw press at different temperatures (75°C, 85°C, 95°C, 105°C, 115°C) and different duration (15 min, 30 min, 45 min, 60 min, 75 min). Response surface methodology (Design Expert Version 12) was used to optimize the extraction conditions at five-level, two-variable using central composite rotatable design (CCRD). Maximum oil yield and antioxidant activity of VCO were obtained at 95°C for 75 min of extraction conditions.

Index Terms- Virgin coconut oil, Mechanical screw press, Dehydrated coconut meat, Response surface methodology, CCRD, Oil yield, Antioxidant activity. Sustainability.

I. INTRODUCTION

Coconut (*Cocos nucifera L.*) is the familiar fruit or superfood for human (Sangamithra et al., 2013). Coconut fruit with the age of 11-12 months is suitable for harvesting because of the highest oil content (Balleza and Sierra, 1976). VCO is a high demand for value added products of coconut great culinary, medicinal, cosmetic and industrial application. Promoting the value-added products through national and global level develop new products can increase the income (Asghar et al., 2020).

Oil that is extracted from fresh or dried meat (mature kernel) of coconut by mechanical or natural means, with or without the use of heat and without refining process is known as virgin coconut oil (VCO) or natural organic coconut oil. VCO has natural fresh aroma and taste of coconut, absence of high temperature and chemical treatment makes it tasty and healthy (Yunus, 2014). Virgin coconut oil (VCO) is growing in popularity as functional food oil and the public awareness of it is increasing. Virgin coconut oil can be consumed in its natural state without the need for further processing (Rajagopal and Rajeev, 2017).

VCO is effective in preventing the peroxidation of lipid and increase the level of antioxidant enzymes (Nevin and Rajamohan, 2010). VCO serves as a nutritional food supplement, unique, abundant antimicrobial properties (Villariba, 2004). The benefits of VCO is to maintain blood sugar level, to control cholesterol level, to reduce the risk of chronic disease, to accelerate metabolism, to help balance hormones, to prevent cardiovascular and Alzheimer's disease (Shijina et al., 2016).

There are edible and inedible applications in VCO. It serves as an important source of energy in diet (Bawalan and Chapman, 2006). It can be taken by mixing with warm food or drink. It can be used as substitute for butter and margarine, cooking and frying oil to enhance the flavor of food (Gerard et al., 2016). It can also be used as a skin and hair conditioner (Bawalan, 2011), an aromatherapy and massage oils (Songkro et al., 2010).

VCO can be extracted from various methods like solvent extraction method, dry method and wet methods (Marina et al., 2009). The use of solvents for oil recovery has several drawbacks such as high safety hazard, high-energy input, low quality oil, environmental risk and low quality meal (Bhosle and Subramanian, 2005). In wet method, oil is extracted through coconut milk by heating and non-heating processes (Ravindra and Bosco, 2017). In dry methods, the kernel is dried to remove moisture in it preventing scorching and microbial invasion (Raghavendra, 2010).

Among them, mechanical method was a preferred method to extract virgin coconut oil. Mechanical extraction involves the application of pressure (using hydraulic or screw presses) to force oil out of an oil-bearing material (Arisanu, 2013). The screw press method involves the removal of the kernel test, by roasting in air over fire, and conveying the decorticated material through a small opening by the screw mechanisms. As the material is being conveyed, it is milled; the small opening at the exit presses the meal, releasing the cake while oil drains off. The oil and meal will be obtained by this method are of high quality, fit for both human and animal consumption (Ademola et al., 2004). The advantages of mechanical oil extraction include simple use, rapid realization of the process and that leads to the short duration of the process, use of small quantities of raw materials, application of different oilseeds and low cost. Also as a by-product protein rich press cake is obtained (Singh and Bargale, 2000).

Response surface methodology is a collection of mathematical and statistical techniques that are useful for modeling and analyzing of problems in which a response of interest is influenced by several variables and the objective is to optimize this response (Montgomery, 1997; Noordin et al., 2004). RSM is commonly used in food process engineering domain due to its advantages of relatively easy to be established, clear on parameter sensitivity (Jin, Chen, & Simpson, 2001).

Temperature plays a crucial role when the screw press is used for nut oil extraction (Adrián et al., 2018). The higher temperature accelerates the reaction rates of oxidation and the more trans-fat is generated (Song et al., 2015). Seneviratne et al., 2008 also concluded that the possibility of slight heat employed in other processing methods may enhance antioxidant activity, but excess heat will lead to reduction in antioxidant activity as observed by oil sample. The retention of antioxidant compounds may provide mechanical screw press oil with acceptable oxidative stability and better health properties (Parry, 2006). Yield is generally one of the prime parameters in VCO extraction. Both yield and quality of VCO could be affected by several factors, both intrinsic and extrinsic ones (Umesh patil et al., 2016).

II. MATERIALS AND METHODS

2.1 Experimental Site and Periods

The experiment was conducted at the laboratory of Department of Postharvest Technology, ACARE, Yezin Agricultural University, Nay Pyi Taw from December 2021 to March 2022.

2.2 Sources of Raw Materials

The dehydrated coconut meat which optimum drying conditions (70°C and 6 h) was used to extract virgin coconut oil. 350 g of dehydrated coconut sample were used for each treatment.

2.3 Statistical Analysis

Response surface methodology (Design Expert Version 12) was used to optimize the processing conditions at five-level, two-variable using central composite rotatable design (CCRD) (DC Montgomery, 2005). These treatments were carried out with thirteen experiments of CCRD design. The treatment combination of different pressing temperature (75°C, 85°C, 95°C, 105°C, 115°C) and pressing duration (15 min, 30 min, 45 min, 60 min, 75 min) were operated by using mechanical screw press to optimize the virgin coconut oil.

2.4 Experimental Design

The variables were used to pressing temperature (°C, X_1), pressing duration (min, X_2) and oil yield (%), antioxidant activity (%), oil recovery (%), residual fat (%) were selected as the responses. The adequacy of each model was determined by evaluating the lack of fit and the coefficient of determination (R^2). The significance of each coefficient was determined by using F-test obtained from the analysis of variance (ANOVA) that was generated. Regression coefficients were then used to generate response surfaces. 3D response surface graph for predicted value and variable was plotted using the Design Expert 12 software. Thirteen experiments were performed which consisted of two factorial points, two extra points (star points) and five replicates for the center point in Table 2.1. The five replicates for the center point were used to estimate the experimental error.

2.5 Analytical Methods

Oil yield was determined by (AOAC, 2007) method. (350) g of coconut slices was used in each run of different pressing temperature and duration using mechanical screw press machine. Before pressing, this machine was needed to warm for preheat about 8 minutes or more temperature was controlled by using SET Key. After the motor was starting, the dehydrated coconut slices were added in the hopper for pressing. While the pressing was continued, the pressing chamber out of the oil has been dropped.

$$\text{Oil Yield (\%)} = \frac{\text{Mass of Oil}}{\text{Mass of Sample Used}} \times 100$$

Antioxidant activity was measured by (Genwali et al., 2013) method. 0.1 mM DPPH solution was prepared by dissolving 3.9 mg of DPPH with 100 ml ethanol in amber volumetric flask and stirred with 700 rpm for 30 min at room temperature. A control solution was prepared by mixing 4 ml methanol and 1 ml 0.1 mM DPPH solution. The control solution was shaken well and kept in the dark place for 30 min at room temperature. For sample analysis, 1 ml of the extracted sample was mixed with 4 ml of methanol. Then, 1 ml of 0.1 mM of DPPH solution was added to the solution and the mixture was shaken vigorously. The mixture was maintained in the dark place for 30 minutes at room temperature. The absorbance was measured at 517 nm using UV spectrophotometer (Shimadzu Inc., Kyoto, Japan).

$$\%RSA = \frac{A \text{ control} - A \text{ vco}}{A \text{ control}} \times 100$$

Residual fat content was determined by solvent extraction method (AOAC, 2003) and using Randall apparatus (VELP SCIENTIFICA SER 158 solvent auto extractor). 7 g of coconut sample was weighed and then placed in thimble. Cotton was blocked at the top of the thimble. 100 ml of n-hexane was added in each glass cap. They were placed in fat extractor stand for 2.45 h. These fat sample were evaporated at ambient temperature until 24 hr. Then, these were placed in hot air oven at 105° C for 1 hr and cooled in desiccator for 1 hr. Extraction time was completely finished until reach to constant weight.

$$\text{Fat Content (\%)} = \frac{\text{Weight of fat Cap} - \text{Weight of Empty Cap}}{\text{Weight of sample}} \times 100$$

Oil recovery was determined by using mechanical screw press after finishing the extraction of oil yield and fat content determination.

$$\text{Oil Recovery (\%)} = \frac{\text{Weight of meal} \times \text{meal oil content}}{\text{Weight of sample} \times \text{oil content in sample}} \times 100 \quad (\text{Zheng, 2003})$$

Table 2.1 Experimental design with coded and actual levels for optimization of extraction conditions of virgin coconut oil

Run	Coded Value		Actual Value	
	Factor A (Temp)	Factor B (Time)	Pressing Temperature (°C)	Pressing duration (min)
1	0	0	95	45
2	-1.41421	0	75	45
3	0	0	95	45
4	0	0	95	45
5	0	1.41421	95	75
6	1	-1	105	30
7	0	0	95	45
8	0	-1.41421	95	15
9	0	0	95	45
10	-1	-1	85	30
11	1.41421	0	115	45
12	1	1	105	60
13	-1	1	85	60

III. RESULTS AND DISCUSSION

3.1 Effect of pressing conditions of temperature and duration on the responses of virgin coconut oil

The different pressing temperature and pressing duration conditions were affected on the responses of virgin coconut oil. In Table 2.3, the results showed that the oil yield, residual fat content, oil recovery and antioxidant activity of VCO ranged from 40 to 67%, 15 to 25.04%, 4.1 to 6.2% and 30 to 76% respectively. In Figure A, the oil yield plotted at 3D surface. Maximum oil yield 67% was obtained at temperature 95°C and 75 min, followed by 60% at temperature 95°C and 15 min according to Table 2.3 and Figure A. And then, the second maximum oil yield 54% was obtained when the temperature and duration was increased at 105°C and 60 min. Other different pressing temperature and duration for oil yield were slightly decreased to around 40% respectively in Table 2.3. The

optimum oil yield was obtained 67% at pressing temperature 95°C and pressing duration at 75 min. Oil yield was increased with medium temperature and long duration. Therefore, the pressing temperature and duration were important for oil yield.

Oil yield increases with the increasing duration for pressing duration of 75 min and at temperature of 95°C. Afterward, further increase in duration and higher temperature (above 95°C) caused decreasing the oil yield. Increasing in temperature reduces the viscosity of oil and improves the oil flow. At excess temperature, more water is lost and dehydrated samples will get hard. So, the resistance to pressure during pressing increased and decreased the oil yield (Huang et al., 2019).

Erna subroto et al., (2014) mentioned that increasing the temperature coagulates the protein, softening the solid structure and decreases the oil viscosity. Ajala et al., (2019) were investigated that the processing of shea butter, to optimize the oil yield of 37% from 150 g sample of shea kernel at 90°C and 20 min. Fakayode and Ajav (2016) studied the relationship between the yield and the process parameters of mechanical pressing and finally obtained the maximum yield by optimizing the mechanical oil extraction process from *Moringa oleifera* seeds using RSM. Mariano et al., (2017) studied a mechanical screw press process, an optimum oil yield of 73.38% at 70 °C and 32 rpm.

According to Table 2.3, the minimum value of residual fat content was 15% at 95°C and 15 min and maximum value was 25.04% at 115°C and 45 min. In Figure B, residual fat content was plotted at 3D surface. The highest residual fat content was 25.04% at 115°C, 45 min and the lowest residual fat content was 17% at both 75°C, 30 min and 95°C, 45 min. The higher temperature accelerates the reaction rates of oxidation and the more trans-fat is generated (Song et al., 2015). VCO contains many types of fatty acids in the medium chain triglyceride (MCT) group so that it has high oxidative stability. This oxidative stability is supported by the value of the active oxygen method (AOM) on MCT greater than other oils (Sahin, 2019).

The minimum residual oil recovery in cake was obtained 4.1% at 95°C and 75 min, beyond then 4.2% at 85°C and 60 min in Table (2.3). The maximum residual oil recovery in cake was obtained 6.2% at 115°C and 45 min, followed by 5.5% at 105°C and 60 min. In figure (C), oil recovery was plotted at 3D surface. The minimum oil recovery was obtained 4.1% at 95°C and 75 min in Table (2.3) and figure (C). Oil yield and oil recovery were inversely proportional affect, because of the highest oil yield result was obtained at 95°C and 75 min. At pressing temperature 115°C and duration 45 min, the maximum oil recovery was 6.2. Similarity, Arslan M. (2010) was finding studied by using treated seeds/nut, an approximately 7% of the oil remains in the seed/nut. Singh et al., 2012 examined that the effect of pre-treatment on the extraction efficiency of linseed oil, these results showed that the pretreatments had a significant effect on oil yield and no significant effect on oil recovery.

In Table 2.3, the antioxidant activity was obtained the maximum value of 76 % at 95°C and 75 min and followed by 67% at 105°C and 60 min. The minimum value of antioxidant activity was 30% at 75°C and 45 min. In figure D, the antioxidant activity plotted at 3D surface was maximum result of 76% at 95°C and 75 min. After that, the second maximum antioxidant activity was 67% at 105°C and 60 min, minimized was 30% at 75°C and 45 min in Table 2.3 and figure D. Similarity as above Oil yield, Antioxidant activity was increased with medium temperature and long duration. In this results, pressing temperature and pressing duration was important for antioxidant activity. Yashi, (2016) investigated that the antioxidant activity ranged from 65 to 70% in VCO. The maximum, oil yield and antioxidant activity of VCO was found under the experimental conditions of pressing temperature 95°C and duration 75 min.

3.2 Analysis of variance(ANOVA) and regression coefficient of the model

According to ANOVA table results in Table 2.4, the developed model was found highly significant at F value ($p < 0.001$) with non – significant lack of fit at p value ($p > 0.05$). Significance of different terms of each coefficient was determined using the F-value and p-value. The coefficient of determination (R^2) and variation (CV%) on the oil yield (OY) were 0.99 and 1.84, residual fat (RF) content were 0.94 and 5.19, oil recovery (OR) were 0.93 and 4.10 and antioxidant activity (AO) were 0.94 and 7.83 respectively. Therefore, the developed quadratic model was suitable for prediction of the effect of process parameters on product responses (OY, RF, OR and AO value) with high accuracy within experimental range. According to Yolmeh et al., (2014) reported that a large F-value and a small p - value would imply a more significant effect on the corresponding response variable. Lee et al., 2010 suggested that for a good fit of a model, R^2 should be at least 0.80. The R^2 for these response variables was higher than 0.80, indicating that the regression models explained the mechanism well.

3.3 Regression coefficient of the Second - order polynomial

In table 2.4, showed the second order polynomial regression model designed for OY, RF, OR, AO value in terms of coded factors were as follows. Regression coefficient model showed oil yield was positively highly significant ($p < 0.001$) influenced on pressing duration as linear effect, pressing temperature and pressing duration as interaction effect and pressing duration as quadratic effect. Residual fat content was highly significant ($p < 0.001$) influenced on pressing duration as linear effect, negatively slightly significant influenced as interaction effect and positively highly significant influenced on pressing temperature as quadratic effect. Oil recovery was positively highly significant ($p < 0.001$) influenced on pressing temperature as linear effect. No significant influenced on pressing duration as linear effect and quadratic effect. Positively slightly significant influenced as interaction effect and highly significant influenced on quadratic effect as pressing temperature. Regression coefficient model showed antioxidant activity was positively highly significant ($p < 0.001$) influenced on pressing temperature and pressing duration as linear effect and slightly significant as interaction effect. The actual quadratic equation of the oil yield, residual fat content, oil recovery and antioxidant activity of VCO responses were given in equations (1) (2), (3) and (4) respectively.

3.4 Model fitting

Empirical models were developed to describe the relationship between pressing conditions and virgin coconut oil quality. From the empirical data obtained, standardized equations for predicting the effects of pressing temperature and duration on oil yield, residual fat content, oil recovery and antioxidant activity of the oil generated are respectively modeled and presented as Equations 1 to 4.

$$\text{Oil yield} = 42.14 + 0.45 X_1 + 2.63 X_2 + 6.87 X_{12} - 0.49 X_1^2 + 10.76 X_2^2 \dots\dots\dots(1)$$

$$\text{Residual fat content} = 18.95 + 0.39 X_1 + 3.40 X_2 - 2.82 X_{12} + 2.95 X_1^2 + 0.50 X_2^2 \dots\dots\dots(2)$$

$$\text{Oil recovery} = 4.57 + 0.54 X_1 - 0.19 X_2 + 0.60 X_{12} + 0.46 X_1^2 - 0.04 X_2^2 \dots\dots\dots(3)$$

$$\text{Antioxidant activity} = 52.77 + 13.02 X_1 + 12.06 X_2 + 9.59 X_{12} - 3.59 X_1^2 - 2.40 X_2^2 \dots\dots\dots(4)$$

3.5 Numerical optimization and point predication

In table 2.6 showed that goal and importance factor of response variables for determining optimum value in extraction conditions. In all treatments, RSM was selected the optimization conditions of 95°C and 75 min. Because of these treatments have highest oil yield, maximum antioxidant activity, medium residual fat and lowest oil recovery in cake. The comparison of predicted and observed value for response variables at optimum conditions of 95°C and 75 min were shown in table 2.7. Both value of % variation are 0.01% for oil yield, 0.00 % for residual fat content, 0.02 % for oil recovery and 0.01 % for antioxidant activity. These test showed that there is not a significant difference between the predicted and actual values since the variation value (V) (0.02) is much smaller than the cut - off value of (V) for 95% confidence level as similarity reported by Mooney and Swift,1999.

Table 2.2 Effect of pressing conditions and responses of virgin coconut oil condition according to central composite rotatable design (CCRD)

Std Run	Temp (T)	Time(t)	Oil yield (%)	Residual fat (%)	Oil recovery (%) in cake	Antioxidant activity (%)
1	75	45	40	24.00	4.6	30
2	85	30	49	17.00	5	38
3	115	45	41	25.04	6.2	61
4	95	45	42	18.02	4.5	49
5	105	60	54	22.81	5.5	67
6	95	45	42	19.17	4.5	53
7	85	60	46	25.00	4.2	43
8	95	75	67	24.26	4.1	76
9	95	45	41	19.45	4.8	53
10	105	30	43	20.46	5.1	52
11	95	45	42	19.80	4.3	50
12	95	45	41	17.00	4.4	59
13	95	15	60	15.00	4.7	39

Table 2.3 Analysis of variance(ANOVA) and regression coefficient of the model for the relation between extraction variables and product responses

Product Response	Regression Model (F-value)	Lack of Fit (p-value)	T	t	T * t	T ²	t ²	R ²	CV%
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Oil Yield (%)	223.83***	0.09 ^{ns}	1.61	55.75***	63.47***	1.86	892.82***	0.99	1.84
Residual Fat Content (%)	22.64***	0.62 ^{ns}	0.82	61.01***	7.01*	43.74***	1.27	0.94	5.19
Oil Recovery (%)	16.01***	0.29 ^{ns}	37.89***	4.58	7.74*	25.89***	0.21	0.92	4.53
Antioxidant Activity (%)	25.43***	0.36 ^{ns}	60.76***	52.13***	5.49*	4.40	1.97	0.94	7.83

*** Significant at P < 0.001, ** Significant at P < 0.01 *Significant at P < 0.05

Table 2.4 Regression coefficient of the Second - order polynomial for the relationship between extraction conditions and changes in VCO conditions

Parameter	β_0	X ₁	X ₂	X ₁₂	X ₁₁	X ₂₂
Oil Yield (%)	42.14	0.45	2.63***	6.87***	-0.49	10.76***
Residual Fat Content (%)	18.95	0.39	3.40***	-2.82*	2.95***	0.50
Oil Recovery (%)	4.57	0.54***	-0.19	0.60*	0.46***	-0.04
Antioxidant Activity (%)	52.77	13.02***	12.06***	9.59*	-3.59	2.40

*** Significant at P < 0.001, ** Significant at P < 0.01 *Significant at P < 0.05 ns = Non Significant

Table 2.5 Goal and Important factor and response variables for determining optimum extraction conditions

Factor/response	Goal	Importance	Lower Limit	Upper Limit	Optimum Value
Factor					
Temperature (°C)	In range	+++	75	115	95
Time (min)	In range	+++	15	75	75
Response					
Oil Yield (%)	Maximum	+++	15.00	25.04	68.31
Residual Fat Content (%)	In range	+++	40.3	67	24.41
Oil Recovery (%)	In range	+++	4.1	6.2	4.43
Antioxidant Activity (%)	Maximum	+++	30	77	77.27

Table 2.6 Comparison of predicted and observed values for response variables

Independent Variables (Process Parameter)	Optimum Conditions		
Temperature (°C)	95		
Time (min)	75		
	Predicted Value (P)	Observed Value (O)	% Variation (V)

Oil yield (%)	68.31	67.44	0.01%
Residual fat content (%)	24.41	24.35	0.00%
Oil recovery (%)	4.37	4.27	0.02%
Antioxidant activity (%)	77.26	76.57	0.01%

$$V = \varepsilon \frac{(O-P)^2}{p} = 0.02$$

Oil Yield (%)
Design Points:
● Above Surface
○ Below Surface
40  67
Oil Yield (%) = 67
Std # 8 Run # 8
X1 = A: Temp = 95
X2 = B: Time = 75

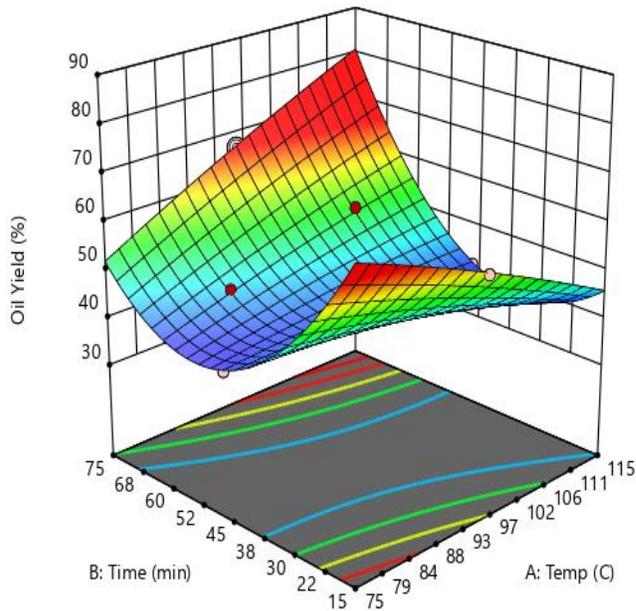


Figure (A): 3D surface plot showing the effect of pressing temperature and pressing duration on oil yield content (%)

Residual Fat (%)
Design Points:
● Above Surface
○ Below Surface
15  25
X1 = A: Temp
X2 = B: Time

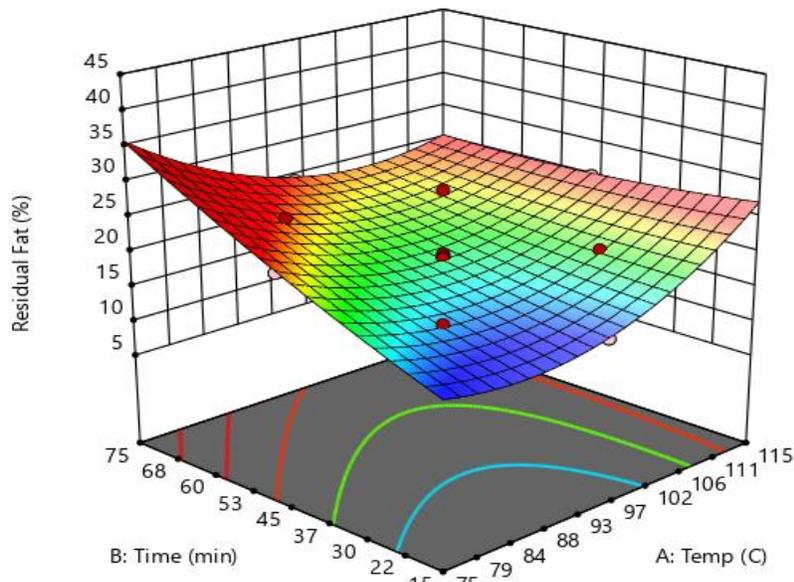


Figure (B): 3D Surface plot showing the effect of pressing temperature and pressing duration on residual fat content (%)

Oil Recovery (%)

Design Points:

- Above Surface
- Below Surface

4.1  6.2

X1 = A: Temp

X2 = B: Time

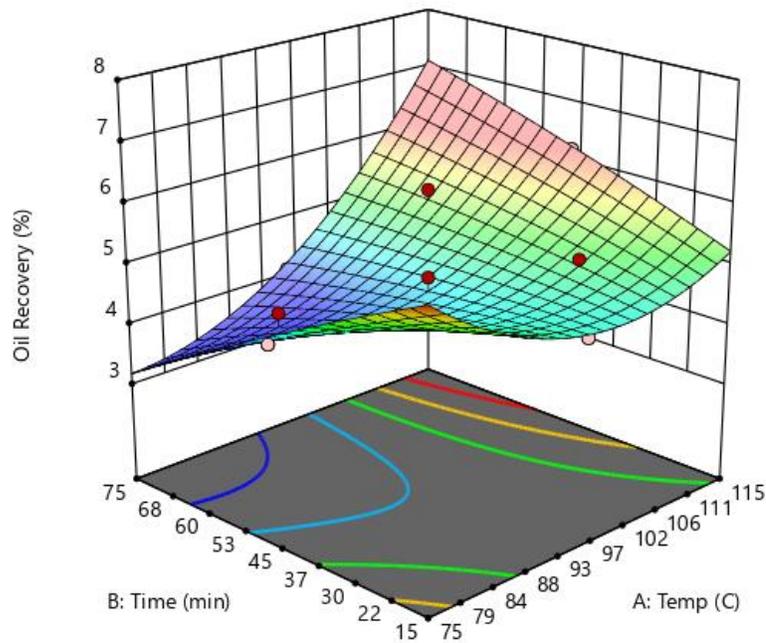


Figure (C): 3D Surface plot showing the effect of pressing temperature and pressing duration on oil recovery (%)

Antioxidant (%)

Design Points:

- Above Surface
- Below Surface

30  76.545

X1 = A: Temp

X2 = B: Time

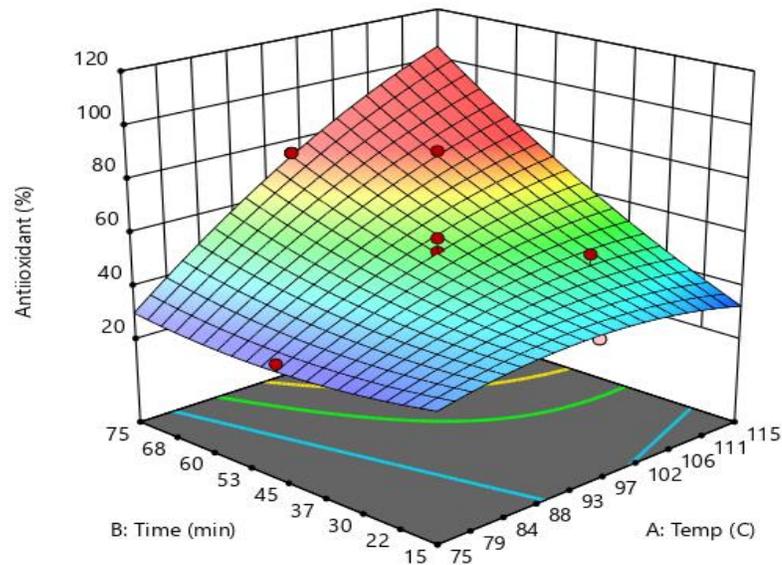


Figure (D): 3D Surface plot showing the effect of pressing temperature and pressing duration on antioxidant activity (%)

IV. CONCLUSION

In this study, virgin coconut oil was established that applied temperature, applied duration are significantly influenced on affecting the oil yield, antioxidant activity, residual fat and oil recovery in cake. The best conditions of pressing temperature and duration at 95 °C for 75 min, which gave maximum oil yield (67.44%), maximum antioxidant activity (76.57%), residual fat content (24.35%) and minimum oil recovery in cake (4.27%). The screw press method can be used commercially as it is environmental friendly, cheaper and easy-applicable. Virgin coconut oil is not processed or chemically altered, unlike other edible oils, so it keeps all of its beneficial plant-based nutrients.

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Technical Analysis to Determine Signal Lines in Sharia Stock Trading: Case in Indonesia Sharia Stock Market

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Abstract – The Sharia investment market is currently increasing and investors are concerned because it does not have advantages. There are many reasons why people are getting concerned about the Sharia investment, not only because investment does not have usury practice, maysir, and gharar, or because this investment is not focused on the investors' profits only, but also because its principles do not contradict with the prevailing Islamic value. This means that sharia investment is convenient to the investors especially in Indonesia where the majority of the citizens are mostly Muslims, which is all forms of transaction carried out based on sharia principles, including investing. This makes it easier for Indonesian people to invest following sharia elements. Investing with sharia principles emphasizes ethical and moral values and can reduce mispricing. This study uses a sharia stock index as a research sample and wants to see the effect of using technical analysis in providing confirmation signals on sharia stocks. The signal line will combine with the indicators in technical analysis to provide a confirmation signal for the stock price movement. It is quantitative research. The population in this study is the companies listed on the Indonesia Sharia Stock Exchange. The sample of this study are companies listed on the Jakarta Islamic Index 30 (JII30) from 2016-2019 using a purposive sampling technique. There are 47 companies that fulfilled the criteria as the samples in this research. The type of analysis method used is multinomial logistic regression. The results show that the Stochastic Oscillator (SO), Moving Average Convergence Divergence (MACD), Relative Strength Index (RSI), and Bollinger Band (BB) indicator has a statistical effect on the signal line.

Index Terms – signal line, sharia stocks, moving average convergence divergence, stochastic oscillator, relative strength index, bollinger band.

I. INTRODUCTION

In general, people invest to get a higher return. It is evident that investors often chase the rise or fall of stock prices in the real world, and it has become the most important issue for market participants to predict future stock prices (Ni, Cheng, et al., 2020). Public perception of investment decisions does not need to have a strong analytical basis. The fact is that decision-making needs to be analyzed to consider the factors that occur. Two types of analysis are usually used in stocks, namely fundamental analysis and technical analysis. Fundamental analysis is a factor calculation, such as the economic factors of a country, and economic policies, both macro, and micro. The fundamental analysis approach relates to the company underlying its stock or not the real company's stock (Agarwal et al., 2017; Anbalagan & Maheswari, 2015; Göçken et al., 2016). Technical analysis is a method of evaluating stocks, commodities, or securities by analyzing the statistics generated by past market activities to predict future price movements (Ong, 2016).

There are several indicators or test tools that can be used to perform technical analysis on stocks. The test equipment used is usually an oscillator. In this study, the oscillator indicators used are the Stochastic Oscillator, Moving Average Convergence Divergence, Relative Strength Index, and Bollinger Band. First, the Stochastic Oscillator is an indicator that shows the location of the last closing price compared to the lowest or highest price range during a certain period (Wira, 2014). The Stochastic Oscillator (SO) is almost similar to the RSI indicator. The difference is that the SO indicator has two lines of analysis tools. Second, Moving Average Convergence Divergence (MACD) is a momentum indicator. This indicator tries to predict the stock market trends by comparing the short-term and long-term trends (Nti et al., 2020). Third, the Relative Strength Index (RSI) is an oscillator used in technical analysis of its function to show price strength by comparing the rise and fall movement of a stock price (Wilder, 1978). Fourth, the Bollinger Band (BB) is a technical analysis indicator in which there are three lines to create a zone in decision-making. The zone includes stock price movements and comparative volatility as well as the relative price in a one-time analysis (Syamsir, 2004). Thus, the four oscillator indicators can help in deciding whether a stock should be bought, sold, or held until the determined time.

Incorporating sharia principles in investment decisions is considered a differentiating factor, as well as encouraging performance on sharia shares (Ahmed, 2018; Al-Khazali et al., 2014; Reddy et al., 2017; Walkshäusl & Lobe, 2012). In terms of risk, and result, of co-movement, Sharia stock, especially in Indonesia, is considered that profitable from diversification (Majdoub et al., 2016; Qoyum et al., 2021; Sherif & Lusyana, 2017). It is known that the majority of Indonesian people are Muslims, although they are still lagging behind Malaysia when it comes to Islamic financial fundamentals. However, as the number of needs and investment potential increases as one of the largest Muslim populations in the world, the opportunities to develop Islamic investment are higher. This can be seen in research on the use of technical analysis on the Jakarta Islamic Index (JII) stock, which is still rarely found. Technical analysis research is one of the most interesting and challenging topics to be discussed. It is because of the attractiveness of the stock price chart that is formed that it becomes challenging to predict which direction the next stock will move. Many investors assume that technical analysis cannot provide certainty in predicting the company's price movement. However, technical analysis can be accepted as a logical method of making a profit in the capital market (Prasetyo et al., 2019).

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Dow Theory

The Dow theory explains that the stock price has presented all the information in the financial market. The purpose of the Dow theory is to identify long-term trends in stock prices. There are two indicators in the Dow theory, namely the Dow Jones Industrial Average (DJIA) and the Dow Jones Transportation Average (DJTA). DJIA is the key indicator of trend-making, while DJTA is a confirmation signal of acceptance or rejection (Maretha & Prasetya, 2021). The trend is a Dow theory that is different from the common trend in society. There are three types of trends in the Dow theory, namely the main trend, the middle trend, and the minor trend. The main trend is the stock price movement over a long period. Usually, a long period can be six months up to one year or maybe it can be more than one year. This main trend movement has three phases, namely the accumulation phase, the public participation phase, and the distribution phase (Sitinjak et al., 2014). The second trend is the middle trend, formed by short-term stock price movements. This period has a three-week to the three-month range. The last trend is the minor trend, which is the daily movement and includes a smaller stock price movement compared with the main trend or the middle trend. This usual period is seen in a period of fewer than three weeks. Thus, the investors already know the trend that occurs in the stock market, then combined with the DJTA to make a confirmation decision to accept or reject.

Signal Lines

The success factor in making decisions is that an investor can be sensitive to signals that appear in stock movements. Signal lines are used in technical indicators, especially oscillators, which are combined with indicators in technical analysis to produce information that investors can take advantage of. In this case, testing

the signal line against technical analysis indicators can give affect whether the information can be used for decision making. The Stochastic Oscillator (SO) is an indicator to show the momentum towards stock price movement so that the signal indication appears. Some studies indicate that stochastic oscillator indicators significantly can get the profit investors in the sharia market (Prabhata, 2012). The use of trading signals emitted by the Stochastic Oscillator (SO) indicator can provide better performance in predicting stock prices (Ni, Cheng, et al., 2020). The SO indicator can be able to confirm the signal and increase its effectiveness (Nickolaevich et al., 2020). Based on the description above, the hypothesis is formulated as follows:

H1 : Stochastic Oscillator Indicator affect the signal line.

Moving Average Convergence Divergence (MACD) is a momentum indicator based on stock prices (Santoso & Sukamulja, 2018). MACD will produce signals that can be used for decision-making. In this case, the MACD uses only 2 intersecting lines. Research by (Prasetyo et al., 2019) showed that the use of the MACD indicator can provide optimal benefits. Then, the result by (Chong & Ng, 2008) shows that the MACD indicator has predictability. The Moving Average Convergence Divergence indicator can provide accurate results and it can be used as a reference to determine the signal (Asthri et al., 2016). According to the description above, the hypothesis is formulated as follows:

H2 : Moving Average Convergence Divergence Indicator affects the signal line.

The Relative Strength Index (RSI) is an oscillator used in technical analysis to show price strength by comparing the price movement of an increase and a decrease (Rosyidah & Hafi, 2021). The RSI indicator will show whether the stock price is saturated or not or moving sideways. The result of the study by (Shalini et al., 2019) showed that although the RSI can provide signals, it still has a risk since the number of false signals produced is quite high. RSI can provide signal information that is accurate enough so that it can give benefit to investors (Utami & Gunarsih, 2018). The Relative Strength Index indicator can provide better performance in investment decision-making (Santoso & Sukamulja, 2018). Based on the description above, the hypothesis can be formulated as follows:

H3 : Relative Strenght Index indicator affects the signal line

The Bollinger Band (BB) indicator is used to obtain information on the forwarding of the trend direction and the stock price amount of volatility through the Bollinger Band (Roy, 2016). The BB indicator will form 3 zones. The research result (Firdaus, 2021) showed that BB can have a positive effect on the signal line. The Bollinger Band indicator can be able to confirm signals that appear to make a profit (Ni, Day, et al., 2020). The Bollinger Band indicator can produce signals used by investors to make decisions(Mafula Choirotul, 2015). According to the description above, the hypothesis can be formulated as follows:

H4 : Bollinger Band indicator affects the signal line.

III. RESEARCH METHOD

Population and Samples

The population used in this study was the companies that are listed on the Indonesia Stock Exchange. Meanwhile, the samples in this study were companies included in the Jakarta Islamic Index 30. The purposive sampling technique by setting certain criteria was used to obtain the samples. Data collection was accessed by www.idx.com and tradingview.com. The selected sample criteria are (1) Companies included in the Jakarta Islamic Index, (2) Companies included in Jakarta Islamic Index 30 from 2016 to 2019, and (3) Companies that have complete charts from 2016 to 2019.

Jakarta Islamic Index (JII) was chosen as the research sample because the listed companies have met several requirements such as good stock capitalization and liquidation so that investors can analyze these stocks. This country with a developing economy has the potential for a sharia stock market whose market capitalization share reached 51.55% at the end of 2019 (OJK, 2018). Data collection was taken from June to November of each year. The selection data from June to November was due to reduce the phenomenon that influenced the company's stock movement.

Variable Measurement

The dependent variable in this research is the signal line. It was measured using a nominal scale of 1 to 3. Nominal 1 represents buying, nominal 2 represents selling, and nominal 3 represents holding. The signal line numbering has no basis yet in explaining this term. The signal line is expected to help with decision-making for an investor. The independent variables in this study are Stochastic Oscillator (SO), Moving Average Convergence Divergence (MACD), Relative Strength Index (RSI), and Bollinger Band (BB).

1. Stochastic Oscillator in technical analysis was measured by looking at a scale of 0-100. In this case, the 80-100 area can be stated as overbought, the 0-20 area can be stated as oversold, and the middle area of 20-80 can be stated as neutral or the stock price moves sideways. The usual Stochastic Oscillator indicator standard used is 14, 5, and 3. This would reduce the false signals in the stock movements.
2. Moving Average Convergence Divergence in stock analysis is technically measured by the intersection of the signal lines and MACD indicator lines. The line setting standard of MACD used in this research was 12, 26, and 9. With such a standard-setting price fluctuation becomes more sensitive.
3. Relative Strength Index in stock analysis was technically measured by the intersection of signal lines if the RSI lines were above 70%, then the stock was overbought and if the RSI lines were below 30%, then it was oversold. Similarly, if the indicator line moved between 30%-70%, the stock experienced sideways.
4. Bollinger Band in stock analysis was technically measured by entering the setting in the indicator (20, 2). Those settings indicated the standard values of $n = 20$ and $k = 2$ which would get the Bollinger band value.

IV. RESULT AND DISCUSSION

Table 1 is a descriptive statistical analysis that describes the variables

Variable	N	Minimum	Maximum	Mean	Standard Deviation
GS	188	1.00	3.00	1.8245	.74291
SO	188	-81.64	446.41	.9787	64.51729
MACD	188	-3795.00	2533.00	33.6596	569.81861
RSI	188	-44.10	40.63	-.3843	21.36966
BB	188	-1.36	1.28	.0112	.72041

The signal line as the dependent variable calculated on a nominal scale of 1 to 3 has a mean value of 1.8245 with a standard deviation of 0.74291. Meanwhile, each independent variable has a mean value from the Stochastic Oscillator (SO) of as much as 0.9787 with a standard deviation of 64.517729. The mean value of the Moving Average Convergence Divergence (MACD) is 33.6596 with a standard deviation of 569.81861. The mean Relative Strength Index (RSI) value is -0.3843 with a standard deviation of 21.36966. The mean Bollinger Band (BB) value is 0.0112 with a standard deviation of 0.72041.

Statistical testing in this study used multi-nominal logistic regression. The estimation parameters in the multi-nominal logistic regression test for the buy decision were compared with the hold decisions, the influential indicators were Moving Average Convergence Divergence and Bollinger Band because the p-value was less than 0.05. As for the sell decision compared to the hold decision, the influential indicators were the Stochastic Oscillator and Relative Strength Index because the p-value was less than 0.05. The equation on the estimation parameter formed to MACD and BB produced the statement that if there was no significant increase in the value against the Moving Average Convergence Divergence (MACD) and Bollinger Band (BB), so the probability of the investor deciding to buy was higher than the hold decision. The higher increase in the MACD indicator value, the higher probability of buying. Concerning the exp (B) to buy, it was explained that the MACD indicator has a

probability of 1.003 times higher compared to other indicators. Meanwhile, the higher the value of the BB indicator value, the higher the probability of buying. Looking at the value of exp (B) to buy, it was explained that the BB indicator has a probability of 40.195 times more precise than other indicators. The accuracy of the classification in each category was the Buy 65 observations, the Sell category as much 75 observations, and the Hold category as much 16 observations. The model accuracy obtained was 83.0%.

Table 2 likelihood ratio test

Effect	Model Fitting Criteria	Likelihood Ratio Test		
	-2 Log-Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	164.794	30.020	2	.000
SO	157.313	22.539	2	.000
MACD	143.264	8.490	2	.014
RSI	146.232	11.457	2	.003
BB	149.203	14.428	2	.001

Based on the data produced by the fitting information model, it can be concluded that the inclusion of an independent variable into a multi-nomial regression model showed the best results. The sustainability test (goodness of fit) of the form model gives the result that the data entered matched or followed the multi-nominal regression model. It meant that the model could describe the data. The feasibility of the model by looking at Cox and Snell showed that the value of 0,752. The value indicated that the data diversity of the free variables could explain the data diversity of the response variable by as much as 75.2%. Meanwhile, the rest was explained by the other free variables that exist outside the model. The partial test showed significant values for all variables smaller than alpha 5% or less than 0,05. From these results, it can be concluded that the Moving Average Convergence Divergence, Stochastic Oscillator, Relative Strength Index, and Bollinger Band are statistically significantly influential on the signal line. Thus, the hypothesis which stated that MACD, SO, RSI and BB affect the signal line is accepted. This result proved that these indicators of oscillators can provide information on buy, sell and hold signals. The results of this study are in line with research from Monika dan Yusniar (2020) which showed the results that MACD and RSI could provide accurate signals in the decision-making. Research by Firdaus (2021) showed that the BB and RSI combination could help to provide signals so that the decisions taken can be accurate. In this case, it means that the indicators respond well to the signals that appear. A stock investor cannot only look at the volume of transactions, but the stock price is also below or above or even just look at the consistency of a company for decision-making, so there is a need for analysis in this case technical analysis that is assisted by indicators to assist in decision making. Therefore, the MACD, SO, RSI, and BB indicators affect the signal lines.

V. CONCLUSION

The selection of the sharia market to determine the effect of technical analysis has a positive impact on investors in the form of decision information. In this case, it will provide a positive trend for the outside world to look at the sharia market and also provide interest for the Indonesian people, which of course are dominated by Muslims to invest in the sharia market. The result of technical analysis use on a nominal scale in companies listed on the Jakarta Islamic Index 30 from 2016 to 2019 found that the use of SO, MACD, RSI, and BB indicators statistically has a significant effect on the signal line. Through the results of all such indicators that can exert a significant influence, an investor cannot ignore the fundamental analysis in decisions. In decision-making, it is better to combine the company's fundamental analysis with the technical analysis formed therefore the decisions taken can provide appropriate and accurate results.

In this research process, it is not separated from limitations, so there needs to be an improvement for further researchers. The limitations in this study show that there has no reference to the signal line consisting of buy, sell, and hold measured by a nominal scale (1,2,3) so researchers only look at the test results that provide the best results. Suggestions for the further researchers, they can test other indicators from the technical analysis therefore they can find out their influence. This study was conducted from 2016-2019 and only observed in the months of June to November each year. In the future, it may observe the phenomena of the months in each year or use the latest year because, in 2020-2021, covid-19 pandemic condition hit Indonesia and may affect the stock price movements.

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Fattening Mangrove Crab (*Scylla olivacea*) With Silvofishery Systems in Different Type Mangrove Vegetation and Trash Fish

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Abstract- Mangrove crab is one of important economically valuable aquatic biological resource whose habitat is in estuarine areas (mangroves). Mangrove crab can be cultivated with a silvofishery system, namely cultivation of mangrove forest areas. This study aims to examine the interaction between mangrove vegetation types and trash fish species of mangrove crabs in the silvofishery system. This study used 27 bamboo cages and kept 10 crabs/m² with an average weight of 200±10 g with a carapace width of ±10 cm. The study was designed using a factorial design with a randomized block design. The first factor is the type of mangrove vegetation (A) and the second factor is the type of trash fish feed (B). Mangrove vegetation consists of 3 levels, namely A1 = *Rhizophora*, A2 = *Avicennia*, A3 = *Sonneratia*, while the trash fish type factor consists of 3 levels, namely B1 = cattle fish, B2 = goldstripe sardinella, B3 = tilapia fish. Each treatment interaction was repeated 3 times, so that the study consisted of 27 experimental units. The results of the analysis of variance showed that trash fish species had a significant effect ($p < 0.05$) on mangrove crab survival. However, mangrove species and their interactions with trash fish did not have a significant effect ($p > 0.05$). Interaction between mangrove species and fish feed also significantly affected ($p < 0.05$) on the absolute growth of mangrove crab. However, the type of mangrove vegetation, trash fish species and their interactions had no significant effect ($p > 0.005$) on crude protein, crude fat, NFE, and energy levels of mangrove crabs. The best survival rate was found in *Rhizophora* and *Tilapia*, which was 90,00% and the best absolute growth was produced in *Rhizophora* and *Sardinella*, which was 32,96 g.

Index Terms- Mangrove, Mangrove Crab, *Silvofishery*, Trash fish

I. INTRODUCTION

Mangrove is a typical coastal ecosystem that has high productivity and acts as a physical, ecological and economic function in coastal areas. In addition to tidal conditions and supporting fertility, some assumptions cause mangrove forests in Indonesia to experience degradation, which is caused by the conversion of mangrove forests for various purposes such as plantations, ponds, settlements, industrial areas, tourism, and others without considering their sustainability and function. to the surrounding environment (Sitorus *et al.*, 2017; Prawita 2018). Therefore, to maintain sustainability and remain utilized, it is necessary to implement a system that can guarantee these two interests, namely silvofishery (Karim *et al.*, 2018).

Silvofishery is an aquaculture activity in mangrove areas. The basic principle of the cultivation system is the plural or dual use of the existence of mangroves without losing their natural ecosystem functions so that fishery and mangrove products can still act as biological, ecological, and economic functions. Various types of economic biota can be cultivated in mangrove areas with a silvofishery pattern, one of which is the mangrove crab (*Scylla* spp). Mangrove crab (*Scylla olivacea*) is one of the important economically valuable aquatic biological resources whose habitat is estuarine (mangrove) areas. Mangrove crabs can be cultivated in mangrove areas composed of various types of vegetation. The mangrove ecosystem consists of various types of vegetation that compose it. The results of research by Asriani *et al.*, (2019) show that litter productivity greatly affects the quality of the mangrove ecosystem. So that, each type of mangrove vegetation produces different litter so it is thought to also affect the quality of aquatic ecosystems. Thus, the different types of mangrove vegetation as a location for mangrove crab cultivation in the silvofishery system are thought to produce different growth and quality of crabs due to several factors such as mangrove litter productivity, nutrient dynamics, and feed abundance.

Research on Mangrove crab cultivation silvofishery system has been carried out by Karim *et al.* (2016), Karim *et al.*, (2017), and Wijaya *et al.*, (2019). Meanwhile, Asriani *et al.* (2019) investigated the silvofishery system of mangrove crab cultivation in various mangrove vegetation, but in that study only used trash feed in the form of tilapia fish alone. Meanwhile, research on silvofishery system of mangrove crab cultivation on various types of mangrove vegetation of various types of trash fish feed has never been carried out. According to Adila *et al.*, (2020) that feeding trash fish affects the weight gain of mangrove crabs.

A good feed must meet the elements of feed, which contain protein, fat, carbohydrates, minerals, and vitamins. So far, cultivators tend to use Mozambique tilapia feed because it is a fish that is easy to obtain and becomes a pest in ponds. However, there are likely other types of fresh bycatch feed that are higher in protein content and are affordable and more economical, such as common ponyfish (*Leiognathidae*) and goldstripe sardinella classified as fish that are easily obtained and the price is quite cheap, but in terms of nutrient content, it is quite high. According to Manuputty (2014), goldstripe sardinella contains 20.227% protein, 3.055% fat, and 2.025% carbohydrates. The cattle fish contains 37.07% protein, 16.85% fat, 1.92% crude fiber, 33.25% ash, and 4559 kcal/g energy (Hasnidar, *et al.*, 2021)

Based on the description above, to study and obtain information about the interaction of mangrove vegetation types and trash fish species in aquaculture for the fattening of mangrove crab cultivation with silvofishery a study on this is needed. Thus, this research needs to be carried out to obtain information about the type of mangrove vegetation and the right types of trash fish in the silvofishery system of mangrove crab cultivation that produces the best growth and production of mangrove crabs.

II. METHOD

This research was conducted from January to April 2022 in the Coastal Mangrove Area, Minangae Village, Sajoanging District, Wajo Regency. Analysis of body chemical composition was carried out at the Animal Feed Chemistry Laboratory, Faculty of Animal Husbandry, Hasanuddin University. The location of crab cultivation can be seen in Figure 1 below.

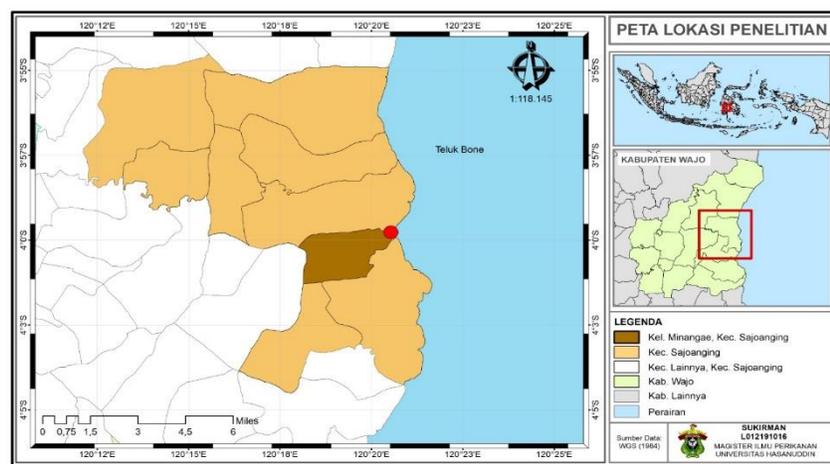


Figure 1. Location of mangrove crab cultivation

The test animals used in this study were mangrove crabs *S. olivacea* with an average weight of 200 ± 10 g and carapace width of ± 10 cm which was stocked with a density of 10 crabs/container and maintained for 30 days. The mangrove crabs were obtained from Malili District, East Luwu Regency, South Sulawesi. The containers used in this study were a circular bamboo cages with diameter of 2 m as many as pieces placed in the mangrove area. The outside of the cage is covered with a lining which aims to protect the cage from garbage and dirt carried by the waves. The type of feed used was bycatch feed, namely cattle fish, goldstripe sardinella, tilapia fish with feeding dose of 10% of the mangrove crab biomass. The frequency of feeding was given twice a day, in the morning (07.00 am) and the afternoon (16.00 pm).

Before the mangrove crabs were stocked in the rearing container, acclimatization was carried out to the rearing environment for 1 day. After the acclimatization period was completed, the mangrove crabs were fasted for 24 hours to remove the remaining feed in the digestive tract. Furthermore, the initial weight of the crabs was weighed using an electric scale, then stocked in the rearing container. At the end of the study, harvest was carried out by counting the number of live crabs, weighing them, and analysis of the chemical composition of the crab's body.

The study was designed using a factorial randomized block design consisting of 2 factors. The first factor is the type of mangrove vegetation (A) and the second factor is the type of trash fish feed (B). Mangrove vegetation consists of 3 levels, namely A1 = *Rhizophora*, A2 = *Avicennia*, A3 = *Sonneratia*, while the bycatch fish species factor consists of 3 levels, namely B1 = cattle fish, B2 = goldstripe sardinella, B3 = tilapia fish, thus there are 9 treatment combinations. The treatment combinations are as follows::

- A1.B1 = *Rhizophora* with cattle fish
- A1.B2 = *Rhizophora* with goldstripe sardinella
- A1.B3 = *Rhizophora* with tilapia fish
- A2.B1 = *Avicennia* with cattle fish

- A2. B2 = *Avicennia* with goldstripe sardinella
- A2.B3 = *Avicennia* with tilapia fish
- A3. B1 = *Sonneratia* with cattle fish
- A3.B2 = *Sonneratia* with goldstripe sardinella
- A3.B3 = *Sonneratia* with tilapia fish

The variables observed in this study include:

Surviva Rate or the survival of the mangrove crab is calculated using the following formula:

$$SR = \frac{N_t}{N_o} \times 100$$

- Information: SR = Survival rate (%)
- N_t = Number of live crabs at the end of the study
- N_o = Number of crabs at the beginning of the study

Absolute Growth The absolute growth average crab was calculated using the formula used as follows:

$$W = W_t - W_o$$

- Information: W = absolute weight growth of crabs (g),
- W_o = average weight of crabs at the beginning of the study (g),
- W_t = average weight of crabs at the end of the study (g).

Body Chemical Composition Test crabs were carried out at the beginning and the end of the experiment. Include protein, fat, NFE, and body energy. Protein was analyzed using kjedal method, NFE is calculated using the formula : NFE = 100 % - % Protein - % Fat - % Crude Fiber, fat with soxlet and energy using a bomb calorimeter according to AOAC instructions (2005).

The data obtained were analyzed using analysis of variance (ANOVA). If there is a significant effect, then it is continued with further W-Tukey test with the help of SPSS software version 23.00.

III. RESULTS

Survival Rate

The average survival rate of mangrove crabs maintained by the silvofishery system on various type of mangroves and type of fish feed were presented in Table 1 below.

Table 1. The average survival rate of mangrove crabs maintained by the silvofishery system on various type of mangroves and fish feed

Type of Vegetation and Type of Feed	Survival (%) ± StDev (n=27)
<i>Rhizophora</i> and cattle fish	70.00 ± 10.00 ^b
<i>Rhizophora</i> and goldstripe sardinella	80.00 ± 10.00 ^{ab}
<i>Rhizophora</i> and tilapia fish	90.00 ± 10.00 ^a
<i>Avicennia</i> and cattle fish	70.00 ± 10.00 ^b
<i>Avicennia</i> and goldstripe sardinella	83.33 ± 11.54 ^{ab}
<i>Avicennia</i> and tilapia fish	80.00 ± 0.00 ^a
<i>Sonneratia</i> and cattle fish	76.66 ± 5.77 ^b
<i>Sonneratia</i> and goldstripe sardinella	76.66 ± 5.77 ^b
<i>Sonneratia</i> and tilapia fish	83.33 ± 5.77 ^a

Description: Different letters in the same column indicate significantly different between treatments (p < 0.05)

The results of the analysis of variance showed that the trash fish species had a significant effect (p<0.05) on the survival of mangrove crabs. However, the types of mangroves and their interactions with trash fish do not have a significant effect. Furthermore, the results of the W-Tuckey test of trash fish on mangrove crab survival showed that all type of fish feed treatment for cattle fish were significantly different with tilapia fish (p<0.05) but not significantly different from goldstripe sardinella and goldstripe sardinella were not significantly different with tilapia fish (p>0.05). the best mangrove crab survival was produced on *Rhizophora* vegetation tilapia fish, which was 90,00%.

Absolute Growth

The average absolute growth of mangrove crabs maintained by silvofishery system on various type of mangrove and fish feed were presented in Table 2.

Table 2 The average absolute growth of mangrove crabs maintained by silvofishery system on various type of mangrove and fish feed.

Type of Vegetation and Type of Feed	Absolute Growth (g) ± StDev (n=27)
<i>Rhizophora</i> and cattle fish	12.33 ± 0.91 ^e
<i>Rhizophora</i> and goldstripe sardinella	32.96 ± 0.88 ^a
<i>Rhizophora</i> and tilapia fish	25.95 ± 1.87 ^b
<i>Avicennia</i> and cattle fish	17.59 ± 0.71 ^d
<i>Avicennia</i> and goldstripe sardinella	19.10 ± 0.66 ^{cd}
<i>Avicennia</i> and tilapia fish	19.76 ± 0.12 ^{cd}
<i>Sonneratia</i> and cattle fish	19.51 ± 1.68 ^{cd}
<i>Sonneratia</i> and goldstripe sardinella	23.88 ± 2.99 ^b
<i>Sonneratia</i> and tilapia fish	22.71±0.96 ^b

Description: Different letters in the same column indicate significantly different between treatments (p<0.05)

The results of the analysis of variance showed that the type of mangrove, the type of trush fish feed, and their interactions had a very significant effect on the absolute growth of mangrove crabs. Furthermore, W-Tuckey test showed that the growth of mangrove crabs reared on *Rhizophora* was significantly different (p<0.05) with all treatments, *Rhizophora* and tilapia fish were not significantly different from *Sonneratia* and goldstripe sardinella and so *Sonneratia* and tilapia fish (p>0.05). But significantly different from other treatments. Furthermore, the absolute growth of mangrove crabs reared in *Avicennia* and cattle fish was significantly different (p<0.05) with *Avicennia* and goldstripe sardinella and tilapia treatments, and then *Avicennia* and goldstripe sardinella were not significantly different with *Avicennia* and tilapia and then *Sonneratia* and cattle fish and tilapia (p>0.05) but significantly different from other treatments. Furthermore, the absolute growth of mangrove crabs reared in *Sonneratia* and cattle fish was significantly different from *Sonneratia* and goldstripe sardinella and tilapia fish treatments (p<0.05), *Sonneratia* and goldstripe sardinella were not significantly different from *Sonneratia* and tilapia and *Avicennia* and goldstripe sardinella (p>0.05), *Sonneratia* and cattle fish were not significantly different from *Avicennia* and goldstripe sardinella and tilapia fish and *rizophora* and tilapia (p>0.05) but significantly different from other treatments. The best absolute growth of mangrove crab was produced on *Rhizophora* and *Sardinella* vegetation, which was 32.96 g.

Body Chemical Composition

The results of the analysis of the chemical composition of the body of mangrove crabs in the form of crude protein, crude fat, NFE, and body energy of mangrove crab maintained by the silvofishery system on mangrove species and fish feed types were presented in Table 3 below.

Table 3. Chemical composition of mangrove crabs on mangrove species and fish feeds

Vegetation and Type of Feed	(%) ± StDev (n=27)			Body Energy (k.cal/g)
	Crude protein (%)	Crude Fat (%)	NFE (%)	
<i>Rhizophora</i> and cattle fish	82.27±0.84	7.94±0.64	3.23±0.43	4.29±0.55
<i>Rhizophora</i> and goldstripe sardinella	82.61±0.42	7.56±0.47	1.85±0.46	4.18±0.07
<i>Rhizophora</i> and tilapia fish	82.32±1.38	7.55±0.63	2.99±1.31	4.25±10.00
<i>Avicennia</i> and cattle fish	81.99±0.33	8.02±0.76	3.59±1.49	4.14±0.30
<i>Avicennia</i> and goldstripe sardinella	81.85±0.77	7.55±0.35	3.88±0.24	4.28±0.02
<i>Avicennia</i> and tilapia fish	83.70±1.20	7.29±0.18	3.00±1.75	4.11±0.34
<i>Sonneratia</i> and cattle fish	82.42±0.99	7.68±0.58	2.70±0.92	4.26±0.04
<i>Sonneratia</i> and goldstripe sardinella	82.44±0.46	7.41±0.40	2.97±0.62	4.24±0.02
<i>Sonneratia</i> and tilapia fish	82.09±0.40	7.29±0.17	4.26±0.61	4.29±0.02

Description: Not significantly different between treatments (p>0.05)

The results of the analysis of variance showed that the types of mangrove and trush fish had no significant effect (p>0.05) on crude protein, crude fat, NFE, and energy levels of mangrove crab.

DISCUSSION

Based on Table 1, it can be seen that the average survival value of mangrove crabs reared on various type of mangroves and trush fish did not show a significant difference. This value was not statistically significantly different in the mangrove vegetation, so it can be said that the survival rate of mangrove crabs reared in these three mangrove species was relatively the same. The average survival rate value obtained in this study was quite high, ranging from 83-90%, indicating that these three types of mangrove vegetation were able to support the life of mangrove crabs. This is because mangrove vegetation is a characteristic of coastal ecosystems which is the original habitat of mangrove crabs, a place where mangrove crabs live, breed, and forage for food. The results obtained in this study are in line with Asriani's *et al.* research (2019) that there is no difference in the survival of mangrove crabs because mangroves are the natural habitat of mangrove crabs. has met the needs of mangrove crabs for various needs including locomotion activities and survival. To maintain the existence of life and growth, the Mangrove crab requires a certain amount of feed. Mangrove crabs will grow well if the feed consumed follows their needs. However, all types of trash fish were statistically different, with the highest survival value obtained was tilapia fish, which was 80-90%, it is suspected that tilapia has protein content which is still in the high protein category, easy to digest, and does not use too much energy for the feed used. According to Karim (2007), the resulting survival rate provides an overview of the results of the interaction between the carrying capacity of the feed.

Several research results on mangrove crab silvofishery according to Nagelkerken *et al.*, 2008; Kochev, (2013) found Mangrove survival and mangrove crabs live in symbiosis because the mangrove area provides a suitable habitat for mangrove crabs and vice versa, mangrove crabs help in inserting oxygen into the mangrove substrate. According to Harshith *et al* (2016) crabs are an important part of the mangrove ecosystem and eat leaf litter and other organic materials as food reserves. Mangrove crabs have a high survival rate, this is because the mangrove land in the research location is still quite good. The mangrove crab population is typically associated with mangrove vegetation which is still in good condition (Wijaya *et al.*, 2010). The survival rate obtained in this study was higher than Asriani, *et al.* (2019) who got a survival rate of 84-86% and lower than Natan (2014) which the result of survival rate reached 100% with a stocking density of 1 fish/cage, because their lives were isolated in each maintenance box then there is no cannibalism process.

The average absolute growth value of crabs obtained in this study was different. Based on table 2, the highest absolute growth of mangrove crabs was produced by Rhizophora vegetation type of bycatch fish feed goldstripe sardinella, with a growth of 32.96 g, while the highest growth of mangrove crabs from Avicennia vegetation was produced, namely 19.76 ± 0.12 g of trush fish feed and growth of crabs. The highest Sonneratia mangrove vegetation produced was 23.88 g of trash fish goldstripe sardinella feed. The value of this range is higher than the study of Tulangow *et al.* (2019) which has an absolute growth value of 24.66 g.

The highest absolute growth was obtained in Rhizophora and goldstripe sardinella because this vegetation was thought to have higher productivity and abundance of feed compared to Avicennia and Sonneratia and also in line with chemical tests having the highest protein for goldstripe sardinellafeed, which was 81.48%.

Crab growth is due to maintenance in a limited space so that the ability to move is very limited, so that crabs can minimize energy, and the stored energy is used for growth. If the use of energy for osmoregulation (environmental adaptation) is low, it will allow a larger portion of the energy for growth (Wamnebo, 2022). Litter productivity greatly affects the quality of the mangrove ecosystem and also environmental quality affects the growth rate of crabs. The abundance of feed affects the metabolism and chemical composition of the Mangrove crab body in Rhizophora relatively higher than in other vegetation. High in protein, fat, and body energy of mangrove crabs on Rhizophora causes higher nutrient retention so that the growth of mangrove crabs on Rhizophora is higher than in other vegetation. This is because litter productivity is an indicator of the quality of the mangrove ecosystem.

Based on table 3, it is known that the chemical composition of the body of the mangrove crabs kept is not significantly different in the three types of mangroves. This result was due to the three types of mangroves having the same litter productivity and abundance of macrozoobenthos. This encourages the availability of feed so that it affects the metabolism of crabs. With abundant feed, crabs can consume feed according to their needs. Sufficient feed is available and its high utilization rate causes the body's chemical composition to be high. Crabs need feed to maintain their existence and growth and will grow well if the feed is available in sufficient quantities and contains all the required nutrient elements at optimal levels (Aslamyah & Fujaya 2012). Several studies have shown that different conditions can affect the chemical composition of the body (protein, fat, and fiber) of crustaceans (Jacoeb and Carter, 2008). Energy requirements are influenced by several factors, including species, age, size, activity, and type of feed. Crabs obtain energy through the food they consume and the expenditure is used for various activities, including protecting their bodies against environmental changes (Karim, 2007). The utilization of feed is closely related to the entry of energy sources and is utilized by Mangrove crabs for growth (Rahadiyani *et al.* 2014). Changes in the percentage of nutrients in the crab's body indicate the use of these nutrients, both as a source of energy and as an insulator and protector of important organs (Katiandagho, 2014). According to Aslamyah and Fujaya (2012), the energy derived from the feed is used by crabs for growth, reproduction, and physiological activities.

The range of protein, fat, and energy values of crabs in this study was relatively the same as the range of values obtained by Karim *et al.* (2017), namely protein (45.26-47.54%), fat (10.33-12.75%) with using different types of feed. Protein

is a building block, regulator and burner). As a protein-building substance, it functions to repair damaged or shrinking tissue and to build new tissue (Kabangga *et al.*, 2004).

IV. CONCLUSIONS

Based on the results of the research that has been carried out, it can be concluded that the survival of mangrove crabs reared in the silvofishery system is highest in *Rhizophora* mangrove and tilapia fish. Furthermore, the highest absolute growth was obtained in those reared on *Rhizophora* and Goldstripe sardinella.

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Role of Manufacturing Sector in Development of Eastern Region of Uttar Pradesh

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Abstract

Eastern region of Uttar Pradesh (U.P.) is an agrarian economy and demographic profile is predominantly rural in character with high level of poverty. Small and marginal farmers dominate the scenario of land holding. Main source of income of majority of population is agriculture. There are many districts in the eastern region of Uttar Pradesh, where agro-based industry could be established. Maharajnagar is the one district, where over 11.5 per cent of the total land of the district is covered by forest which offer very good potential for forest based industries. On the other hand, Sonbhadra district is rich in mineral and forest resources. Sonbhadra and Mirzapur can be developed on the basis of development of stone based industries. Ambedkar, Azamgarh, Mau, and Varanasi are suitable for manufacturing of handloom and powerloom based cloths. Ambedkar is known for its Tanda terri-cotton cloths. However, Benarasi Sari (Hand Looms/ Power Looms) of Mubarakpur is famous all over the world. It is a village household industry with looms setup in the most of rural households. This cluster constitutes the most important industry in the district affording maximum employment and is responsible for major percentage of values of industrial production in the district. Agriculture and industry are not exclusive of each other. For example, the agro based industries in India have given major boost to agriculture by raising its productivity. To support the development of agriculture sector there is a strong need to develop industrial sector in the eastern region of Uttar Pradesh. Eastern region of Uttar Pradesh has potential for development of agro based industries, forest based industries, and mineral based industries provided all infrastructural facilities like transport, communication, and regular power supply are made available to the eastern region of Uttar Pradesh. This paper focuses on the importance of development of manufacturing sector in the eastern region of Uttar Pradesh and find out the potential for development of micro, small and medium Enterprises (MSMEs) in manufacturing sector as manufacturing industries not only help in modernising of agriculture, which forms the backbone of our economy, they also help in creation of job opportunities for those depending on agriculture for their livelihood.

Keywords: manufacturing sector, eastern region of Uttar Pradesh, MSMEs.

JEL: A1, J23, L60, Q10, R10.

Introduction

Uttar Pradesh with its largest population and the largest producer of agricultural products in India, it is also the largest consumer market of the country. It had the largest number of estimated Micro, Small and Medium Enterprises (MSMEs) with a share of 14.20 per cent of MSMEs in the

country (ASSOCHAM) and its contribution to national output stood at 8 per cent, such that it is third largest contributor to India's gross domestic product (RBI. 2018). It has the biggest railway network in the country with a railway density of 40 km which is double the rail density of the India. Agriculture, fertilisers, cement, coal and manufacturing are the major sectors and industries served by the railways (IBEF. 2018: 16). It is a state with an access to a robust industrial infrastructure, has 15 industrial areas, 12 specialised parks (IBEF. 2018: 28), 4 growth centres and Industrial Infrastructure Development Centres (IIDC). However, since 2005, the gap between its per capital income and the national average has widened consistently. Asian Development¹ Bank has estimated that per capital income of U.P stood at less than 50 per cent of the national average in 2017-18. Agriculture still accounts for quarter of the state's output.²

Eastern region is the most populous region, contributing nearly 40 per cent to the state population. This region is officially designated as backward region (GoUP.2008). It is critically short of power and no development can take place without regular power supply. Credit to small and tiny has been a chronic problem of the eastern region. This needs to be solved through mechanism of self-help groups and incentives to local bodies for successful arrangements with the rural banks (Government of India a:47)

Uttar Pradesh comprises 75 districts divided into four economic regions called Western, Central, Eastern and Bundelkhand region. This study focuses on the importance of manufacturing sector on the socio-economic development of eastern region, which is also known as Purvanchal region comprises 28 districts of Uttar Pradesh, viz., Ambedkar Nagar, Amethi, Azamgarh, Bahraich, Balrampur, Ballia, Basti, Chandauli, Deoria, Ayodhya (Faizabad), Ghazipur, Gonda, Gorakhpur, Jaunpur, Kaushambi, Kushinagar, Maharganj, Mau, Mirzapur, Pratapgarh, Prayagraj (Allahabad), Sant Kabir Nagar, Sant Ravidas Nagar, Shrawasti, Siddharth Nagar, Sonbhadra, Sultanpur, and Varanasi.

In 2006 the Ministry of Panchyati Raj named Ambedkar Nagar, Azamgarh, Jaunpur, Maharajganj, and Mirzapur as one of the country's 250 most backward districts out of a total of 640. It is one of the 34 districts in Uttar Pradesh currently receiving funds from the Backward Regions Grant Fund Programme (BRGF). Micro and Small enterprises clusters exists in Ambedkar Nagar. Tanda city of Ambedkar Nagar is famous for Tand terri-cotton cloths. Main business in this district depends on hand-loom and power-loom. The cloths of Tanda are now exported to other different countries. Ambedkar Nagar has potential for development of power-loom as most of the people in the district are self-employed in the power loom. There is one cluster in manufacturing sector at Mariyahu based on Woollen Durry. Mirzapur is known for its stone based industries as huge quantity of raw materials are available in the district. There are four clusters in the manufacturing sector, viz., Brass & German Silver Utensils Cluster Mirzapur, Woolen Carpets and Durries Cluster, Plaster of Paris Idols and Toys Cluster, and Sandstone Blocks and Slabs.

Balrampur town is known for Balrampur Chini Mills, one of the largest sugar manufacturing industries in the country. The most of the land in the district is very fertile and is

suitable for its main crop sugarcane, wheat, rice and mustard etc. However, agriculture farming in the district depends on rain water.

The main occupation of the people of Azamgarh is agriculture as the industrial base of the district is very weak. However agricultural base is very strong. The cluster of Banasari Saree (hand-loom/power-loom) of Mubarakpur is providing maximum employment in the district and is responsible for major percentage of values of industrial production in the district. It is a village household industry as most of the looms are set-up in the rural households. The main places are Mubarakpur, Jahanganj, and Jeeyanpur etc. The weavers in this district are very proficient and possessor of innate skill, and use mill made yarn. This district is also known for its pottery, which is one of the oldest industries of the district, contributing substantially to the economic life of the people. The fancy pottery made in Nizamabad is famous in the world. The identified clusters in the district are Black Pottery Cluster of Nizamabad, Jute Rope/Yarn Cluster of Koelsa, Jute Rope/Yarn Cluster of Rani Ki Sarai. Jute rope, yarn and bags are another important industry in the district providing employment to its youth. Jute, yarn, and bags are manufactured at Koelsa and Rani Ki Sarai (Government of India c).

The industrial sector of Ballia is dominated by agro-processing. The Maniar is a place in the Ballia, where bindi (Indian ladies putting on their forehead) is manufactured. Hence, Maniar is known for its bindi industry and major supplier. Sugar refineries and mills for extracting oil from seeds are located in Faizabad. Faizabad is a market centre for the produce of the surrounding area, including grain, oilseeds, cotton, and tobacco. A hydroelectric plant is located nearby. The identified cluster in the district is Lead Acid Storage Battery.

There are five major clusters in manufacture sector in Gorakhpur district, viz., Chauri Chaura Leather Cluster, Power-Loom Cluster, Gorakhpur Stationery Cluster, Gorakhpur Plastic Cluster, Gorakhpur Readymade Garment Cluster. There is only one cluster in Ghazipur district named as Jute Wall Hanging Cluster. The Government Opium & Alkied Industries in Ghazipur is exporting the items i.e. Opium Powder I.P. and Opium Cake I.P. and in future their export may likely to be increased.

Mau, formerly Mau Nath Bhanjan is a small industrial town on the banks of Ghaghara (Saryu) is the powerhouse of textile weavers in eastern region of Uttar Pradesh. There is one cluster in manufacturing sector called Hand looms and Power looms.

Sravasti is industrially backward district. However, with the development of basic infrastructure like industrial estate and transportation facilities there is huge scope of forest and agro-based industries in this district.

The economy of Bahraich and Chandauli district is mainly agrarian in nature. Both districts are industrially backward district and most of the industries in this district are based on agricultural and forest products. Sericulture is another occupation in the Bahraich district where people depends on for their livelihood. The Tendu leaves are found in huge quantity in Chaundali district, which is used for making 'Beedi' (Government of India c).

The major clusters in manufacturing sector in Varanasi district are Glass Beads, Silk Brocades Cluster, Handloom Clusters at Saraiyan, Bazardeeha, Baragaon, Harshosh, Jallipura,

Lallapura, Sarimohna, Katehar. The major exportable items of M/s DLW located in Varanasi is Diesel Engine, which is exported to countries like Nepal, Bangladesh, Srilanka, Bhutan, and Vietnam etc.

Sant Ravidas Nagar (Bhadohi) district is known by the name of ‘Carpet city’ as it is home to the largest hand-knotted carpet weaving industry hubs in South Asia. It is biggest carpet manufacturing centre in India. There is one cluster named as Cluster of Carpet Industries. The Mirzapur-Bhadohi region is the largest handmade carpet weaving cluster, engaging around 3.2 million people in the industry, while Bhadohi employs 22 lakh rural artisans.

Pratapgarh district is known for its amla-based product. This district has one cluster in manufacturing called Amla cluster, located in Chilbila. There is one cluster in Sant Kabir Nagar district named as Brass Ware Cluster. The principal products manufactured in this cluster are brass utensils namely Thali, Lota, Glass, Parat, Bowl, Kalchi, Kalash etc. There is one cluster each in Siddharth Nagar and Sultanpur districts, called Rice Cluster and Moojh Rope Cluster respectively in manufacturing sector.

Sonebhadra district is rich in mineral and forest resources, though the main occupation of people is agriculture. The district has historic, cultural, and ecological affinities with the Bundelkhand region. Obra, Anpara, Renusagar and NTPC Rihand & NTPC Shaktinagar are the power project located in this district.

Potential for Development of Manufacturing Industries

The eastern zone is by far the most backward region in terms of industrialisation and value addition. There is potential for industrial development in the region. The potential of rural entrepreneurship has not been fully utilised because of a very low level of operations. Based on Chinese models of village and town level enterprises, eastern region could formulate policies for village level enterprises according to prevailing specialisation to increase scale of operation (Government of India a: 44). Growth in exports provides a much needed pathway for job creation in eastern region. For instance, in just five year period 2001-2006, labour-intensive exports enabled China to create 70 million jobs for workers with primary education (Los et al. 2015: 19-32). In India, increase export explains the conversion of about 800,000 jobs from informal to formal between 1991 and 2001, representing 0.1 per cent of labour force (ILO Report. 2019). China’s image as a low-cost location for final assembly of industrial products was rapidly changing due to labour shortages and increases in wages. These developments in China present an unprecedented opportunity to chart a similar export trajectory as that pursued by China and create unparalleled job opportunities for its youth. By importing components and assembling them in China for the world, China created job at an unprecedented scale. Similarly, by integrating “Assemble in eastern region for the world” into Make in India, eastern region could create job opportunities for the youth (Government of India b: 100-101).

The gross domestic product by economic activity for 2018-19 is given in the Table 1, while Table 2 explains the same in percentage. Primary sector comprises: (i) agriculture, forestry and fishing which includes crops; livestock; forestry and logging; fishing and aquaculture, (ii) mining and quarrying. Secondary sector comprises: (i) manufacturing, (ii) electricity, gas, water

supply and other utility services, and (iii) construction. Tertiary sector consists of: (i) trade and hotel and restaurant, (ii) financial services, (iii) real estate, ownership of dwellings and professional services, (iv) public administration, (v) transport, storage and communication, and (vi) other services. Transport, storage and communication include railway, other means of transport, storage, communication and services related to broadcasting.

Except Kaushambi, Mirzapur, Prayagraj and Sonbhadra, contribution of agriculture, forestry and fishing in primary sector of all districts of eastern region of Uttar Pradesh is above 93 per cent. This shows that most of the people in the eastern region depend on primary sector especially in agriculture, forestry and fishing for their livelihood. In Sonbhadra district contribution of mining and quarrying in primary sector is 82.16 per cent as shown in the Table 2.

Table 1: Gross District Domestic Product by Economic Activity 2018-19 (Revised)
At Constant Prices in Crores Rs. (Base Year 2011-12)

District	Economic Activity			
	Primary Sector		Secondary Sector	Tertiary Sector
	Agriculture, Forestry, and Fishing	Mining and Quarrying	Manufacturing	Financial Services
Ambedkar Nagar	2047.14 (2194.36)	147.22	664.29 (1108.87)	392.96 (4334.86)
Amethi	1843.76 (1859.87)	16.12	1267.59 (1948.51)	449.10 (3318.52)
Azamgarh	3352.15 (3430.28)	78.13	213.23 (1488.59)	727.44 (8196.92)
Ayodhya	2271.89 (2357.43)	85.54	731.67 (1215.66)	435.06 (5999.73)
Bahraich	3550.97 (3670.96)	119.99	477.71 (766.83)	458.45 (5642.91)
Balrampur	2143.56 (2206.52)	62.96	442.75 (613.69)	325.13 (2844.03)
Ballia	2244.61 (2332.60)	87.99	345.74 (868.74)	505.23 (5485.67)
Basti	2059.72 (2198.58)	138.86	314.44 (1038.85)	383.60 (5420.18)
Chandauli	1509.63 (1618.51)	108.88	830.07 (1115.24)	381.26 (3295.45)
Deoria	1859.59 (1895.79)	36.20	365.36 (737.09)	507.57 (6217.21)
Ghazipur	2411.65 (2481.39)	69.74	455.92 (1013.82)	629.20 (7230.51)
Gonda	3409.19 (3548.36)	139.17	878.96 (1412.95)	526.29 (5852.92)
Gorakhpur	2990.51 (3156.09)	165.58	1443.21 (3384.53)	944.97 (11485.52)

Jaunpur	2382.82 (2426.50)	43.69	682.06 (1726.60)	781.24 (7327.89)
Kaushambi	1280.84 (1856.83)	575.99	230.10 (1640.91)	287.70 (2550.23)
Kushinagar	3798.52 (3858.74)	60.22	624.55 (1612.70)	467.81 (5648.69)
Maharganj	2141.06 (2174.07)	33.01	343.62 (1056.61)	360.21 (4951.40)
Mau	1037.44 (1058.51)	21.07	781.97 (1901.50)	369.57 (4674.07)
Mirzapur	1894.43 (2894.61)	1000.17	878.97 (1962.64)	437.40 (5839.69)
Pratapgarh	2105.25 (2135.10)	29.85	200.79 (697.18)	570.73 (5465.54)
Prayagraj (Allahabad)	3634.13 (4941.96)	1307.82	3307.79 (10487.76)	1258.41 (20962.60)
Sant Kabir Nagar	1628.10 (1737.20)	109.10	193.44 (393.62)	280.69 (2223.05)
Sant Ravidas Nagar (Bhadohi)	836.20 (897.34)	61.14	1292.14 (1893.49)	294.72 (2951.56)
Shrawasti	897.34 (964.17)	66.83	150.67 (298.97)	161.39 (1429.78)
Siddharth Nagar	2473.78 (2525.31)	51.54	216.82 (1106.44)	346.18 (3936.55)
Sonbhadra	881.65 (4942.25)	4060.60	1955.80 (2465.82)	357.87 (5137.92)
Sultanpur	2064.75 (2085.87)	21.11	519.95 (1590.91)	399.98 (5150.10)
Varanasi	1811.76 (1845.30)	33.54	1777.38 (4669.95)	1160.17 (11047.06)
Eastern Region	60562.13 (69294.19)	8732.06 (69294.19)	21586.95 (50218.46)	14200.35 (164620.58)
Uttar Pradesh	249032.15		295970.09	515745.41

Source: Directorate of Economics and Statistics, Government of Uttar Pradesh.
<http://updes.up.nic.in>

Note: Figures in parenthesis shows data for primary sector, secondary sector, and tertiary sector.

Table 2: Gross District Domestic Product by Economic Activity 2018-19 (Revised)
(In Percentage)

District	Economic Activity		
	Primary Sector	Secondary Sector	Tertiary Sector

	Agriculture, Forestry, and Fishing	Mining and Quarrying	Manufacturing	Financial Services
Ambedkar Nagar	93.29	6.70	59.90	9.06
Amethi	99.13	0.86	65.05	0.001
Azamgarh	97.72	2.27	14.32	8.87
Ayodhya	96.37	3.62	60.18	7.25
Bahraich	96.73	3.26	62.29	9.71
Balrampur	97.14	2.85	72.14	11.43
Ballia	96.22	3.77	39.79	9.20
Basti	93.68	6.31	30.26	7.07
Chandauli	93.27	0.00067	74.42	11.56
Deoria	98.09	1.90	49.56	8.16
Ghazipur	97.18	2.81	44.97	8.70
Gonda	96.07	3.92	62.20	8.99
Gorakhpur	94.75	5.24	42.64	8.22
Jaunpur	98.19	1.80	39.50	10.66
Kaushambi	68.97	31.02	14.02	11.28
Kushinagar	98.43	0.15	38.72	8.28
Maharganj	98.48	1.51	32.52	7.27
Mau	98.00	1.99	41.12	7.90
Mirzapur	65.44	34.55	44.78	7.49
Pratapgarh	98.60	1.39	28.80	10.44
Prayagraj (Allahabad)	73.53	26.46	31.53	6.00
Sant Kabir Nagar	93.71	6.28	49.14	12.62
Sant Ravidas Nagar (Bhadohi)	93.18	6.81	68.24	9.98
Shrawasti	93.06	6.93	50.39	11.28
Siddharth Nagar	97.95	2.04	19.59	8.79
Sonbhadra	17.83	82.16	79.31	6.96
Sultanpur	98.98	1.01	32.68	7.76
Varanasi	98.18	1.81	38.05	10.50
Eastern Region	87.39	12.60	42.98	8.62
Eastern Region	27.82		16.96	31.91

Note: Table 2 shows the figures of Table 1 in percentage calculated by author.

The contribution of primary sector, secondary sector, and tertiary sector of eastern region in gross domestic product of Uttar Pradesh is 27.82, 16.96, and 31.91 per cent respectively. The contribution of secondary sector is very low. This shows that growth of manufacturing sector in the eastern region is very poor. As compared to agriculture, forestry, and fishing, the contribution of manufacturing sector is very low. The development of any economy depends on manufacturing sector as it is considered as the backbone of development in general and economic development in particular. Manufacturing industries not only help in modernising agriculture, which forms the backbone of our economy, they also reduce the pressure of increasing population on agriculture and provide opportunities for employment in secondary and

tertiary sectors. Development of manufacturing industries is precondition for eradication of poverty and unemployment. Exports of manufactured goods expand trade and commerce and bring in much needed foreign exchange. There is potential for development of both agriculture and industry in the eastern region. Development in this region is not exclusive but move hand in hand.

Shravasti district is endowed with natural resources, historical monuments, famous temples, pilgrimage centres; and presence of Sangam, Allahabad Fort, Patalpuri Temple and Akshaya Vat, Anand Bhawan, Swaraj Bhawan, Khusrau Bagh, Hanuman Mandir, Allahabad Museum in Prayagraj district have made the district very important tourist and pilgrim destination. Thus, both Shravasti and Prayagraj (Allahabad) could be developed as tourist and pilgrim destinations with the proper development of these attractions. Besides, with the development of basic infrastructure like industrial estate and transportation facilities there is huge scope of forest and agro-based industries in Shravasti district.

Gorakhpur, Deoria, Basti, Gonda, Bahraich, and Faizabad are sugar producing district in the Tarai region. Sugar industries could be developed in these districts if proper social and physical infrastructure facilities are made available in these districts. Knowledge-based industries could be developed in the Allahabad and Varanasi districts. Eastern region of Uttar Pradesh has potential for development of agro based industries, forest based industries, knowledge-based industries, and mineral based industries provided all infrastructural facilities like transport, communication, and regular power supply are made available to the eastern region of Uttar Pradesh.

Obstacles for Development of Industries

The strength of eastern region of U.P. lies in its strong agricultural base and high level of output and naturally developed industrially activities across different districts of the eastern region. However, in terms of per capita production and yield per hectare in the eastern region is very low. Further, damaged roads, inadequate street light, irregular power supply and power cut, law and order problems, lack of marketing assistance for exports, insufficient supply of skilled labour, illegal and encroachment in industrial estate, lack of banking and health facilities, limited e-commerce by small exporters, lack of awareness about various government schemes among entrepreneurs, lack of financial assistance from financial institutions, lack of transport facility, inadequate credit facilities for the first generation of entrepreneurs, lack of research and development facilities for development of new products and manufacturing technology, lack of market tie up are several weaknesses in, and threats to the progress of the eastern region. Lack of entrepreneurship among educated youth in the region is responsible for slow industrial development in the region.

Macroeconomic Strategies and Recommendations

Based on the foregoing discussions, the strategies and recommendations for the socio-economic development of eastern region of U.P are summarised. However, at the outset some clear findings need to be reiterated:

1. Relative decline of eastern region in the state economy;
2. Available resources provide strong base for agricultural development and there is potential for development of manufacturing sector;
3. Due to lack of social and physical infrastructure region is lagging behind in industrialization;
4. Bankers do not accept loan applications under Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE) especially in cases of the new entrepreneurs and insist for the collateral security;
5. Investment climate needs to be improved through good governance and make sure that social and physical infrastructure is available;
6. Investment in development of skill and enhancement in employability of the people is required;
7. Low level of diversification, low productivity and low per capital income;
8. Agriculture is not market-oriented; and
9. Eastern region has potential to be emerged as a major assembly hub for several labour intensive products.

Thus, a focused approach is required to develop eastern region. Districts of the eastern region must be developed according to the comparative advantage they enjoy. The solution lies in the rapid urbanisation and industrialisation, better investment climate, investment in social, physical and financial infrastructure both in rural and urban areas, increase in agricultural productivity, efficient irrigation mechanisms and farmer education, education and health facilities, involvement of local bodies in the development programme, public-private partnership, financial arrangement for the development of micro, small and medium enterprises (MSMEs), accessibility to formal financial institution and positive attitude of the administration towards development schemes, and employment opportunities programme, special economic zones (SEZ) are required to be created in Prayagraj (Allahabad), Gorakhpur, and Varanasi, mutual development of agriculture and industry is needed in the region. Along with huge investment in industry, this region requires investment in building human capital and social security.

In order to attract investment in the eastern region from the corporate houses, region should plan financial and commercial complexes at Varanasi and Gorakhpur with modern amenities, connectivity and research facilities through public-private partnership. Research and development centre should be established in the eastern region that focuses on the development of region according to the comparative advantage that each district of the region enjoys. Research activities from all educational institutions should be published and documented to generate a sense of competition and awareness.

Conclusion

Except Sonbhadra, agriculture still remains the primary livelihood option for the majority of the working population in eastern region of Uttar Pradesh. Eastern region of Uttar Pradesh is suitable

for agro-based industries, knowledge-based industries, and stone-based industries. This region has potential for development of labour-intensive product. Cheap labourers are available in more quantity in the eastern region. Making use of imported parts and components, eastern region could be emerged as a major assembly hub for several labour intensive products. By integrating “Assemble in eastern region for the world” into Make in India, eastern region will not only fulfill the demand for unskilled-labour intensive products but also create job opportunities for the youth. The eastern region should specialise more in the areas of its comparative advantage and achieve significant quantity expansion. The eastern region can benefit significantly from utilising the potential opportunities from greater trade with the high income markets; this requires a reorientation of trade specialization towards labour-intensive product lines. This can be achieved both via selective focus on (i) traditional labour intensive sector (Government of India b: 100-109), (ii) promotion of strong local linkages for domestic industries, and (iii) increased participation in global value chain (GVC),³ wherein linkages are globally dispersed. In order to promote industrial investment and attract investment in the region from outside, it is imperative to create an environment which is congenial to entrepreneurship development.

Footnotes

1. Analysis by ADB study team based on data drawn from Government of India. Ministry of Statistics and Program Implementation. www.mospi.gov.in.
2. Data drawn from Government of India. Ministry of Statistics and Program Implementation. Central Statistical Office.
3. A higher level of participation in GVC implies that, for any given country, the share of foreign value added in gross exports is higher than when more inputs are sourced locally.

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The Language of Command in Various English Quran Translation

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Abstract- Quran is the holy book for Muslims which mainly function as guidance. It was revealed in Arabic and for the maintenance of its originality the Quran must be in Arabic, if it is not in Arabic, it is not the Quran. The translation of the Quran into any languages is called translation of the Quran and it is not called the Quran. Theoretically, this can be accepted because the translation of one language into other languages will never be able to transfer the idea completely. There must be something missing because literal translation will not be able to convey the cultural message a word contained due to the different culture of the language. Moreover, subjectivity of the translators is indispensable result from for example their background of knowledge. Consequently, different translator will end up with different translation. This research aimed at analyzing and comparing five English Quran translation in translating the verses of command to see the similarities and differences. The findings of this research revealed that there are some similarities and differences among the five English Quran translation in translating commands. The similarities and differences related to the use of words as well as grammatical constructions. However, those differences do not lead to differences in meaning.

Index Terms- command and prohibition, English Quran translation, verses, translators

INTRODUCTION

The need for translation today is absolutely indispensable to communicate ideas from one language to another in writing form. Translation itself is a form of communication between people of different languages around the world. In theory, translation is defined as the transfer of ideas from one language to another, from the source language to the target language. In the process of translation, it must be able to transfer ideas completely and perfectly. (Dweik & Abu Helwah, 2014). Failure to do this will lead to misunderstanding or misinterpretation of the ideas. For this reason, a translator must

have the skills required to become a translator such as mastering the target language and source language as well.

Translation itself is more needed in line with current global developments where communication between regions in the world can no longer be limited. Developments in all aspects such as technology, communication, transportation, politics, culture are required to always be communicated from one region to another in this world. For that reason, a translation is needed because each region has a different language. With this translation, obviously, it makes communication among people from all over the world much easier.

Translation is also necessary for religious life to understand the holy book as the guidance. For example, Quran as the holy book for the Muslims. As is known, the Quran uses Arabic, while Muslims are not only Arabs but all nations in the world. To be able to understand the Koran, the readers must understand Arabic. In fact, most of the Muslims outside the Arabs do not speak Arabic so they cannot understand the Quran. For that, in order to be understood by non-Arabs, the Quran must be translated into other languages. For the purpose that the Koran can be understood by all readers around the world globally, the Koran must be translated into English as a global language.

Translating religious texts, especially the Quran as a holy book, is not an easy job. It takes the expertise of a translator to be able to translate the Quran from the original Arabic language to the target language, for example English. Gerding-Salas (2000) states that to be able to translate Islamic texts a translator is required not only to be bilingual or multilingual, but also to be bicultural and multicultural. This is because the translation process is not only related to linguistic issues but also cultural transfer issues. However, there have been many translations of the Quran into English that have been produced by translators to meet the needs of readers in understanding the Quran for English speakers. Among these translations are The Holy Qur'an by Abdullah Yusuf Ali, Quran in English by Talal Itani, The Clear Quran by Mustafa Khattab, The Qur'an by M. A. S. Abdel Haleem, and The Glorious Quran by Muhammad M.

Pickthall. These five translations become the object of the present research by analyzing and comparing the translations produced in translating the verses of the Quran related to the commands of Allah SWT. The purpose of this research is to see if there are similarities or differences in the results of the translation of the verses related to the commandments.

REVIEW OF LITERATURE

For Muslims, the Qur'an is the words of Allah revealed to the Prophet Muhammad in Arabic. Experts recognize the quality of the language of the Qur'an so that it cannot be imitated even by Arabs themselves. Even Manafi-Anari (2012) said that the language of the Qur'an is not Arabic but the language of the Arabic Qur'an, which is Arabic specifically for the Koran. This is also acknowledged by Abdalati M. Ali (2020) that the Arabic language of the Qur'an is not only unique but also very complex lexically and grammatically. This is why the Qur'an is very difficult to be translated into any language. Translators must be able to present a translation that can be read and understood by conveying the right meaning. They have to make sure that they are able to translate all the meanings contained in the Qur'anic language into the target language. The conveyance of the meaning contained in the source language must be fully confirmed or which is often claimed to be the universe of discourse. According to Lefevere (2004) the Universe of Discourse is considered as a complete set of ideologies, concepts, people, and objects that are appropriate to a particular culture. In his view, translators need to balance between the discourse of the original text and the discourse of the target language. For this reason, Ali (2012) recommends that a committee of experts in various field of knowledge such as language, culture, history and science of the Quran should be involved in the process of translation.

Schwarz, Laura, and Diana-Bianca (2016) mention some problems related to difficulties in translation such as Language problems, Cultural problems, Textual problems, and Pragmatic problems. Language problems consist of Terminological Problems, Lexical Nature of Problems, and Stylistically Problems. Ali (2012) lists some linguistic problems in translating Quran into English such as Lexical Problems, Syntactic problems, Semantic Problems, Metaphor, Metonymy, Ellipsis, and Polysemy. Cultural problems occur due to the differences between two different cultures – the culture of the source language and the culture of the target language. In translating Quran into English, the two different cultures are Arabic culture and English culture. Textual problems refer to the coherence and cohesion of the textual elements. The Pragmatic problems frequently occur between the source text and target text are the target text reader/source; the transmission path between the message text source/target text, the motivation of the source text/target text, and the text function for both the target and source.

Jahanshahi, Maryam, and Reza Kafipour (2015) found out in their research that the most frequent errors made by students in translating Islamic text into English was related to language problems. When there are similarities between the two

languages – the source and the target language – problems related to language can be reduced. On the contrary, the more the differences, the more difficult the translation process.

One of the forms of language problem is the use of imperative in expressing command. In translating Qur'an into English, the translator should understand the forms and functions of imperative in both languages: Arabic and English. Ingeish, and Saadiya (2009) list several meanings of imperative in Arabic when used in different context. They are Permission, Supplication, Request, Advising and Guiding, Educating by Instruction, Wishing, Disabling, Threat, Insult and Humiliating, Alternative/choice, Obligation/Duty, Urging, Notification, Informing, Irony, Taking a warning or a lesson from, Approval, Putting on the Same Level, Honoring, Astonishment, Thankfulness, Subjugation, Total Acceptance, Give the Lie to Someone, and Making Someone Regret or Grieve for Something. They also compared the meaning of imperative in English which include Permission, Supplication, Request, Advice, Instructions, Wish, Challenge, Threat, Insult, Exhortation, Advertising, Irony, Warning, Suggestion, Invitation, Offer, Promise, Prohibition, Condition, Defiance, and Plea. They revealed from the analysis of the imperative forms in English and Arabic that there are no strict one –to one similarities between the implications of the imperatives in English and their equivalents in Arabic.

RESEARCH METHOD

This is an analysis and comparative study conducted to see the similarities and differences of different English Quran translation. Five eminent English Quran translation were analyzed to see the differences and similarities in translating the selected verses of command and prohibitions. Three selected verses of Quran from the five translations related to command and prohibitions were taken to be analyzed. The analysis aimed at comparing and finding the similarities and differences. If they are similar, in what way they are similar, and if they are different in what way they are different. The five English Quran translation under investigation are The Holy Qur'an by Abdullah Yusuf Ali, Quran in English by Talal Itani, The Clear Quran by Mustafa Khattab, The Qur'an by M. A. S. Abdel Haleem, and The Glorious Quran by Muhammad M. Pickthall.

FINDINGS

1. الَّذِينَ يُقَاتِلُونَكُمْ وَقَاتِلُوا فِي سَبِيلِ اللَّهِ (CH 2 – Al Baqarah: 190)

No.	Translator	Translation
1	Yusuf Ali	Fight in the cause of Allah those who fight you
2	Talal Itani	And fight in the cause of God those who fight you
3	Pickthall	Fight in the way of Allah against those who fight against you

- 4 Mustafa Khattab Fight in the cause of God only against those who wage war against you
5 Abdel Haleem Fight in God's cause against those who fight you,

2. **خُذِ الْعَفْوَ** (CH 7 – Al A'raaf: 199)

No. Translator	Translation
1 Yusuf Ali	Hold to forgiveness
2 Talal Itani	Be tolerant
3 Pickthall	Keep to forgiveness
4 Mustafa Khattab	Be gracious
5 Abdel Haleem	Be tolerant

3. **وَبِالْوَالِدَيْنِ إِحْسَانًا** (CH 17 – Al Israa': 23)

No. Translator	Translation
1 Yusuf Ali	and that ye be kind to parents.
2 Talal Itani	and that you be good to your parents.
3 Pickthall	and (that ye show) kindness to parents.
4 Mustafa Khattab	and honour your parents.
5 Abdel Haleem	and that you be kind to your parents.

DISCUSSION

1. **الَّذِينَ يُقَاتِلُونَكُمْ وَقَاتِلُوا فِي سَبِيلِ اللَّهِ** (CH 2 – Al Baqarah: 190)

From the translation, all of the translators follow the basic construction of command or order in English which use verb 1 or infinitive. The first verb used is also the same where all of the translators used the verb 'fight'. However, the differences that can be seen here are related to the use of 'in the cause of', 'in the way of', and in God's cause', the use of God and Allah, the use of against, and the insertion of the word 'only'.

The use of 'in the cause of' and 'in the way of' does not have significant different in meaning. The first concerns more on the reason to fight, that is for the God, and the latter concerns on the way to fight which has to be in line with the way that the God wishes. The construction 'in the cause of God' and 'in God's cause' have no difference in meaning. Both of them are acceptable in English grammar. Different use of word God and Allah does not bring different understanding because in Islam, Allah is the name of the God. Consequently, anytime the word God is used, the reference will be Allah. The use of word 'against' after the word 'fight' (fight against) is merely to emphasize that the opponent is the enemy. Without using the word 'against' the word fight has already mean that we fight with our enemy. The insertion of the word 'only' in the translation 'Fight in the cause of God only against those who wage war against you' is to accentuate the teaching of Islam that fighting is only allowed if Muslims are attacked. Muslims are prohibited to start the fight.

2. **خُذِ الْعَفْوَ** (CH 7 – Al A'raaf: 199)

All of the translators start the command using verb 1 or infinitive. However, they use different types of verbs to start the command or order. Two of them use full verb, while the other two use 'be' followed by adjective. Other differences are on the use of word 'forgiveness', 'tolerant', and 'gracious'.

In English, the use of 'be' followed by adjective is a form of imperative to give suggestion or advise. In this translation, the adjectives used are tolerant and gracious. These two words are closely related in meaning. Gracious is characterized by kindness and courtesy. One form of kindness is tolerant. Those who are tolerant must be kind, and consequently, gracious. The same goes for the word forgiveness. If you are forgivable, you are gracious. Thus, the use of different words in this translation does not deviate from the original meaning of the word 'afwu' in Arabic.

3. **وَبِالْوَالِدَيْنِ إِحْسَانًا** (CH 17 – Al Israa': 23)

From the translation, only one translation follows the rule of imperative to give command or order in English by using verb 1 or infinitive without mentioning the subjects. The other four use other construction – by mentioning the subjects. Other differences are on the use of 'ye' and 'you', the use of 'kind' and 'good', the use of 'kindness as the noun form of 'kind', and the use of 'parents' and 'your parents'.

In imperative sentences in English, the subject is normally eliminated because it is already clear who the command or order is addressed to, that is the second person. However, the subject can also be mentioned to give emphasis. So, the use of any of these two constructions does not influence meaning. In religious scripts, some old English words are still used like thou, ye, thee, etc. Ye is used for 2nd person plural subject. This is the same as you which is used now to mean 2nd person singular/plural subject/object. So, the use of ye and you in this translation has the same meaning. The use of different words 'kind', 'good', and 'honour' is just a matter of the translators' choice of words., They are all synonymous, so they convey exactly the same meaning. The use of your parents as the objects aims to clarify the reference is the parents of the receiver of the command, not anyone else. The translation 'and that ye be kind to parents' without using your parents, also means the same. Thus, the use of your parents is merely to give emphasis.

CONCLUSION

The finding of the present study leads to conclusion that different English Quran translations have similarities as well as differences in the translation of selected verses of command. The differences are in the form of grammatical construction and the choice of words or diction. The difference construction for translation of verses of command does not change the meaning. They still convey the meaning of command as the original language. The same thing goes for the difference in the word choices of the translators. They use different words which are synonymous. Hence, this does not cause different meaning.

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Comparison Analysis and Data Retrieval to identify the associated people of Instagram by Image Processing

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Abstract— *Instagram has become a fastest growing social network in the last three years. It let the users to share their status by uploading images with a descriptive text, a location, and certain hashtags that do not necessarily represent the substance of the pictures. So now Instagram has become a most popular photo-sharing website. While it is a relatively simple service, Instagram's simplicity has contributed to its worldwide success. But unfortunately, some people misuse this website for unethical activities such as sharing false propaganda and fake news, terrorist activities, unethical religious activities, illicit drug distributions etc. Therefore, this work is to recognize the suitable technologies that can be used to retrieve and analyze image data from Instagram such as Demographic analysis, Text analysis, Image analysis, Snowball Technology and some of the face recognition technologies used in iPhone photos, face recognition technologies such as Eigenfaces technology, Neural Networks, Graph Matching, Line Edge Mapping for a system to retrieve and analyze image data from Instagram and to identify the most associated people of a certain Instagram user.*

Keywords— *Instagram, Social network, Face Recognition, Neural Networks, retrieve and analyze image data, Demographic analysis*

I. INTRODUCTION

In the modern world, social media has become an extremely important part of our lives. Social media applications such as Facebook, Instagram, WhatsApp, and Twitter have become indispensable to everyone. So, when concerning about Instagram, people share thousands of images, posts, comments on their accounts. But sometimes these images, posts, or the comments influence for the national security of a country. This means some people misuse Instagram for some of the illegal activities such as sharing false propaganda and fake news, terrorist activities, unethical religious activities, illicit drug distributions etc. Unfortunately, some of these illegal activities causes for the murders, crimes, or suicides also.

Especially when concerning about Sri Lanka, day by day these kinds of illegal activities are rising. So, it is very important to develop a system to retrieve the data from Instagram accounts and analyze that data to identify the mostly associated people of a certain account.

In present, as some people use Instagram for illegal activities such as sharing false propaganda and fake news, terrorist activities, unethical religious activities, illicit drug distributions etc., many of the times it affects for murders, crimes, or the suicides also. So, to eliminate these types of issues, we may develop a new system that analyses data in a specific user's Instagram account and predict the most associated people with that Instagram account. In here, this system is mainly focusing on developing an algorithm with image processing to recognize the faces of the extracted images and predict the percentages of the mostly associated people. Finally, this system will display the images of most associated people of a certain Instagram user.

So, before the implementation of a system to retrieve data from Instagram and analyze to identify the associated people of Instagram by Image processing we must do a literature review. By this review we present the advantages and drawbacks of some of the data retrieving and analyzing methods and some of the face recognition algorithms, to understands the most suitable technologies for the system that is to be built.

II. LITERATURE REVIEW

This section gives an overview on literature for several existing data retrieving and analyzing technologies and methods such as Demographic analysis, Text analysis, Image analysis, Snowballing method, Coding rules: binary coding and Regression analysis etc. And also, the face recognition algorithms used in iPhone photos, Eigenfaces technology, Neural Networks, Graph Matching technology and Line Edge Mapping Technology.

A. Data Retrieving and Analyzing

There are many research that have been done to retrieve many kinds of data from Instagram and analyze them and identify the relevant details of a certain Instagram image. According to the study of Pang et al.[1] [2] it says that Instagram can be used for demographic analysis, text analysis, image analysis, and age detection. In this work the demographic had been analyzed by the images with various face detection and face analysis technologies. The tags that are corresponding with the images were examined. Penetration has been accomplished via studying the followers of the brand, as well as drinking behaviors.

Then according to the research by Park et al.[1] it says that Snowballing method ,Coding rules: binary coding and Regression analysis can be done with Instagram.[2] To investigate the association between sexual pictures and social involvement, a quantitative method is applied. The number of likes was also utilized. The snowballing approach was used to acquire visual data from individuals. The photos were self-coded using a binary coding method. The behavior of users was examined using regression analysis.

According to a research done by Hosseinmardi et al.[3] Fivefold cross validation , logistic regression classifier with forward feature selection approach can be performed for Instagram.[1] Data is gathered from the very first posts. A predictor was trained using LRC. Instagram comments, photos, and followers were utilized to assess the behavior. The emphasis was on unigrams and bigrams.

When considering the research INSTAFIER it is an Instagram profile verifier.[4] According to the method used in this work they examine an Instagram profile and provide a comprehensive analysis of the account by displaying pie charts for each factor test. So, these pie charts make it easier to learn more about the account.

B. Face Recognition Technologies

a) Face Recognition Technologies use in iPhone Photos

Face recognition and image similarity checking process is mainly used in iPhone photos. Apple initially invented face detection accessible in the Core Image framework as a public API via the CIDetector class. Also this API was utilized by Apple internally in the applications such as Photos. The Viola-Jones detection technique was utilized in the first version of CIDetector.[5]. When they started functioning on a deep learning method to recognizing faces in photos in 2014, Deep convolutional networks (DCN) were only getting started to show promise on tasks that require object recognition. The highly significant of them was a method known as "Overeat" [7] which popularized several simple principles that demonstrated DCNs were highly efficient at scanning a picture for an item. Another technology known as network-in-network [8] is also employed. Utilizing such a network in the previously proposed picture scanning technology would be absolutely unfeasible. They resulted in low efficiency and excessive energy consumption. They wouldn't even being able to save the network into the memory. With that, they tried to approach a technique known as "teacher-student" training [9]. This method offered them with a methodology for training a second thin-and-deep network (the "student") in such a way that the outputs of the enormous, complicated network (the "teacher") that we had trained matched extremely closely. Finally, they developed a deep neural network technique for facial identification which could be executed on-device. They went through numerous cycles of training to get a network model precise enough to support the intended applications. While this network proved accurate and practicable, a significant amount of work had to

be done before it could be deployed on millions of consumer devices [10].

b) Eigenfaces

Eigenface is another most extensively researched techniques that is used for facial recognition. Also, it is referred to as the Karhunen-Loève expansion, eigen picture, eigenvector, and primary component. Principal component analysis was employed in references [6], [7] to effectively portray photographs of people's faces. They contended that each face image could be roughly recreated using a simple set of weights for each face and a typical picture of the face or the eigenpicture. By placing the face image on the eigenpicture, the weights characterizing each face are acquired. Reference [8] employed eigenfaces for face detection and identification, which was inspired by Kirby and Sirovich's method. They said that a face image may be roughly recreated using a minimal set of weights for each face and a typical face photo. By projecting the face image onto the Eigen picture, the weights characterizing each face are acquired.

c) Neural Networks

The desirability of employing neural networks may be related to the nonlinearity of the networks. Because of this, the stage of feature extraction may be more quicker than the linear Karhunen-Loève approaches. WISARD, a network with only one layer of adaptation with a different network for each stored individual, was one of the earliest artificial neural network approaches which is utilized for facial recognition [9]. The method used to build a structure of neural network is crucial for good recognition. It is heavily influenced by the intended use. Face detection has been accomplished using multilayer perceptron [10] and convolutional neural network [11]. A hybrid neural network combining local image sampling, a self-organizing map (SOM) neural network, and a convolutional neural network was proposed in reference [11]. The SOM quantizes picture samples into a spatial area where the input data that are close in the original space are similarly close in the output domain, resulting in dimensional reducing and invariable to slight alterations in the picture sample. In a hierarchical series of layers, the convolutional network captures gradually bigger features and gives partial invariance to translation, rotation, scaling, and deformation. The PDNN [7] learning scheme is divided into two parts. During the first stage, each subdomain is taught using its own images of the face. The subdomain parameters can be learned by certain specific sample data that was collected from different classes of the faces in the second phase, known as learning based on decisions. The strategy of learning based on decisions doesn't train using all of the training examples. Only patterns that have been misclassified are utilized. When any sample is incorrectly categorized to a wrong subdomain, the correct subdomain will adjust its parameters. As a result of which its judgment nearer to the incorrectly classified sample.

The benefits of both the statistical techniques and neural networks are combined in a PDBNN-based biometric identification system, and its shared computing premise is

reasonably simple to execute on a parallel computer. This was stated in [12] that the PDBNN facial recognition system could recognize up to 200 persons and obtain a percentage of 96 correct identification rate in around 1 second. Nevertheless, if the amount of people grows, the cost of computing will rise as time goes on. In generally, neural network techniques run into issues as the number of classes grows. However, they are unsuited for a single model image identification test since training the algorithms to "optimal" parameter values necessitates a large number of model photographs for each individual.

d) Graph Matching

Another method for recognizing faces is graph matching.[13] described a dynamically network structure for deformation resistant object identification that used graph matching to locate the nearest recorded graph Dynamically networked architecture is a variation on traditional artificial neural networks. Objects that were memorized are represented as sparse graphs, the vertices of which are labeled with a multiresolution description in terms of a local power spectrum, and the edges with geometrical distance vectors. Recognition of objects may be expressed as graph matching, that is accomplished by stochastic optimization of a matching cost function. They reported positive results on a database of 87 persons and a tiny collection of office objects consisting of distinct phrases rotated 15 degrees.

On a parallel computer with 23 transputers, the matching procedure is computationally intensive, requiring roughly 25 seconds to compare with 87 stored items. The approach was expanded in reference[7], which matched human faces to a gallery of 112 neutral frontal view faces. Because of the rotation in depth and the shifting face expression, the probe pictures were distorted. On faces with considerable rotation angles, encouraging results were found. They reported recognition rates with the percentage of 86.5 and 66.4 for matching tests of 111 faces rotated 15 degrees and 110 faces rotated 30 degrees to a gallery of 112 neutral frontal images, respectively. In terms of rotation invariance, dynamic link architecture outperforms conventional face recognition systems; nonetheless, the matching procedure is computationally costly.

e) Line Edge Map (LEM)

Edge detail is a helpful object representating element that is relatively insensitive to variations in illumination. Despite the fact that the edge map is widely utilized in many pattern recognition domains, it has been mostly ignored in face recognition, with the exception of recent work presented in [7].Object edge images might be utilized for object detection and similar to grayscale photographs in terms of accuracy. Edge maps were used in reference [7] to assess the similarity of facial pictures. The accuracy rate was 92 percent. Takács contended that the process of face recognition may begin considerably earlier, and that edge pictures can be utilized to recognize faces without the participation of high-level cognitive capabilities. [14] proposes a Line Edge Mapping technique for extracting lines as features from a face edge map. This method may be

thought of as a hybrid of geometrical feature matching and template matching. The LEM technique not only offers the benefits of methods based on features, it has benefits such as invariance to illumination and minimal memory demand, but it also has an excellent template matching recognition performance.

Line Edge Mapping technology combines structural and spatial information from a face picture by grouping pixels from the face edge map into line segments. After narrowing the edge map, the LEM of a face is generated using a polygonal line fitting procedure [15]. Figure 1 depicts an illustration of a human front face Line Edge Mapping. Because it simply retains the termination points of line segments on curves, the LEM representation requires less storage. Furthermore, as LEM is a middle-level image representing technology that is constructed from a bottom-level edge mapping representation., it is projected to be less susceptible to variations in light. The line segment is the fundamental unit of LEM, which is made up of pixels from the edge map.

A face prefiltering approach is presented for use as a preprocess of Line Edge Map that matching in a facial recognition program. The prefiltering technique may accelerate the search by lowering the quantity of applicants, and the real matching of the face is only performed on a subset of the models that are remaining.

Experimentations that were done on front view of the faces under controlled or ideal settings show that the suggested Line Edge Map regularly outperforms the edge map. On face databases, LEM successfully identifies a percentage of 100 and 96.43 of the input front views of the faces [14]. Line Edge Map accomplished similarly as the eigenface approach for faces under ideal settings and much better than the eigenface technique for the faces with minor fluctuation of the appearance.

[14] demonstrates that the LEM technique outperforms the eigenface approach for detecting faces in various illumination conditions. The LEM technique is likewise less susceptible to position alterations compared to the eigenface technique, however it is more sensitive to big changes of the expressions on the face.



Figure 1 Line Edge Mapping Illustration

III. ANALYSIS AND DISCUSSION

So, when concerning the above describes data retrieving and analyzing methods in the literature review Snowballing method can be considered as one of the best methods that can be used to collect image data from Instagram.

When concerning Eigenface face recognition technology, it is an effective method for facial recognition. Due to the

simplicity of its method, the construction of an eigenface recognition system is simple. It saves time and space during processing and storage. PCA decreases an image's dimension size in a short amount of time. There is a strong relationship between the training and recognition data. Many factors influence eigenface correctness. Because it uses the pixel value as a comparison for the projection, the accuracy decreases as the light intensity changes. Image preprocessing is essential to produce a decent outcome. One advantage of this technique is that the eigenfaces are created specifically for certain purposes, making the system extremely efficient. One disadvantage is that it is sensitive to lighting conditions and head position. A disadvantage of PPC is that it takes a long time to find the eigenvectors and eigenvalues.

Neural networks are utilized in a wide range of applications, including pattern identification, character recognition, object recognition, and autonomous robot driving. The basic goal of a neural network in face recognition is to be able to train a system to recognize a complicated class of face patterns. To achieve the optimum performance from the neural network, the number of layers, number of nodes, learning rates, and other parameters must be fine-tuned. Because neural networks are nonlinear in nature, they are a popular tool for face recognition. As a result, the extraction of features may be more advantageous and efficient rather than the Principal Component Analysis. The creators When 400 photos of 40 people were used, the face recognition technique achieved 96.2 percent accuracy. When concerning the classification time, it takes less than 0.5 seconds.

Unlike eigenfaces, the graph matching algorithm treats one vector per face feature. The benefit of this is that if any of the features change or are missing, the individual will still be identified. The data may be readily transferred to a database for storage. When new face photos are added, no further work is required to edit templates because they are already saved in the database. It is able to distinguish a person up to 22 degrees of rotation. The disadvantage of this technique is that it is quite sensitive to lighting conditions, and many graphs must be manually positioned on the face. When there is a major shift in illumination, the recognition rate decreases significantly.

The Line Edge Mapping (LEM) approach offers the benefits of feature-based techniques, such as lighting insensitivity and cheap memory requirements. Also has the benefit that the template matching has a high level of recognition performance. Because it simply retains the termination points of line segments on curves, the LEM representation requires less storage. Furthermore, because Line Edge Mapping is a middle-level image representation built from a bottom-level edge map representation, it is projected to be less susceptible to variations in light. The fundamental unit of Line Edge Mapping technique is the line segment, which is made up of pixels from the edge map. A face pre-filtering technique is described for usage as a pre-process of LEM matching in a face identification application. The pre-filtering procedure can speed up the search by lowering the number of possibilities, and facial LEM matching is only performed on a subset of the remaining

models. The only drawback of this technique has been overcome by the specifications of current computer systems and is no longer considered a limitation in any way. Earlier systems had storage capacity issues, making the size of each individual's face template (16 Kilobytes) too large for outmoded computer systems. The application's concurrent multi-threaded processor processes presented a threat to elderly computers as well.

Table 1 Comparison on Face Recognition Technologies

Technology	Advantages	Disadvantage
Eigenfaces	<ul style="list-style-type: none"> • Simplicity is high. • Effective • Save time and space 	<ul style="list-style-type: none"> • Sensitive to lighting conditions and head position.
Neural Networks	<ul style="list-style-type: none"> • Accuracy is high. • Feature extraction is more efficient. • Classification time is very low. 	<ul style="list-style-type: none"> • Much storage is needed.
Graph Matching	<ul style="list-style-type: none"> • if any of the features change or are missing, the people will still be identified 	<ul style="list-style-type: none"> • Sensitive to lighting conditions
Line Edge Map	<ul style="list-style-type: none"> • Insensitive for the lighting conditions. • Cheap memory requirement. 	<ul style="list-style-type: none"> • Computing requirement and the specifications are high.

So according to the review of above advantages and limitations of the face recognition technologies, the most suitable face recognition technology for this system will be Neural Networks.

IV. CONCLUSION

In present, Instagram has become a most popular social media network among the society. Unfortunately, some people misuse it for many of the illegal activities. Also, some of these illegal activities causes for the murders, crimes, or suicides etc. So, it is very important to develop a system to retrieve the data from Instagram accounts and analyze that data to identify the mostly associated people of a certain account.

Data retrieving, Analyzing and Face recognizing technologies are popularly used in the modern world for many applications. In this review paper various Data

Retrieving, Analyzing and Facial Recognition algorithms are discussed, along with their benefits and drawbacks. By using this review as a future work, we will implement a system to retrieve Instagram data and analyze them and identify the most associated people of a certain account of Instagram by Image Processing.

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Analysis Of Policy Implementation On Electronification Application Of Notification Of Tax Payable On Rural And Urban Land And Building Tax In The Special Region Capital Of Jakarta - Indonesia

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Abstract- The dynamics of change in the era of globalization to date mainly lies in the important role of technology. The adoption of technology in many developing countries has brought about drastic changes in tax administration, structure and operations. With the existence of technology that is growing fast in DKI Jakarta, which has the highest portion in Indonesia, it encourages a change in the tax administration model to digital tax administration. One of the changes in tax administration model implemented in DKI Jakarta is the implementation of electronification of a notification of tax payable on rural and urban land and building tax, where taxpayers can make registration and obtain it through an application that has been provided. Before that, a notification of tax payable on rural and urban land and building tax is conventionally printed in a form of paper and then distributed in stages through the District, Sub-District and RW/RT Administrator in order to be submitted to the community (the taxpayers). In order to get a copy of a notification of tax payable on rural and urban land and building tax, the Taxpayers should come to register to the tax office to get its printed copy. Therefore, this study has purpose to analyze the implementation of an electronification policy on a notification on rural and urban tax payable in DKI Jakarta. It is a qualitative study to obtain an in-depth picture about the application of electronification of a notification of tax payable on rural and urban land and building tax in DKI Jakarta. Data collection is conducted through literature and field studies by performing an interview with relevant stakeholders. The result of this study shows that the application of electronification on a notification on rural and urban tax payable in DKI Jakarta can be said successful because in the early of its implementation, the percentage of taxpayers registering themselves to get an electronic document of a notification of tax payable on rural and urban land and building tax of 2021 achieves 90.06%.

Index Terms- Policy Implementation; Land and Building Tax (PBB); A Notification of Tax Payable (a notification of tax payable); electronification.

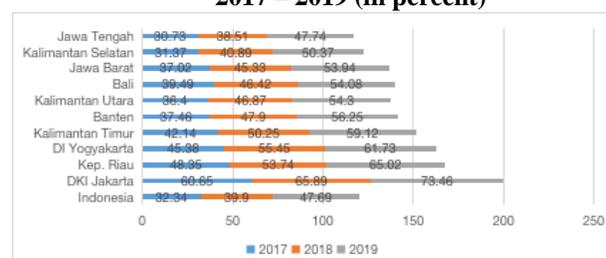
I. INTRODUCTION

Technology and innovation are important elements that encourage a paradigm shift in tax administration from a conventional model to a digital tax administration model. Digital tax administration becomes a model for reporting in real time with the speed of electronic service processes to simplification in tax administration with output in the form of intensive data integration to increase tax revenue and compliance for the taxpayers (Camil, 2021), as well as trust from the taxpayers through a modernization of tax administration by electronification (Aryati & Putritanti, 2016).

The application of modernization of electronification tax system in Jakarta is based on policies regulated in laws and regulations on local taxes and retributions; one of them is land and building tax in rural and urban sectors which is included as a type of local tax and it has applied an electronification in term of issuance of a notification of tax payable, in accordance with district regulation on local tax and regulations stipulated by the Governor of DKI Jakarta as a basis of policy that regulates about the application of digitalization in an electronification of issuance of a notification of tax payable.

DKI Jakarta as a capital of the State of the Republic of Indonesia becomes a region that is included in the largest population compared to other regions in Indonesia in the utilization of information and technology, especially the utilization of internet as seen in Figure 1.

Figure 1. Proportion of Individual Internet User in Indonesia 2017 – 2019 (in percent)



Source: BPS, Statistics of Indonesian Telecommunication in 2019, processed by the Author (2022).

Based on the above figure, the percentage of growth of internet use in DKI Jakarta in 2018 was 65,89 percent. Such percentage was higher than in 2017 which was 60,65 percent.

Entering 2019, its growth increased more to 73,46 percent (BPS, 2019).

The increase of population in DKI Jakarta in utilizing technology and information is in line with total growth of the object on rural and urban land and building tax as seen in this following table:

Table 1. The Growth of Object on Rural and Urban Land and Buiding Tax in DKI Jakarta during 2017 – 2021

Year	Number of Tax Object	Growth of Tax Object
2017	2.016.786	30.397
2018	2.061.681	44.895
2019	2.081.386	19.705
2020	2.107.012	25.626
2021	2.120.277	13.265

Source: Local Revenue Agency of DKI Jakarta, processed by the Author (2022)

As seen in Table 1 above, total object on rural and urban land and building tax determined increases every year. Starting 2017, it has 2.016.786 objects with a growth of 30.397 objects. Then in 2018, total tax object increased 2.061.811 with a growth increasing to 44.895 objects compared to 2017. In 2019, total tax object increases to 2.081.386 objects compared to 2018 with its growth of 19.705 objects compared to 2018. Next, in 2020, total tax object increases to 2.107.012 objects with a growth of 25.626 objects compared to 2019. In 2021, total tax object increases to 2.120.277 objects with a growth of 13.265 objects compared to 2020. It indicates that it still needs effort that should be conducted by the local tax authority of DKI Jakarta to optimize the collection on rural and urban land and building tax. One of the efforts is to

determine an electrification policy on a notification of tax payable on rural and urban land and building tax based on rules determined in the Governor Regulation of DKI Jakarta number 23/2021 on the Amendment to the Governor Regulation Number 27/2018 on the Procedures for Issuance of Regional Notice of Tax Assessment, Assessment Letter of Payment Obligation and a Notification of Tax Payable where its tax is stipulated by the Governor. By stipulating such Governor Regulation, it hopefully gives ease to the taxpayers and may increase the realization of revenue on rural and urban land and building tax. But then, it is not automatically being able to increase the realization of revenue on rural and urban land and building tax as seen in Table 2.

Table 2. Target and Realization on Rural and Urban Land and Building Tax in DKI Jakarta during 2017 – 2021

Year	Target	Realization
2017	7.100.000.000.000	7.001.144.176.545
2018	8.000.000.000.000	7.606.651.990.073
2019	8.500.000.000.000	8.893.076.195.170
2020	10.000.000.000.000	9.649.565.555.778
2021	9.450.000.000.000	8.957.229.158.206

Source: Local Revenue Agency of DKI Jakarta, processed by the Author (2022)

Realization of revenue in Table 2 shows that it only receives 8,95 trillion rupiah in 2021. Such realization of revenue has decreased income of tax revenue by comparing it with tax realization revenue in 2020 which is 9,64 trillion. Therefore, the implementation of an electrification policy requires control and monitoring in its implementation. It is necessarily conducted as an effort of avoiding bad impact on tax collection planning and implementation through an electrification system. In this case, the local tax authority of DKI Jakarta should formulate considerations for the taxpayers who meet requirements as potential taxpayers who can be expected to register themselves in order to get an electronic mail of a notification of tax payable on rural and urban land and building tax through an online tax system that has been provided. Such consideration, requirement and

potency may finally encourage the increase of activities of online tax report submission (Olatunji & Ayodele, 2017).

The main problem as a focus in this study relates to the implementation of an electrification policy on a notification of tax payable on rural and urban land and building tax in DKI Jakarta. Therefore, this study is important to know how far such success of implementation of an electrification policy on a notification of tax payable on rural and urban land and building tax in DKI Jakarta in terms of an implementation model of George Edward III (1984) with 4 (four) success factors, namely communication, resources, implementing officer's attitude, and organizational structure.

II. THEORITICAL REVIEW

The success of application of electronification on a notification of tax payable on rural and urban land and building tax in achieving target and purpose of policies that have been determined by the District Government of DKI Jakarta cannot be separated from general principles in local taxes as expressed by Devas in Sutedi (2015) where it needs the principles of elasticity, justice, ease of administration, politically accepted and may not distort the economy. Rural and urban land and building tax becomes a popular revenue source of the District Government because, according to Bahl and Martinez-Vazquez (2007) the assessed tax object is immovable asset of land and building used as a tax base. In addition, it has a certainty of imposition basis on rural and urban land and building tax so that it can obtain stable local revenue for the development (Bahl & Martinez-Vazquez, 2007). On the other hand, if it is not monitored and controlled in its implementation, Payton (2006) discloses that based on a tax basis, it is obtained an estimation of value quality of tax object that causes bad quality that has impact on inaccuracies in a tax basis so that it creates injustice and economic distortion.

The success or failure of the implementation of electronification in tax administration in achieving the specified goals in DKI Jakarta, especially related to the implementation of electronification on a notification of tax payable on rural and urban land and building tax, requires the accuracy of strategy by considering the hindrance and obstacle arising out of procedural hindrance, supporting capacity of facilities and software in providing property tax services (Das-Gupta, et.al, 1998). The success of implementation on policy, according to George Edwards III (1984), is affected by four (4) factors as follows:

1. **Communication.** Communication is an important factor in the success of policy implementation. Those related to communication in this case among others are the delivery of information, thoughts or ideas, expertise, guidelines and others using facility in its delivery to the information recipient (Arifin, 2000). This policy implementation shall really run effectively if the policy maker and implementing officer know their respective duties and what to do. Communication should not only be right and correct, but the implementing officer should also understand and comprehend the content of information delivered. Communication becomes a benchmark of delivery of policy in a regulation form clearly with the same interpretation and it can be performed consistently with those implementing officer of regulation. Edward III states that there are three (3) important things that need to be considered in the communication process of policy, namely clarity, consistency and transmission.

2. **Resources.** Resources include four (4) components: adequate human resources (enough quantity and quality), availability of information needed to take decision, has adequate authority to conduct the duty or responsibility that has been determined, and supporting means and facility required for the implementation of policy.

3. **Implementing officer's Attitude.** The meaning of attitude here is the attitude shown by an implementing officer in supporting the implementation of policy that has been determined. According to Winarno (2002), in this case, if an implementing officer works well on the decision of policy that has been determined, supports

and most likely the implementing officer shall implement the policy as desired according to the decision that has been made in the beginning, it certainly can encourage the success of the implementation of policy.

4. **Bureaucracy Structure.** According to Edwards III, bureaucracy has 2 (two) main characteristics: standard operational procedures (SOP) and fragmentation. The making of SOP works for internal respon toward the implementing resources, implementation time and standardization in the implementation, especially in the implementation of program in the organization which is complicated and widely spread such as the government.

III. METHOD OF STUDY

This study uses a qualitative approach in order to get an in-depth picture about the implementation of electronification of a notification of tax payable on rural and urban land and building tax based on 4 (four) success factors in the implementation of policy, namely: communication, resources, the implementing officer's attitude and bureaucracy structure.

A method of data collection is used by performing literature and field studies. Literature study is performed by making review on books, literatures and documentations that have connectedness with problem being studied. Field study is performed by an in-depth interview to the informant of relevant stakeholders. Such informants are among others:

1. Local tax authority

- a. Legal Analysis of Junior Expert of Sub-Coordinator for Regulation 1 Affairs is a sub-field under Regulation that has duty to perform formulation, arrangement and establishment of local product of law on local revenue in the form on rural and urban land and building tax;
- b. Analysis of Tax Potency and Extensification 1 is a sub-field under Tax Revenue 1 that has duty to coordinate and formulate the policy of potential exploration and/or extensification on rural and urban land and building tax;
- c. Head of Sub-Field of Development of Informaation System is a sub-field under Planning and Development of Local Revenue Agency that has duty to build and develop a local tax system.
- d. Head of Implementing Unit of System and Data, is the Head of Implementing Unit under Data Center and Local Revenue Information that has duties to perform maintenance and operation of system and data of local tax.
- e. Head of Implementing Unit of Counseling of the Regional Revenue Agency is the Head of Implementing Unit under Data Center and Revenue Information where one of the duties is to conduct counseling and socialization to the taxpayers related to the most updating tax regulation.
- f. Regional Collection Tax Service Unit as a direct service implementing officer to the taxpayers.

2. Academics

Academics shall be the Dean of Economic and Business Faculty of the University of Lampung. An in-depth interview is made with the academics and it may need a neutral party that has theoretical understanding on the problem of study and may give input, criticism and solution related to the problem raised in this study.

3. Taxpayers

An in-depth interview is also conducted to the taxpayers, because the implementation of an electrification policy on a notification of tax payable on rural and urban land and building tax greatly impacts on the taxpayers especially in the changes in service of issuance of a notification of tax payable from conventional to electronic means.

IV. GENERAL OVERVIEW OF THE ISSUANCE OF A NOTIFICATION OF TAX PAYABLE RURAL AND URBAN LAND AND BUILDING TAX IN DKI JAKARTA

A notification of tax payable on rural and urban land and building tax before such implementation of Governor Regulation number 23/2021, its issuance refers to Governor Regulation of DKI Jakarta number 27/2018 on Procedures for Issuance and Establishment of Regional Notice of Tax Assessment, Assessment Letter of Payment Obligation and a Notification of Tax Payable of which its tax is stipulated by the Governor. In the Governor Regulation number 27/2018, the issuance of a notification of tax payable is still in a conventional form with these following flows:

1. Local tax authority determines rural and urban land and building tax;
2. Local tax authority prints a notification of tax payable on rural and urban land and building tax conventionally in a form of paper to be then wet signed by the relevant head of unit office of collection service of local tax;
3. Local tax authority prints the List of Tax Assessments;
4. Tax authority officer verifies and conducts document sorting of a notification of tax payable on rural and urban land and building tax and the document of list of tax assessments based on the level of sub-district to be then distributed to the sub-district offices according to the address of tax object;
5. Sub-District Office sorts documents based on the level of RW/RT, and then distributed to the local RW/RT Administrator;
6. RW/RT Administrator submits documents of a notification of tax payable on rural and urban land and building tax to the citizens as the taxpayers in a domicile environment.
7. RW/RT Administrator returns a receipt of a notification of tax payable on rural and urban land and building tax to the Sub-District Office;
8. The Sub-District collects a report on submission of a notification of tax payable on rural and urban land and building tax and then it is reported to the local tax authority;
9. Taxpayers in need of the copy of a notification of tax payable on rural and urban land and building tax due to they do not receive them or being lost should register themselves by coming to the tax office in accordance with the address of tax object in order to receive the copy sheet of a notification of tax payable on rural and urban land and building tax.

Upon the enforcement of Governor Regulation number 23/2021, the issuance of e-notifications of tax payable on rural and urban land and building tax follows these following flows:

1. Local tax authority determines a notification of tax payable on rural and urban land and building tax;
2. Electronic signing is made on the online system of local tax;
3. Taxpayers register in the canal that has been provided by the local tax authority;

4. Taxpayers receive an email of verification and link to download such document of a notification of tax payable on rural and urban land and building tax;

5. For a notification of tax payable on rural and urban land and building tax next year, taxpayers who have been registered shall receive an email for downloading an electronic document of a notification of tax payable on rural and urban land and building tax automatically.

6. And to get the copy of a notification of tax payable on rural and urban land and building tax, the taxpayers may not need to come to the local tax office, they just register it on the online tax canal of Jakarta and get the copy of an electronic document of a notification of tax payable on rural and urban land and building tax through a registered email.

The difference of issuance of a notification of tax payable on rural and urban land and building tax between conventional and electrification is obviously seen. Fundamental change is related to the issuance of e-notifications of tax payable on rural and urban land and building tax. A notification of tax payable on rural and urban land and building tax is previously issued by the local tax authority of DKI Jakarta in a form of paper and directly given to the taxpayers in stages through sub-district, RW/RT administrator and only then submitted to the community or the taxpayers in a domicile environment. Its monitoring report is also in stages on the opposite way from RT/RW Administrator to the sub-district and then the sub-district reports to the local tax authority of DKI Jakarta. Upon coming into effect of Governor Regulation number 23/2021, the issuance of e-notifications of tax payable on rural and urban land and building tax can be directly obtained by taxpayers through a canal that has been provided by the local tax authority of Jakarta by means of the taxpayers register themselves to get e-notifications of tax payable on rural and urban land and building tax wherever and whenever using their handphones, *personal computers* or laptop that are connected to internet networks. And in terms of delivery reporting on a notification of tax payable on rural and urban land and building tax, it can be directly monitored from the management system on rural and urban land and building tax managed by the local tax authority of DKI Jakarta. It certainly gives ease to the taxpayers and the local tax authority of DKI Jakarta in the management of a notification of tax payable on rural and urban land and building tax.

V. ANALYSIS OF POLICY IMPLEMENTATION OF THE APPLICATION OF ELECTRONIFICATION ON A NOTIFICATION OF TAX PAYABLE ON RURAL AND URBAN LAND AND BUILDING TAX IN DKI JAKARTA

1. Communication in the application of electrification on a notification of tax payable on rural and urban land and building tax in DKI Jakarta

Communication, according to George Edwards III (1984), is an influential factor on the implementation of an electrification policy on a notification of tax payable on rural and urban land and building tax that becomes a benchmark of delivering policies in the form of regulation clearly with the same interpretation and it can be conducted consistently with those implementing officer of the regulation by considering three (3) important aspects, namely clarity, consistency and transmission.

Communication meant in this study relates to communication applied in implementing an electronification policy on a notification of tax payable on rural and urban land and building tax in DKI Jakarta.

From the perspective of communication factor in implementing an electronification policy on a notification of tax payable on rural and urban land and building tax in DKI Jakarta pursuant to Governor Regulation number 23/2021, it is stated that the issuance of e-notifications of tax payable is made through a canal that has been provided. Local tax authority of DKI Jakarta has built an online tax system as the system used to process and issue e-notifications of tax payable on rural and urban land and building tax.

Communication, according to Arifin (2000), is said as a form of delivery of information, thoughts or ideas, expertise, guideline and others using the means in its delivery to the information recipient. At such implementation level of an electronification policy on a notification of tax payable on rural and urban land and building tax in Jakarta which is come into effect in 2021, Zidni Agni Apriya as the Head of Sub-Field of Development of System and Information, Planning and Development Field of the Regional Revenue Agency (Bapenda) of Jakarta Province in a youtube canal on the Learning Wednesday of Jakarta Province on August 18th 2021 says “in this pandemic situation, the acceleration in digital transformation becomes very important to make easy of the administration process and service improvement to the community. There are some kinds of taxes as the main source of tax revenue in Jakarta. It can be seen from its contribution that achieves more than 80% from total tax revenue, namely motor vehicle tax, rural and urban land and building tax, fees for acquisition of rights of lands and buildings, transfer of motor vehicle title fee and self-assessment taxes (Restaurant, Hotel, Entertainment and Parking). For this case, it is made priority of digital transformation process in this tax segment in order to increase compliance of taxpayers and give positive contribution toward local tax revenue”.

Establishment of policies regulating the issuance of e-notifications of tax payable on rural and urban land and building tax, according to Sri Haryati as Acting Official of the Head of Bapenda Jakarta as quoted in a website of merdeka.com on June 6th 2021, says, “this policy hopefully can give ease to the taxpayers in accessing tax documents as well as a strategic initial step to perform a local tax digitalization. Submission policy of e-notification of tax payable on rural and urban land and building tax is a form of implementation of Governor Regulation Number 23/2021. To get electronic document of a notification of tax payable on rural and urban land and building tax of 2021, the community must first register online.

The clarity, consistency and transmission of coming into force the policy in the form of Governor Regulation consistently delivered to the taxpayers on rural and urban land and building tax with a channel of communication using an internet media become an influential factor toward success achieved by the local tax

authority of DKI Jakarta in implementing an electronification policy on a notification of tax payable on rural and urban land and building tax. Therefore, the level of success of policy implementation of an electronification policy on a notification of tax payable on rural and urban land and building tax based on the success factors of George Edward III (1984) in Jakarta is said successful which is indicated by an effort made through a delivery program of e-notifications of tax payable on rural and urban land and building tax in order to achieve purpose for local tax digitalization which assumed to be able to make easy for taxpayers on rural and urban land and building tax in reporting their local tax activities, especially e-rural and urban land and building tax.

Nevertheless, it can be said that a communication factor having impact on success of implementation of an electronification policy on a notification of tax payable on rural and urban land and building tax lies from a clarity of policy determined in the form of Governor Regulation Number 23/2021 which is then performed various socializations by the local tax authority of DKI Jakarta through the use of internet-based social media using various means such as Youtube, Instagram, Facebook, Tiktok and outdoor media in Jakarta in accelerating and introducing digital tax transformation to the taxpayers on rural and urban land and building tax, especially in Jakarta. Such establishment of Governor Regulation can be assumed as a strategic communication in performing local tax digitalization by enforcing the delivery policy of e-notifications of tax payable on rural and urban land and building tax assumed to be able to give ease for the taxpayers on rural and urban land and building tax in DKI Jakarta.

2. Resources in the application of electronification of a notification of tax payable on rural and urban land and building tax in DKI Jakarta

Resources as an influential factor on the success of implementation of a policy, according to George Edwards III (1984), include adequate human resources in terms of enough quantity and quality, availability of information needed for decision making, adequate authority for the policy implementing officer to conduct his/her duties and responsibilities that have been determined, as well as its supporting means and facilities. Resources meant in this study relate to available resources in implementing a policy on the application of electronification of a notification of tax payable on rural and urban land and building tax in DKI Jakarta.

In the implementation of application on local tax digitalization mainly on the type on rural and urban land and building tax, it has capability of tax officer as the policy implementing officer in exploring potential tax revenue on rural and urban land and building tax according to its growing number of notifications of tax payable and the assessment on rural and urban land and building tax for a period of 2017 until 2021 which can be seen in Table 3.

Table 3. The growth of notifications of tax payable and assessments on rural and urban land and building tax in tax year of the period of 2017 – 2021

Tax Year	Number of notifications of tax payable	Number of assessments on rural and urban land and building tax	Growth	
			Notification of tax payable	Assessment on rural and urban land and building tax
2017	2,001,702	8,648,563,417,368		
2018	2,040,911	10,227,447,599,752	1.96%	18.26%
2019	2,062,137	11,430,616,931,674	1.04%	11.76%
2020	2,088,414	13,332,148,095,886	1.27%	16.64%
2021	2,102,899	13,360,857,042,728	0.69%	0.22%

Source: Local Revenue Agency of Jakarta, processed by the Author (2022)

Table 3 may show the capability of the policy implementing officer and availability of means and facilities at the local tax authority of DKI Jakarta in exploring potential revenue on rural and urban land and building tax, there is a growth of notifications of tax payable issued and the growth of assessment values on rural and urban land and building tax that increase in the amount of assessment value on rural and urban land and building tax up to 2021 achieves Rp. 13,36 trillion with 2,10 million notifications of tax payable assessed and issued.

The capability of regional tax officer in achieving the purpose of an electrification policy on notifications of tax payable on rural and urban land and building tax to reach for all taxpayers on rural and urban land and building tax in order to register themselves through a canal provided to get e-notifications of tax payable on rural and urban land and building tax highly affects the successful application of electrification of notifications of tax payable on rural and urban land and building tax. At the beginning of the establishment of an electrification policy on notifications of tax payable on rural and urban land and building tax though in limitation due to being affected by a condition of Covid 19 pandemic time so that such socialization performed by the officer in reaching taxpayers widely through a social media is still conducted. In addition, the tax officer gives direct socialization with RW and RT Administrators restrictively and gradually which then continued to all people (the taxpayers) on rural and urban land and building tax, so that though under Covid 19 pandemic condition, such socialization of the application of electrification on notifications of tax payable on rural and urban land and building tax is still able to reach the whole community.

Thus, it can be said that human resources factor in terms of the policy implementing officer as well as available means and

facilities have impact on the success of implementation of the application of electrification on notifications of tax payable on rural and urban land and building tax that should be supported with capability and competence of tax officer.

3. Implementing officer’s attitude in the application of electrification on notifications of tax payable on rural and urban land and building tax in DKI Jakarta

Implementing officer’s attitude as an influential factor on the success of policy implementation, according to George Edwards III (1984) is a commitment in the form of attitude shown by the policy implementing officer in supporting the policy implementation that has been determined. Implementing officer’s attitude meant in this study relate to a commitment of the policy implementing officer in the implementation of electrification policy on notifications of tax payable on rural and urban land and building tax in DKI Jakarta.

Implementing officer’s attitude in terms of attitude and commitment of the policy implementing officer in implementing an electrification policy on notifications of tax payable on rural and urban land and building tax shows an attitude that has commitment in achieving the level of community awareness to get e-notifications of tax payable on rural and urban land and building tax and increase the realization of revenue on rural and urban land and building tax as a type of local tax significantly contributed to locally-generated revenue. It is reflected from percentage of total electronic documents of notifications of tax payable on rural and urban land and building tax downloaded by taxpayers in 2021 which can be seen in Table 4.

Table 4. Realization of electronic document of notifications of tax payable on rural and urban land and building tax downloaded by taxpayers of DKI Jakarta in 2021 as per December 31st 2021

ADMINISTRAT ION CITY	DISTRICTS	Notifications of tax payable DETERMINE D	Electronification of notifications of tax payable DOWNLOADED	%
WEST JAKARTA	CENGKARENG	97.350	80.021	82.20%
	GROGOL	66.699	58.937	88.36%

	KALIDERES	78.637	63.159	80.32%
	KEBON JERUK	59.802	42.369	70.85%
	KEMBANGAN	64.697	64.580	99.82%
	PALMERAH	34.092	23.982	70.34%
	TAMAN SARI	34.772	32.913	94.65%
	TAMBORA	50.768	41.963	82.66%
	Total	486.817	407.924	83.79%
CENTRAL JAKARTA	CEMPAKA PUTIH	26.009	17.390	66.86%
	GAMBIR	21.304	13.450	63.13%
	JOHAR BARU	20.194	19.231	95.23%
	KEMAYORAN	52.893	52.511	99.28%
	MENTENG	16.417	8.692	52.95%
	SAWAH BESAR	30.757	24.444	79.47%
	SENEN	29.317	24.603	83.92%
	TANAH ABANG	68.731	62.492	90.92%
	Total	265.622	222.813	83.88%
SOUTH JAKARTA	CILANDAK	38.710	36.787	95.03%
	JAGAKARSA	70.212	68.140	97.05%
	KEBAYORAN BARU	43.157	42.941	99.50%
	KEBAYORAN LAMA	61.121	58.932	96.42%
	MAMPANG	27.033	26.983	99.82%
	PANCORAN	40.671	40.566	99.74%
	PASAR MINGGU	55.948	55.504	99.21%
	PESANGGRAHAN	40.079	37.647	93.93%
	SETIABUDI	36.407	36.362	99.88%
TEBET	44.353	42.907	96.74%	
	Total	457.691	446.769	97.61%
EAST JAKARTA	CAKUNG	96.181	92.966	96.66%
	CIPAYUNG	56.571	53.758	95.03%
	CIRACAS	52.946	49.331	93.17%
	DUREN SAWIT	79.553	76.531	96.20%
	JATINEGARA	58.245	54.661	93.85%
	KRAMAT JATI	57.412	55.918	97.40%
	MAKASAR	33.794	32.122	95.05%
	MATRAMAN	28.345	27.972	98.68%
	PASAR REBO	36.571	34.603	94.62%
	PULOGADUNG	49.216	48.102	97.74%
	Total	548.834	525.964	95.83%
NORTH JAKARTA	CILINCING	61.951	58.097	93.78%
	KELAPA GADING	56.511	50.076	88.61%
	KEPULAUAN	4.832	4.701	97.29%
	KOJA	41.547	41.495	99.87%
	PADEMANGAN	49.492	33.177	67.04%
	PENJARINGAN	80.009	59.776	74.71%
	TANJUNG PRIOK	71.092	62.380	87.75%
	Total	365.434	309.702	84.75%
Grand Total		2.124.398	1.913.172	90.06%

Source: Local Revenue Agency of Jakarta, processed by the Author (2022)

It is seen in Table 4 that there are 1.913.172 taxpayers registering themselves and downloading electronic document of notifications of tax payable on rural and urban land and building tax in 2021 with a percentage of 90.06% from 2.124.398 where such notifications of tax payable on rural and urban land and building tax are determined. It shows that in general, such implementing officer's attitude supports the implementation of

application of electronification of notifications of tax payable on rural and urban land and building tax. Meanwhile in terms of realization of revenue on rural and urban land and building tax in Jakarta during the period of 2017 until 2021, it can be seen in Table 5.

Table 5. Realization of revenue on rural and urban land and building tax at DKI Jakarta during 2017 – 2021

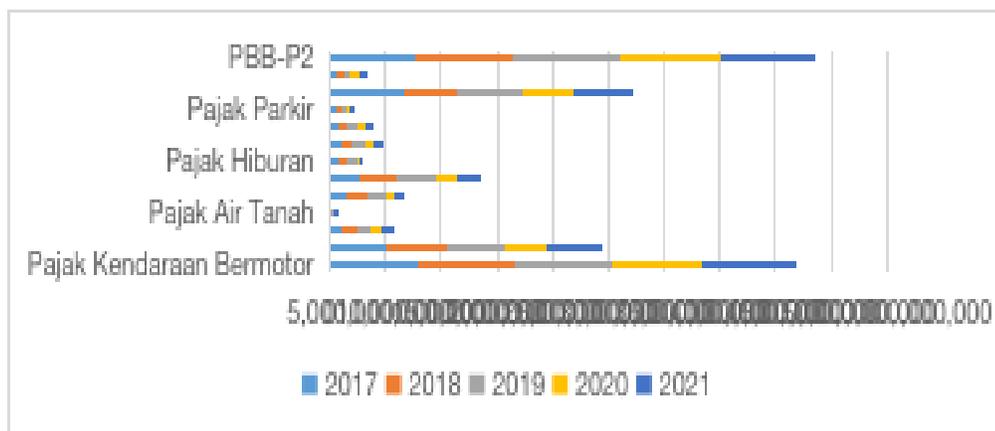
Year	Target	Realization	Percentage
2017	7.100.000.000.000	7.001.144.176.545	99%
2018	8.000.000.000.000	7.606.651.990.073	95%
2019	8.500.000.000.000	8.893.076.195.170	105%
2020	10.000.000.000.000	9.649.565.555.778	96%
2021	9.450.000.000.000	8.957.229.158.206	95%

Source: Local Revenue Agency of Jakarta, processed by the Author (2022).

Table 5 can show an attitude from the commitment of the policy implementing officer in achieving the purpose of policy implementation on rural and urban land and building tax in term of realization level which is still, but it tends to be at more than 90 percent of achievement on the realization of tax revenue on rural and urban land and building tax toward such specified target, though it decreases in 2020 and 2021 due to a decreasing economic condition of the people as a result of Covid 19 pandemic. DKI Jakarta has also applied electronic-based payment on rural and urban land and building tax. This condition reflects a high commitment of the policy implementing officer which has positive values in the effort of achieving realization of tax revenue on target previously determined. Realization of revenue on rural and

urban land and building tax that always has positive values that result in significant contribution toward the original local government revenue. Local tax plays a significant role in the process of generating local revenue and its regional development financing. Teritorial tax (regional) is a mandatory contribution that is charged to the individual person or entity in a territory to the district government, without any balanced direct compensation, being collected and forced in accordance with applicable laws and regulations. (Ering, et.al,2016). The contribution on rural and urban land and building tax toward local tax revenue in Jakarta during 2017 until 2021 can be seen in Figure 2.

Figure 2. Local Tax Revenue in DKI Jakarta during 2017 – 2021



Source: Local Revenue Agency of Jakarta, processed by the Author (2022).

Figure 2 shows the attitude and commitment of the policy implementing officer on rural and urban land and building tax in his/her effort to contribute to the original local government revenue for DKI Jakarta from 2017 to 2021. Rural and urban land and building tax has the highest contribution from other local taxes.

The attitude in the form of commitment from tax officer in the implementation of application of electrification on notifications of tax payable on rural and urban land and building tax at DKI Jakarta in exploring potential tax revenue in terms of the growth of tax revenue on the object on rural and urban land and building tax at DKI Jakarta can be seen in Table 6.

Table 6. Number and Growth of the Objects on rural and urban land and building tax at DKI Jakarta during 2017 – 2021

Year	Number of Tax Object	Growth of Tax Object	Number of Services
2017	2.016.786	30.397	121.313
2018	2.061.681	44.895	117.604
2019	2.081.386	19.705	134.189
2020	2.107.012	25.626	138.364
2021	2.120.277	13.265	103.461

Source: Local Revenue Agency of Jakarta, processed by the Author (2022).

Table 6 shows the attitude and commitment of the implementing officer in exploring potential revenue of local tax, it has the growth of objects on rural and urban land and building tax with an increasing trend of growth every year. We can see that there are 2,107,012 tax objects in 2020 which increases its growth in 2021 as sum of 13.265 tax objects with total tax objects of 2,120,277 objects on rural and urban land and building tax at DKI Jakarta.

The implementing officer's attitude factor in terms of the attitude and commitment of the policy implementing officer has impact on successful implementation of the application of electronification of notifications of tax payable on rural and urban land and building tax with a very significant achievement of contribution to the original local government revenue in exploring potential tax revenue on rural and urban land and building tax from such increasing growth of tax object every year.

Thus, it can be said that the implementing officer's attitude factor in the implementation of the application of electronification of notifications of tax payable on rural and urban land and building tax in terms of the attitude and commitment of the implementing officer has impact on successful policy implementation. It should be supported by availability of means and facilities in optimizing the capability of tax officer in the utilization of electronic-based information and technology, in order to be able to achieve the purpose to reach the whole taxpayers to register themselves in an online tax system in order to get e-notifications of tax payable on rural and urban land and building tax.

4. Bureaucracy structure in the application of electronification of notifications of tax payable on rural and urban land and building tax at DKI Jakarta

Bureaucracy structure as an influential factor in a successful policy implementation, according to George Edwards III (1984), is based on its standard operational procedures (SOP) that work as an internal response toward implementing resources, implementation time and standardization in program implementation in a public organization. In addition, it is also applied by fragmentation. Fragmentation is a distribution of duties and responsibilities to entities outside of the organization in performing duties related to the policy implementation. Bureaucracy structure based on such SOP and fragmentation has relatedness with the implementation of an electronification policy on notifications of tax payable on rural and urban land and building tax by the local tax authority of DKI Jakarta.

Bureaucracy structure in the implementation of SOP of the local tax authority of DKI Jakarta has been regulated in the Governor Regulation number 154/2019 on the Organization and Working Procedures of Local Revenue Agency and in implementing the application of electronification of notifications of tax payable on rural and urban land and building tax that has been regulated in the Governor Regulation number 23/2021, it has a mechanism that regulates on the management and issuance of e-notifications of tax payable on rural and urban land and building tax. The division of duties and responsibilities of each implementing officer has provisions determined by the local tax authority of DKI Jakarta in implementing the application of electronification of notifications of tax payable on rural and urban land and building tax.

Bureaucracy structure factor has impact on successful implementation of the application of electronification of notifications of tax payable on rural and urban land and building tax as a form of application of *e-government* in local tax sector. Bureaucracy structure can influence such successful implementation of the application of electronification of notifications of tax payable on rural and urban land and building tax in Jakarta by involving *stakeholder* of the taxpayers, the private sectors and the government (Husnia, *et.al*, 2016). In term of the implementation of SOP, according to Permana, *et.al* (2020), it is required a synergy among tax management organizations related to the implementation of tax collection and administration on rural and urban land and building tax, as well as in term of fragmentation, it is required availability of competence of the tax officer in understanding about technology-based means and facilities of tax management in the management of issuance service of electronification of notifications of tax payable on rural and urban land and building tax in DKI Jakarta.

Thus, it can be said that the organizational structure factor in the implementation of the application of electronification of notifications of tax payable on rural and urban land and building tax in Jakarta is considered clear in the use of SOP and fragmentation or division of its duties and authorities.

VI. CONCLUSION

Successful implementation of the application of electronification of notifications of tax payable on rural and urban land and building tax in Jakarta is based on 4 (four) success factors of George Edward III as follows:

1. Communication factor can be considered successful because it has clarity of policy based on rules stipulated by the Governor where consistency and communication channel can be understood by the policy implementing officer.
2. Resources factor mainly in the capability of the implementing officer in making socialization is also considered successful because in terms of means and facilities in implementing electronification of notifications of tax payable on rural and urban land and building tax have been adequate and those tax officers are adequate and competent because all tax officers have ability and understanding of knowledge in the utilization of technology and innovation in a digital tax system that has been applied through electronification of notifications of tax payable on rural and urban land and building tax.
3. Implementing officer's attitude factor is considered successful in terms of the attitude and commitment of the implementing officer in an effort to obtain realization of tax revenue on rural and urban land and building tax significantly contributing to the original local government revenue for the District Government of DKI and it can be seen from the percentage of taxpayers registering themselves in order to obtain electronic documents of notifications of tax payable which is 90.06%.
4. Bureaucracy structure factor in terms of the use of SOP and fragmentation can be considered successful where in the use of SOP, its mechanism has been regulated in a policy stated in the Governor Regulation and it has division of duties and responsibilities for the policy implementing officer in achieving

the purpose of the application of electrification of notifications of tax payable on rural and urban land and building tax in Jakarta.

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Estimating HbA1c External Quality Assurance Scheme (EQAS) Findings in Princess Iman Center; a Stepwise in Quality Improvement Plan

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I. INTRODUCTION

Laboratory is simultaneously the most, and the least used resource of the healthcare system, laboratory tests provide information which help doctors to provide better and more effective care for their patients. It's often cited that laboratory results are an integral part of every medical decision.

The daily routine basis in clinical laboratories that maintain a good control over all the result in a single laboratory are known as internal quality control (IQC), which is one of the most important impacts on laboratory testing; it ensures both precision and accuracy of patient sample results. The integrity of quality control samples is important to both management of overall quality as well as to meeting requirements of proficiency testing.

The role of External Quality Assessments (EQA) in ensuring good laboratory practice is recognized at national and international level, EQA schemes are the main tools for measuring the quality of laboratory results, for maintaining confidence in all tests and for implementing the standards of quality assurance [1].

How it is works, External Quality Assessment (EQA) / Proficiency Testing (PT) allows for a comparison of a laboratory's testing procedures to other laboratories across the world. Comparisons can be made to a peer group of laboratories or to a reference laboratory.

EQAS measures a laboratory's accuracy using 'blind' samples that are analyzed as if they were patient samples. Results are returned to the scheme organizer for statistical analysis. Laboratories receive a report comparing their individual performance against other participants in the programme [2].

II. OBJECTIVE:

The object of this study is to evaluate the performance of clinical chemistry laboratory targeting HbA1c test using the indicators (Standard Deviation Index SDI) used by EQAS body.

III. MATERIALS AND METHODS:

This study was conducted for HbA1c test in clinical chemistry department at Princess Iman Center in King Hussein Medical City, during the period of December 2016 until November 2020. A period of 4 periodically cycles. Each cycle completion in one year consist of 12 samples, one sample was ran every month. The EQAS samples were lyophilized samples provided from BIO-RAD. The analyzer were the tests been done was Cobas c501 from Roche Diagnostic system.

The results were uploaded on the EQAS website (BIO-RAD QC NET) on scheduled dates and the final reports were downloaded after the completion of each cycle (12 samples).

Performance indication was analyzed in terms of the (Standard Deviation Index SDI/Z-score, Range and Mean) and (Variance index score VIS) at the end of each cycle for all of 12 samples.

Standard Deviation Index (SDI): it is calculated as:

$$SDI = \frac{\text{differences between lab value and target value}}{\text{SD of mean for comparison group}}$$

And interpreted as

0.0 = perfect comparison with consensus group

<1.25 = acceptable

1.25 -1.49 = acceptable to marginal performance (some investigation of the test system may be required)

1.5 – 1.99 = marginal performance

2.0 – 3.0 = warning signal. (Investigation of test system is recommended)

Variance Index Score (VIS): it is calculated as:

$$\% \text{Variation} = \frac{\text{differences between participant's result and group mean}}{\text{group mean}} \times 100$$

$$\text{Variance Index Score (VIS)} = \frac{\% \text{Variance}}{\text{Desired CV}} \times 100$$

The VIS interpreted as,

- < 100 – *very good*
- 100 – 150 *good*;
- 150 – 200 *satisfactory*
- > 200 – *not acceptable*

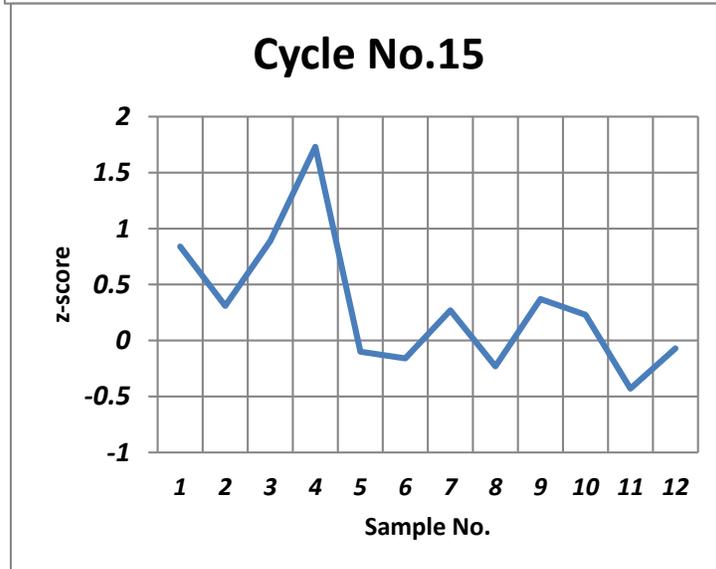
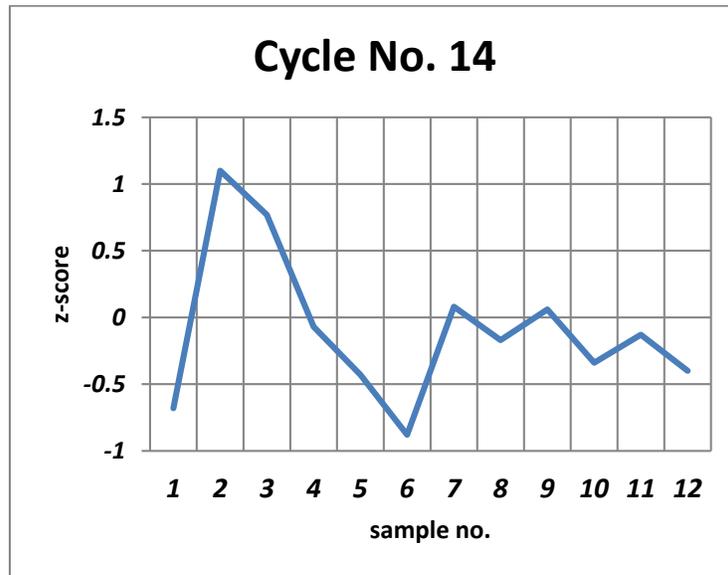
IV. RESULTS:

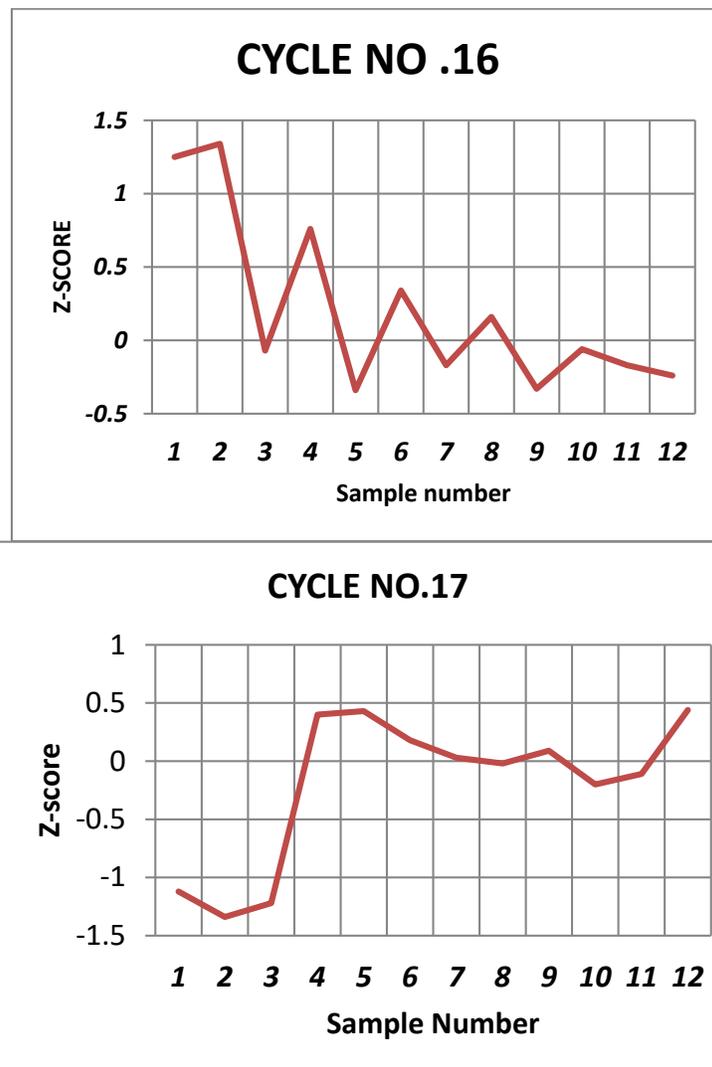
Based on the results assorted from (BIO-RAD QC NET) web site and according to the indicators we specify which is the Standard Deviation Index (SDI) for every sample in each cycle, the mean SDI for cycle 14 was (0.425) <1.25 = acceptable, for cycle 15 was (0.469) <1.25 = acceptable, for cycle 16 was (0.439) <1.25 = acceptable and for cycle 17 was (0,456) <1.25 = acceptable.

The second indicator which is Variance index score (VIS) value for every sample in each cycle and similarly the overall mean of VIS (OMVIS) for cycle 14 was (42.6) < 100 very good, cycle 15 was (46.9) < 100 very good, cycle 16 (55.5) < 100 very good and cycle 17 (43.5) < 100 very good.

SDI (Z-Score) and VIS for the four EQAS cycles from 12/2016-11/2020

Cycle number	Range of SDI	Mean SDI	Variance Index Score VIS
14	-0.88 to 1.10	0.425	42.6
15	-0.43 to 1.73	0.469	46.9
16	-0.33 to 1.34	0.439	55.50
17	-1.34 to 0.44	0.456	43.5





V. DISCUSSION:

EQAS is an important tool to monitor and maintain the laboratory performance output. It is obviously acceptable to have a very close result along this period of cycles because of the test was done to only one analyte (HbA1c), but this is not considered as failure but much stability and consistency in daily and monthly good laboratory practices, following scheduled instrument maintenance.

The SDI and VIS results we get for every month in each cycle were very close to the accepted group of results and they don't need any corrective action. The overall performance of our lab for the study period in terms of mean Z-Score of the HbA1c test for all cycles are acceptable, as far as the OMVIS with an excellent score.

The EQAS program is valuable management tool destined to improve the efficiency and services of a laboratory in particular lab and a hospital in general. The program provides an opportunity to the participating organizations to compare activities and modify their own practices based on what they learn [3][4].

EQAS evaluate the performance of procedure, equipment, materials, personnel and suggests areas for improvement. For medical laboratories, EQAS have been found useful, in that it initiates a "peer-review" process towards solving technical and methodological problems to improve the quality of service for each individual laboratory as well as to achieve comparability of results among different laboratories [5].

VI. CONCLUSION:

The benefit of applying the EQAS program is to provide reliable information that allows laboratories to assess and monitor the quality status of internal procedures and processes, suitability of the diagnostic systems, accountability and competence of the staff. In addition it provides important role in improving the efficiency of a laboratory service.

We believe that global participation in such an EQAS program will definitely improve the quality of a hospital service because no health care facility can be totally self-sufficient and there is always an inclination for improvement and development in a system [6].

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Factors Affecting Egyptians Adoption of E-government Using Extension of the UTAUT Model after COVID-19 Pandemic

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Abstract- In this era, e-government has transformed the interaction between the government and the citizens. Egypt is a developing country that has recently experienced a transition to e-government. The COVID-19 pandemic has and still deeply changed the world. This study examines the efficiency and the acceptance of e-government factors in Egypt. A proposed model was developed by reviewing the key concepts related to the implementation of the e-government and testing the pandemic influence to accelerate the acceptance and the real usage. Citizen trust in government and technology is urgent to the widespread adoption of e-government. Thus, the Unified Theory of Acceptance and Use of Technology model (UTAUT) has been extended by including government trust and Internet trust. The study was conducted by surveying the opinions of 483 citizens. The results shed a light on the key factors of e-government adoption in Egypt and support the proposed constructs; performance expectancy, effort expectancy, social influence, facilitating conditions, trust in the government, and trust in the Internet, in addition to the role of education and income as indirect moderators' factors. Moreover, most of the participants were satisfied with e-government services as a good and useful channel to get governmental information and services during the pandemic.

Index Terms- E-government, Egypt, Trust, PLS-SEM, UTAUT

I. INTRODUCTION

According to the World Bank e-government has defined as “government-owned or operated systems of information and communications technologies (ICTs) that transform relations with citizens, the private sector and/or other government agencies to promote citizen empowerment, improve service delivery, strengthen accountability, increase transparency, or improve government efficiency” [1]

Usually, the interaction between a citizen or business and a government agency occurs in a government office. In the past, government organizations paid little attention to service quality or responsiveness to users. With emerging ICTs and the approach of e-government, today in developed countries, e-government is allowing to delivering of government services directly to citizens in their homes, using the web to buy necessary products and services in a more timely and cost-effective way, conducting virtual town hall meetings to allow representatives to communicate with their electorates, using large national networks to link organizations and share information, using electronic polling and voting and creating intergovernmental networks to coordinate global issues. Developing countries have begun to recognize the emergence of e-government as a potential to reshape the public sector and build relationships between citizens and the government. [2], [3], [4]

E-government not only provides advantages such as inexpensive and reliable services to citizens and businesses, through using all internal and external services online means decreases the processing costs of many activities as well as will increase the government efficiency, but also offers the possibility to reshape the public sector and remark the relationships between citizen, and the government by allowing for open-communication, participation and public information flow in preparing national regulations since e-government is looking for to create an atmosphere of interaction between all partners in e-government through the exchange of information on a network and an integrated and harmonious community [5], [6]

Egypt has taken an e-government initiative since 1999, as part of its plan to turn Egypt into an information-based society. In 2001, The Egyptian e-government program in Egypt began within the Ministry of Communication and Information Technology (MCIT) and was

a component of the Egyptian Information Society Initiative (EISI), Egypt Information and Communication Technology (ICT) strategy. In 2004, the program was moved to the Ministry of State for Administrative Development (MSAD), as a part of administrative improvement and development, together with the institutional reform of public administration. In January 2004 the Egyptian Prime Minister and Microsoft Chairman Bill Gates started the e-government solution using Microsoft technology. The government of Egypt installed an e-government portal (www.egypt.gov.eg) in January 2004. Some services were placed in the portal to trail test the project as telephone e-billing, birth certificate, issuing, etc. [7] [8] [9] [10] [11], [6]

The e-government portal delivers content in both Arabic and English to offer services for individuals, businesses, and foreigners. The website introduces an e-payment facility and the availability to download the necessary documents for achieving government services, which include digital assets repository, land transportation services, traffic attorney and vehicle licenses services, as well as online services for businesses such as environmental services and qualified Industrial zone services. Moreover, the e-government offers online services such as Egypt airline ticketing services and cultural services [9] [11]

Egypt has made several works to improve its e-government in the last few years. In terms of success in communication infrastructures, connectivity and access have been developed by implementing several policy measures, including the deregulation of the telecommunication sector with the launching of four mobile operators' licenses. In addition, high-quality broadband connections are accessible in main cities and business parks, such as the Smart Village. [5]. But the UN e-government survey (2020) Egypt is ranked number 111 worldwide. Table 1 shows E-Government Development Index rank from 2004 to 2020. According to this index rank, it is easy to notice the fluctuates up and down. This ranking might be attributed to many obstacles to implementing an e-government program in Egypt. In addition, developing countries are less advanced than developed countries in the areas of technological infrastructure, maybe because the technology is produced in the developed countries, but the developing countries import it. The ability to develop countries to obtain the full advantages of e-government is limited and is mainly restricted by the existence of a combination of political, legal, social, and economic barriers [5]

Table 1: Egypt E-Government Development Index rank

Egypt	2020	2018	2016	2014	2012	2010	2008	2005	2004
E-Government Development Index rank	111	114	108	80	107	86	79	99	136

COVID-19 had great effects globally. All countries have acted quickly and taken quick protective actions to slow the spread of the virus. Egypt's e-government takes jumped in 2020, from EGP 1billion to EGP 4billion per month following the occurrence of the COVID-19 pandemic. The significant jump reflected an annual growth of 250%, stress strength of the country's electronic payment (e-payment) and collection system, according to Minister of Finance Mohamed Maait, Maait said that the administrative regulations of the law concerning non-cash payment methods have contributed to placing order the foundations for the transformation of payment methods and electronic collection. This change has been observed not only in administrative organizations but also spreads to the public and private sectors.

The minister mentioned the deadline for organizations addressed by this law is 7 March 2021, with organizations also being subject to its administrative regulations to resolve their situations. They will also be resolved to provide means of non-cash payment for those dealing with vents for the collection of services at no extra cost.

The minister added that, in collaboration with the banking sector, the payment of government fees has been made possible through money collection machines at administrative organizations, through the quick response code (QR CODE) of mobile wallets, which is an easy and safer service of carrying out payments during the global health pandemic, as there is not any need to use any bank cards to pay government fees.

In addition, the minister added that about 37,000 Meeza cards were issued during the first and second trial stages and that the ministry is running against time to finish operating about 5 million Meeza cards in the future period. [12]

According to the 2030 Agenda for Sustainable Development, the presence of e-governments or e-governments is no longer just a step that governments can take. Rather, it has become a necessity and a measure of governance over the progress of any government and its achievement of sustainable development goals.

But effective e-government is depending on understanding how citizens accept technology. Thus, the main objective of this study is to explore the factors that affect citizens' acceptance of e-government in Egypt, especially after the COVID-19 pandemic which accelerate and encourage more people to use many online services. The study investigates the factors that influence Egyptian citizens to accept and use e-government by applying an extension UTAUT Model. In addition, the study put attention on building people's trust and

extends the model by including government trust and Internet trust

Research Questions

- What are the citizen's opinions of e-government services as a solution to keep governments and citizens connected during the outbreak either through information sharing or online services?
- What are the most e-government services used by the citizens?
- What are the main sources of knowledge of e-government services?

In addition, to answer the previous questions, the conceptual framework of UTAUT was proposed as the foundation for this study to investigate the factors of e-government acceptance.

After the introduction, section 2 briefly discusses the literature review for the conceptual model and e-government studies. Section 3 presents the methodology and the hypotheses. Section 4 includes sampling, data collection, analysis, and hypothesis testing. Section 5 is discussed the findings in detail. Finally, Section 6 concludes the research and future research

II. LITERATURE REVIEW

a. *The Unified Theory of Acceptance and Use of Technology (UTAUT)*

UTAUT is one of the modern developments in the field of general technology acceptance models. It aims to justify user intentions to use an information system and the additional usage behavior. Venkatesh et al. (2003) created this combined model to present a more understanding of the acceptance process than any previous models had been able to do. The UTAUT considers the four main key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions), which are direct predictors of usage intention and behavior. In addition, gender, age, experience, and voluntariness of use are suggested to mediate the impact of the four key constructs on usage intention and behavior [13]

1. Performance expectancy (PE): "is the degree to which an individual believes that using the system will help him or her to attain gains in job performance."
2. Effort expectancy (EE): "is the degree of ease associated with the use of the system."
3. Social influence (SI): "is the degree to which an individual perceives that important other believe he or she should use the new system."
4. Facilitating conditions (FC): "is the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system."

UTAUT2 suggests that, in addition to the UTAUT constructs, the intention to use the technology is influenced by hedonic motivation (i.e., the degree to which the technology is perceived to be enjoyable), price value (i.e., the cognitive trade-off between perceived benefits and financial costs of technology usage) and habit (i.e., defined as the passageway of time from the initial technology usage). In addition, voluntariness as a moderator variable was excluded [14]

b. *Technology Acceptance in E-government*

Many studies have used technology acceptance models to test e-government services. For example, Hung et al. (2006) used the TPB model to investigate factors that influence the public to use online tax filing and payment systems in Taiwan [15]. Gupta et al. (2008) used UTAUT to investigate the adoption behavior of employees towards using the Internet as an internal communication channel at an organization in India [16]. Lean (2009) used integration constructs from the models of TAM and DOI to investigate factors influencing the intention to use e-government services among citizens in Malaysia [17]. Shareef et al. (2011) used a combination between TAM, DOI, and TPB to discover the critical factors that enable citizens to adopt e-government at different stages of service in Canada [18]. Lin et al. (2011) used TAM to explain and predict users' acceptance of corporate information technology in the Gambia [19]. Al-hujran et al. (2013) used TAM to investigate citizen adoption of e-government services in Jordan. [4]. Alshehri et al. (2013) used UTAUT to explore the key factors of Saudi citizens' acceptance of e-government [20]. Ahmed & Mansoori (2017) used a modified UTAUT model to investigate Emirati citizens' adoption of e-government in Abu Dhabi [21]. Amrouni et al. (2019) tried to identify and predict the

factors that influence an employee to adopt technology implemented at the workplace by focusing on using UTAUT and TTF theory [22]. Jacob and Darmawan (2019) used the extension of UTAUT to understand the citizens' acceptance and use of e-government in developing countries [23]. Maznorbalia & Awalluddin (2020) used UTAUT to investigate the key factors of Malaysian citizens' in Sintok, Kedah, a semi-rural area on acceptance of e-government services [24]. Mutaqin and Sutoyo (2020) used UTAUT to investigate factors that influence the use of e-punten applications in the city of Bandung [25]. The results differed from one study to another according to the countries, developed or developing, and according to the hypotheses and the extensions of the model. But most of these studies investigated e-government implementation using the factors of DOI, TAM, UTAUT, and TPB and showed that performance expectancy, effort expectancy, and facilitating conditions had a significant positive effect on behavioral intention to use e-government services. However, social influence did not have a significant influence on behavioral intention in all studies. Moreover, trust as an additional construct has shown to have a significant positive impact on e-government services in many studies [15], [17], and [18]. Also, the price value as a proposed construct at UTATU2 has shown to have a significant positive impact on e-government services [26].

Regarding Egypt, some studies on e-government acceptance focused on the challenges of the e-government in Egypt and provided solutions to these challenges. These challenges can be summarized as; the Lack of e-signature systems, security, and private affairs, e-payment transactions challenges especially for simple citizens, computer illiteracy, lack of citizens' awareness, participation, and education, and lack of integration and information sharing between governmental agencies, The absence of unified standards and the connection among service providers [10]. Some recommendation for acceptance of e-government in Egypt were; reviewing technical and governmental experiences of other countries in order to use their experience in the field of implementing the e-government, Egypt e-government portal should be separate e-payment system connected to all channels of the Egypt banks to handle all online transactions, government should work in close cooperation with the private sector and citizens for confirming secure use of e-government portal, develop applications outfits citizens' wants and features, including simple and suitable payment methods, e-government services should often be reviewed to ensure that these services are workable, execution and accessible, extend e-service access, free or low price for the Internet which can help in solving e-service access problems, high consideration should be given to the delivery of services and content development using mobile platforms, deliver free executive training courses to help citizens access and deliver some basic educational resources on e-government at the school level [8], [10] and [6].

The existing literature on the impact of COVID-19 in the government sector is mostly illustrative and focused on measuring national governments' competence in managing their citizens' state of affairs, for example [27], [28], and [29]

III. METHODOLOGY

A modification of the UTAUT model is proposed in this study, where variables have been added to the original UTAUT model related to trust, e-government trust, and Internet trust. Trust in government according to the literature was an important construct as mentioned before. In addition, price value was added as proposed in UTAUT2.

Then the proposed model includes the dependent variables; behavioral intention and perceived use of e-government, the independent variables; performance expectancy, effort expectancy, social influence, price value, facilitating conditions, e-government trust, and Internet trust, besides five moderating variables; the three traditional (age, gender, and experience), in addition, education level and income level as additional moderators, that are expected will influence the independent variables.

Trust is an integral part of e-government adoption, a citizen wants to be sure in making transactions through e-government services that his private information is secured. In addition, trust in the Internet is critical when the information that is shared with others is sensitive [3] [30], [21] and [31]

Education and income level are not included in the original UTATU or the extended UTAUT2. But they have been added because they have been found by many researchers, such as [32], [33], [34], and [31] that education level has been noted as an important moderator in technology acceptance because highly educated people tend to adopt new technologies more [35], and higher income are more likely to be confident in their ability to understand how government runs and to get involved effectively [36].

The following Figure 1 illustrates the proposed UTAUT

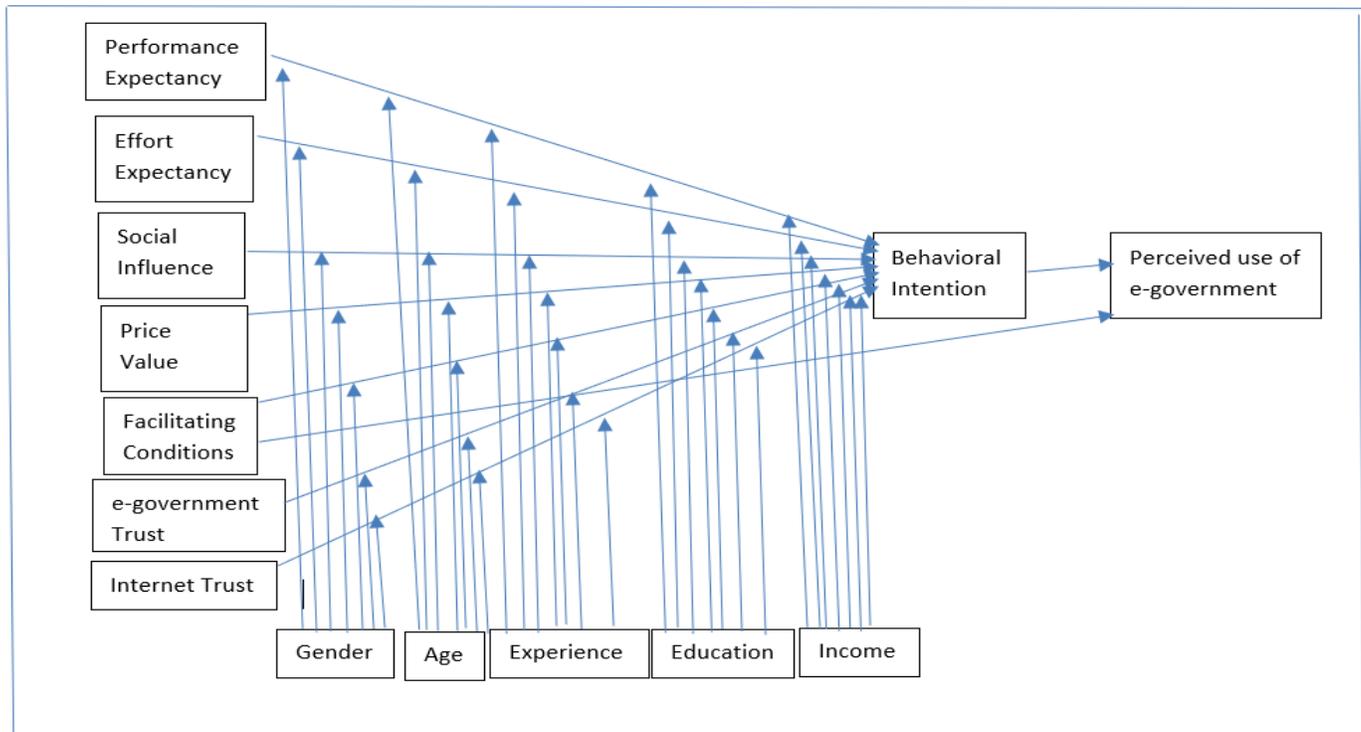


Figure 1: The modified diagram of UTAUT hypotheses

The research hypotheses are the following:

- H1: Performance expectancy will have a positive influence on behavioral intention to use e-government services.
- H2: Effort expectancy will have a positive influence on behavioral intention to use e-government services.
- H3: Social influence will have a positive influence on behavioral intention to use e-government services.
- H4: Price value will have a positive influence on behavioral intention to use e-government services.
- H5: Facilitating conditions will have a positive influence on behavioral intention to use e-government services.
- H6: Facilitating conditions will have a positive influence on the perceived use of e-government services.
- H7: Trust in the e-government will have a positive influence on behavioral intention.
- H8: Trust on the Internet will have a positive influence on behavioral intention.
- H9: Behavioral intention to use e-government services will have a positive influence on the perceived use of e-government.

In addition, gender, age, experience, education, and income moderate hypotheses H1, H2, H3, H4, H5, H7 and H8

The proposed UTAUT applied the partial least squares method of structural equation modeling (PLS-SEM). PLS is a technique that reduces the predictors to a smaller set of uncorrelated components and performs least squares regression on these components, instead of on the original data. SEM is a powerful multivariate analysis technique that is widely used in the social sciences. It is a group of statistical techniques used to measure and analyze the relationships between observed and latent variables. Like but more powerful than regression analyses, it tests linear causal relationships among variables, while simultaneously accounting for measurement error [37], [38]. SEM technique is a statistical methodology to evaluate the relationships in the UTAUT model and to test the hypotheses among the variables in the model [39]

Based on the key aim of the study, i.e., to investigate the factors affecting the Egyptian citizens' adoption of e-government services, a quantitative approach was assumed, using an online questionnaires survey. The SPSS program was used for the statistical analysis, and the SmartPLS3 program was used for the reliable analysis and testing of hypotheses. The questionnaire was divided into two parts, the first part was about demographic information and the second part contained statements covering the 9 hypotheses of the proposed UTAUT model where a Likert scale was used to test the model (from Strongly Agree to Strongly Disagree). The structured questionnaire was developed using Google form through the social network site Facebook. Pre-testing was conducted to ensure the clarity and understandability of the survey. The responses were 483 citizens

The sufficiency of the sample is measured by Kaiser Meyer Olkin (KMO) in SPSS. The sampling is adequate or sufficient if the value of KMO is larger than 0.5 [40]

The results section should provide details of all of the experiments that are required to support the conclusions of the paper. There is no specific word limit for this section. The section may be divided into

subsections, each with a concise subheading. The results section should be written in the past tense.

IV. DATA ANALYSIS AND RESULTS

Statistical Packages for Social Science (SPSS) was used to analyse the data collected through the surveys. The SmartPLS3 program was used for the reliable analysis and testing of hypotheses. It depends on PLS-SEM.

According to the collected data, the KMO value is 0.767, which means the sample size was adequate.

- a. *Descriptive Statistical Perspective*
 - i. *Demographic information*

The following Table 2 provides a general overview of the Egyptian citizens who participated in this study in terms of demographic information, such as age, gender, and education level.

Table 2. Demographic information of respondents

Item		Percentage
Age	< 25	43.7
	26 to 45	33.7
	> 46	22.6
Gender	Male	46
	Female	54
Educational Level	Diploma or less	14
	Higher education Student	33
	Bachelor degree	42
	Postgraduate degree	11.2
Approximately, family monthly income	Less than 3000	21.3
	3001 to 10000	51.8
	10001 to 20000	16.8
	More than 20000	10.2
Place of live	Capital Cairo	69.8
	Delta governorates	20.2
	Upper Egypt governorates	10

According to the data, the largest group of participants were aged less than 25 (43.7 %), followed by those middle-aged 26-45 (33.7 %), then greater than 46 (22.6 %).

The number of female respondents was comparable to the number of male respondents; female participants (54%) and male participants (46%).

The largest group of participants (42%) had a Bachelor of Education degree qualification, followed by higher education students (33%) then a diploma or less (14%), and the smallest group had a postgraduate degree (11%).

The distribution of the respondents by income was categorized into four groups: 21.3% with income less than 3000 EGP, 51.8% had

income in the range of 3,000 to 10,000 EGP, 16.8% with income in the roof ge 10,000 to 20,000 EGP, and 10.2% with income more than 20,000 EGP.

69.8% of the participants were from Cairo city, 22.2% were from Delta governorates, and 10% were from Upper Egypt governorates.

In addition, 83% of the respondents had used e-government services and confirmed that it was a useful channel for communicating with the government during the pandemic, 17% have not used it. The high usage of e-government services was explained by the fact that most of the respondents were from Cairo, higher education students, or had a university degree

ii. E-government Usage details

The e-government portal offers content in both Arabic and English to deliver services to citizens, businesses, and foreigners. Table 3 shows the services provided by the portal and the percentages of usage of these services from the participants.

Table 3: E-government portal services

E-government services on the Egyptian Portal	Percentages
Documentation services for citizens ((Birth document - death certificate)	30
Documentation services for citizens (marriage document - divorce document - family registration)	10
Documentation services for citizens (purchase of a national number form - national number card)	36
Documentation services for citizens (elderly service - people with special needs)	2.5
Inquiry services / reading registration / bill payment (water - telephones - electricity - gas)	51.5
Student Services (University Admission Coordination Office - University Dorms Admission Coordination Office - Degree Equivalency Services)	68.4
Municipal services (replacement of lost/building permits - request to inspect a property that is deteriorating - complaint - advertising license - works permit - payment certificate)	10
Services for Egyptians abroad (request for the issuance of an official extract of the birth certificate - application for renewal of work permit - filing a complaint or a general request - preserving the citizen's right to registration - extraction and renewal of passports and nationality affairs - civil and personal status - all kinds of attestations - entry visas - application for renewal of the travel document for the Palestinians	8.5
Government job search services and registration of job seekers – manpower	11.4
Inquiry services for EgyptAir flights	30
Train schedule services - train reservations	27
Traffic Prosecutions Services (Violations Inquiry)	25.6

The electronic university admission coordination started in 2004 in Egypt, so the higher percentage of the e-government services usage (68.4%) was for student services. Most of the participants used the inquiry services for reading registration or bill payment (51.5 %). 36 % of the participants used the e-government to get national number services. The birth document, death certificate, and inquiry services for EgyptAir flights were used by 30%. More than a quarter of the participants also used train and traffic services (27 %, 25.6 %). Low percentages of usage were for a government job (11.4), family services and municipal services (10%), and Egyptian abroad services (8.5%). The fewer services used were for the elderly and people with special needs (2.5% only)

Table 4 shows the main sources of knowledge about e-government services. The most common source was from family and friends (39%). Then from the social network sites (34.6%). TV ads helped 23% to know about e-government services. Only 18.4% of the participants searched on the Internet by themselves to know about the e-government services available.

Table 4: Sources of knowledge of e-government services

Family and friends	39
Social networks sites	34.6
TV ads	23
From the Internet	18.4

b. Reliability Verification

To calculate the measurement model features of the nine reflective hypotheses, the researcher executed the tests suggested by [38]

The reliability of a measure refers to the degree to which the instrument is free of random error. It is concerned with the consistency and stability of the measurement. Cronbach-alpha was used as a measure of the internal consistency of each of the variables constructed from the survey. Cronbach's alpha values higher than 0.6 are considered reliable. According to the following table, Table 5 the result

shows that all alpha values of the study instrument were reliable and exhibited appropriate construct reliability.

Table 5. Cronbach alpha reliability results

Construct	Cronbach's alpha
	> 0.6
Performance Expectancy	0.892
Effort Expectancy	0.915
Social Influence	0.880
Price Value	0.651
Facilitating Conditions	0.801
Trust E-Government	0.837
Trust in Internet	0.839
Behavioral Intention	0.940

c. Validity Test

Construct validity is the degree to which an operational measure correlates with the theoretical construct examined. In this study, confirmatory factor analysis was conducted to measure the overall measurement models and examine the convergent and discriminant validity.

i. Convergent Validity

Convergent validity is the degree to which a measure correlates positively with alternative measures of the same construct. The items that are measures of a specific reflective construct should converge or share a high proportion of variance. To evaluate the convergent validity of reflective constructs, researchers consider the outer loadings of the indicators and the average variance extracted (AVE) [38]. Loadings above 0.70 indicate that the construct explains more than 50% of the indicator's variance, demonstrating that the indicator exhibits a satisfactory degree of reliability, the size of the outer loading is also usually called indicator reliability. An acceptable threshold for the AVE is 0.50 or higher. For the composite reliability criterion, higher values indicate higher levels of reliability. Results between 0.70 and 0.95 represent "satisfactory to good" reliability levels. Table 6 shows the composite reliability, AVE, and the indicators' reliability for all the constructs.

Table 6: Convergent Validity

Construct	Composite Reliability	AVE	Items	Indicators' Reliability
	>0.7	>0.5		>=0.7
Performance Expectancy	0.925	0.756	PE1	0.896
			PE2	0.865
			PE3	0.842
			PE4	0.874
Effort Expectancy	0.940	0.797	EE1	0.862
			EE2	0.895
			EE3	0.911
			EE4	0.903
Social Influence	0.943	0.893	SI1	0.943
			SI2	0.947
Price Value	0.809	0.586	PV1	0.811
			PV2	0.728
			PV3	0.756
Facilitating Conditions	0.883	0.716	FC1	0.866
			FC2	0.873
			FC3	0.798
Trust E-Government	0.888	0.665	TGOV1	0.745
			TGOV2	0.787
			TGOV3	0.849
			TGOV4	0.876
Trust in Internet	0.893	0.676	TNET1	0.822
			TNET2	0.871
			TNET3	0.844
			TNET4	0.747
Behavioral Intention	0.962	0.893	BI1	0.940
			BI2	0.954
			BI3	0.942

ii. Discriminant Validity

Discriminant validity is the range to which scales show their suggested construct differently from the relation with all other scales in the research model. Discriminant validity is measured by comparing the square roots of AVE to the inter-factor correlations between constructs, Table 7 shows the AVE values, if the AVE is higher than the squared inter-scale correlations of the construct then discriminant validity is supported.

Table 7: Discriminant Validity

	PE	EE	SI	PV	FC	TGOV	TNET	BI
PE	0.869							
EE	0.691	0.893						
SI	0.526	0.450	0.945					
PV	0.645	0.552	0.473	0.766				
FC	0.676	0.752	0.467	0.609	0.846			
TGOV	0.542	0.507	0.427	0.531	0.479	0.816		
TNET	0.561	0.534	0.482	0.524	0.529	0.691	0.822	
BI	0.745	0.662	0.533	0.610	0.651	0.569	0.617	0.945

Figure 2 displays the Smart-PLS3 model that was proposed for the hypotheses connected with e-government

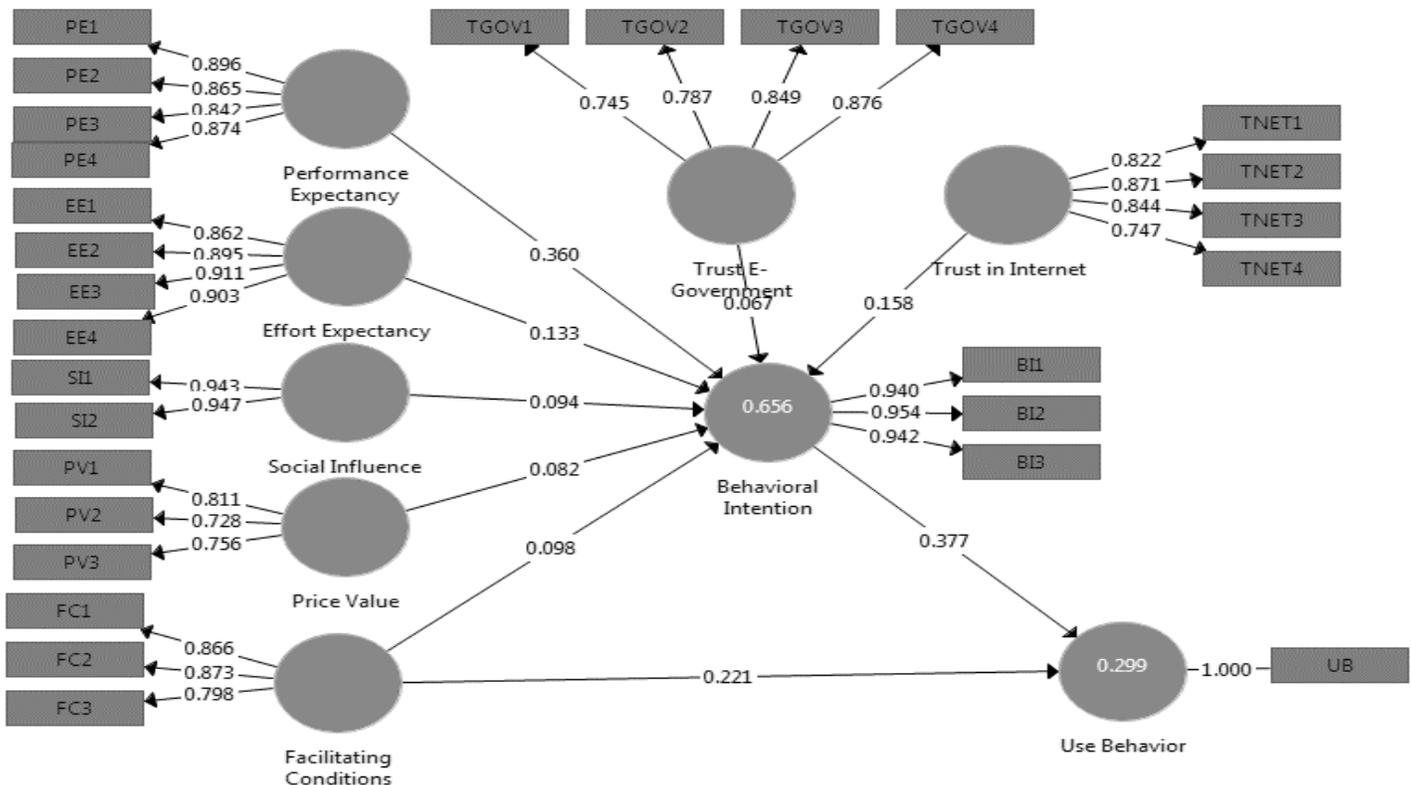


Figure 2. E-government Proposed model Results

d. Hypothesis Testing Results

Testing the hypotheses aims to determine which predictors (independent variables) provide a meaningful contribution to the description of the dependent variables. In this study, hypotheses testing was conducted using SmartPls3, bootstrapping process was used with 5000 bootstrap subsamples. Path coefficients with the significant t and p values have been considered for the evaluation of results. Table 8 represents the results supported depending on the result coefficients beta.

Table 8: Summary of Structural Model Path Coefficients

Hyp #	Path	Path Coefficient	Standard Deviation	T Statistics	P Values	Sig. Level
H1	PE -> BI	0.360	0.051	7.008	0.000	***
H2	EE -> BI	0.133	0.051	2.611	0.009	**
H3	SI -> BI	0.093	0.038	2.477	0.014	**
H4	PV -> BI	0.082	0.040	2.055	0.040	**
H5	FC -> BI	0.098	0.049	2.005	0.045	**
H6	FC -> UB	0.222	0.052	4.203	0.000	***
H7	TGOV -> BI	0.067	0.039	1.712	0.088	*
H8	TNET-> BI	0.158	0.041	3.806	0.000	***
H9	BI -> UB	0.377	0.051	7.432	0.000	***

Note: *p < 0.1; **p < 0.05; ***p < 0.01

All hypotheses of this study have been confirmed. And independent variable PE (performance expectations) had the strongest effect on the dependent variable BI (behavioral intention), ($\beta=0.360$, $p<0.01$). Citizens feel that using the e-government system will help them to achieve job performance efficiently. The impacts of EE, SI, PV, FC, TGOV, TNET on BI, and FC on UB has also been approved. So, the results of this study have been able to provide support for the theory of Venkatesh et al. 2003 [13], which stated that performance expectancy, effort expectancy, social influence, and facilitating conditions have significant effects on behavioral intention, and the facilitating conditions have a significant effect on the system use behavior. The intention to use significantly affect the respondent's behavior in using e-government services. In addition, the results showed that the price value had a significant effect on behavioral intention according to the extended UTATU2 [14], and agreed with the study of Munyoka 2019 [26]. Trust as an additional construct showed significant effects on behavioral intention which was confirmed by many studies [15], [17] and [18] and reflects the importance of trust factors to adopt and use e-government services. Citizens must ensure secure and private data communication over the Internet, in addition to, trust in the government agency that provides the service. The government agencies need to connect their power to provide citizens with suitable, reliable services.

e. Moderators Testing Result

Possible moderations of the variables, gender, age, experience, education, and income on the relationship of each of the independent variables with the dependent variables (BI) were examined. A variable was confirmed to be a moderator if the relationship between the dependent variable and a given independent variable changes significantly depending on the level of the moderator.

After testing, gender was confirmed to moderate the effect of three independent variables, PE (P=0.091), PV (P=0.022), and SI (P=0.015) on behavior intention. Hence, the gender difference can moderate performance expectancy, social influence, and price value on behavioral intention. The effect of performance expectancy on behavioral intention will be stronger for men, female users suggested on average to be less likely to adopt technology compared to males [41], the women tend to be more sensitive to others' opinions and therefore find social influence to be more significant when starting an intention to use new technology, the price value allocated by men to technologies will likely be higher than the value allocated by women to the same technologies, which confirm the theory of Venkatesh et al. 2013 [14].

Age was confirmed to moderate only the effect of SI (P=0.087). Hence, the age difference can moderate social influence on behavioral intention. This supports Venkatesh et al.'s 2003 theory that older persons have more social influences.

The experience was confirmed to moderate the effect of three independent variables, EE (P=0.027), TGOV (P=0.070), and TNET (P=0.073). Hence, the difference in experience can moderate effort expectancy, e-government trust, and Internet trust on behavioral intention. This supports Venkatesh et al.'s 2003 theory that effort expectancy will be most affected with relatively little experience with the system.

Education was confirmed to moderate the effect of PE (P=0.068). Hence, the effect of performance expectancy on behavioral intention will be stronger for highly educated people who tend to adopt new technologies more [35].

Income was confirmed to moderate the effect of four independent variables, PE (P=0.002), PV (P=0.069), TGOV (P=0.057), and TNET (P=0.084). Hence, the income level can moderate performance expectancy, price value, e-government trust, and Internet trust on behavioral intention. Higher-income are more likely to be confident in their ability to understand how government runs and to get involved in an effective way [36].

V. DISCUSSION

E-governments are nowadays paying increasing attention to efficient interactions with their citizens who have great access to electronic connectivity and interactions. The vision of the Egyptian state 2030 declares the government's intention to build a strong ICT-based infrastructure for the delivery of quality services for all sectors. Carter and Belanger (2005) contended that the success of e-government creativities is dependent not only on government support but also on citizens' enthusiasm to accept and adopt those e-government services. This study uses a modified version of the UTAUT model to explore the factors that might influence the adoption and use of e-government services in Egypt, especially after COVID-19 which helped and encouraged citizens to know and use the electronic services in all sectors. Egypt made growth in its e-government project and did notable improvements during this pandemic, from EGP 1billion to EGP 4billion per month.

According to the results, we can respond to the main questions as follows. The participants were satisfied with e-government services as a useful channel to get governmental information and services during the pandemic. The most common sources of knowledge about the e-government services were from family and friends, then from the social network sites. The most usages were student services, inquiry services for reading registration or bill payment then national number services. Although there were useful services for the elderly and people with special needs the percentages of using them are very weak.

For the hypotheses and according to the analysis of the collected data, performance expectancy had a strong positive effect on behavior intention, but there is no effect of age or experience as moderators to this relationship. Effort expectancy had a positive effect on behavior intention, but there is no effect of gender, age, or education as moderators to this relationship. Although social influence did not have a significant influence on behavioral intention in all studies, in this study it had a positive effect on behavior intention, but there is no effect of income, experience, or education as moderators to this relationship. Price value had a positive effect on behavior intention, but there is no effect of age, experience, or education as moderators to this relationship. Facilitating conditions had a significantly positive influence on both behavioral intention and use behavior but the findings indicated that there is no moderator effect. For the trust constructs, e-government trust, and Internet trust both had a positive effect on behavior intention, but there is no effect of gender, age, or education as moderators to these relationships.

VI. CONCLUSION, RECOMMENDATIONS, and FUTURE RESEARCH

The e-government development index in Egypt is still fluctuating up and down, which means that Egypt is still faced with many challenges in its activities to implement e-government initiatives effectively. But COVID-19 accelerates and encourages more citizens to use the e-government services. With more focus on issues related to security, privacy, and trust in using e-government, providing IT skills and computer or Internet programs will increase the citizen's awareness of using online services. Need more awareness about e-government services, for example, the elderly and people with special needs

This study applies the presently modified UTAUT model to user acceptance and use of e-government services in Egypt. Based on the data collected and the results of the analysis, it can be concluded that performance expectancy, effort expectancy, social influence, price value, and facilitating condition, in addition to e-government trust and Internet trust have positive influences on user intention to use e-government services. In addition to the traditional moderators, age, gender, experience, and education, income proved to be an important moderate, which influences five constructs from seven constructs.

The findings can offer useful insights to decision-makers, trust in the government agency and trust in the Internet is an essential element of e-government acceptance. Citizens must trust a secure and private data transmission process. It could be claimed that while this paper has a focused on Egypt, the key findings presented may also have significant implications for other developing countries, especially after the global effect of COVID-19. Considering the effect of the individual's income and the education level is important to understand the acceptance of e-government adoption.

This study, like any other, has its own set of limits. First, Egypt is a big country, and the number of responders may not reflect the opinions of all Egyptian citizens about the adoption of e-government services. Second, this study did not investigate citizens' satisfaction and the quality of each of the e-government services. Third, the study focused on e-government services acceptance and did not link these acceptance factors with the most important nowadays challenges

In future work, a larger study should be carried out. In addition, considering Egypt's large geographical area, it might also be important to evaluate whether there is any variation in the acceptance and use of technologies concerning the region. Adding website quality as an independent variable into our research model and considering the effects of other crucial constructs of the UTAUT model within the context of Egypt is important. Evaluating the actual application of the solutions and discovering the new challenges are important too. To be more precise and realistic, our work will continue, and new findings will be anticipated especially as we approach

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Development And Validation Of Mathematics Test (MT) For Senior Secondary Schools

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Abstract- The purpose of this study was to construct and validate a mathematics test. Five research questions were employed in conducting the study. Test items were constructed and sent to two content specialists who jointly rated the relevance of the MT items. Based on the recommendation of these resource persons, nine to ten items were randomly sampled on each domain specifications and built into the form I MT. In a situation where items assessed two or more behaviors, other items constructed to measure the behavior were eliminated. This practice helped to cut down form I MT from 100 items to 54. Form I MT was face-validated in terms of clarity of words and plausibility of distracter by specialist in educational measurement and evaluation, and mathematics teachers. This MT was also tried tested and the difficulty and distracter indices of the items determined. The form II MT (i.e. 54 items) was administered to 324 students and their response were used in determine the proportions of students who showed mastery. The findings of this study show that the MT II is a valid and reliable instrument. The major implication of these findings is that MT should be used in both formative and summative evaluation of student's performance in mathematics tests.

Index Terms- Development, Mathematics, Schools, Test, Validation

I. INTRODUCTION

Mathematics is believed to be the most exact, useful and important branch of human knowledge (Jayanthi, 2014). This is because in our homes, farm, workplaces, industry, in war, peace time, in our leisure etc, we make use of mathematics. No meaningful thing can be done without some mental or physical competition. Due to all-round importance of mathematics in our lives, Opara and Magnus-Arewa (2017) cited the work of Karl Fredrick (1777-1885), a German mathematician who stated that "mathematics is the queen of the science and arithmetic is the Queen of mathematics". Mathematics is a very important component of human activities and survival; it is useful in science and technological activities as well as commerce, economics, and educations (Rafina, Abubarkar & Stephen, 2015). According to Darling (2002) the acquisition and development of mathematical concepts and skills during early years forms the foundation of future mathematics performance and achievement.

A study done by Ololube (2008) affirmed that high challenging and accessible mathematics education in secondary school is a vital foundation for future mathematics learning. The author also added that mathematics help students make sense of their world outside of school and also help them construct solid foundation for success in school. Furthermore, a UNESCO (1990) report shows that teachers efficacy towards mathematics is a powerful predictor of how and whether he or she will act with students. Additionally, teachers who have high self efficacy in mathematics tend to persist in failure situation, take more risk with the curriculum, use new teaching approaches to get better gains in students achievement and have more motivated students (UNESCO, 1990). These qualities of a mathematics teacher give him or her ability to provide students with appropriate mathematics experience and attitude towards mathematics. Studies that have been done to assess teachers efficacy towards mathematics shows that it is affected by number of factors such as teacher training, teaching experience, type of schools and scores in mathematics in college, model and school subjects (Akhter & Bahoo, 2015). Lastly, good working conditions and high motivation of teachers in private schools than public schools make teachers in private schools to be more committed to their work in class.

For instance, in Nigeria, despite the wide importance of mathematics in school curricula and its applicability in many fields, many students have not found their feet in mathematics as a result of their perennial failure in the subject (Ukeje, 2005). The performance in maths at the secondary school has been very low as compared to other compulsory subjects such as English language as affirmed by Clement & Sarama (2007) who asserts that mathematics is the most dreaded examination paper at O'level. For instance, in many schools in Nigeria, more than half of the students score grade "E" which represents total failure (Rafina et al. 2015). The Ololube (2008) posits that due to these poor results in mathematics; many students have developed a phobia for the subject to the extent that even when test

and examination questions are very simple, student fails. The situation is not different in early mathematics education in lower secondary schools which forms the basis for later mathematics learning and achievement. For instance, a survey conducted by Unodiaku (2009) revealed that majority of students in lower schools do not possess the mathematics skills and learning passion required for high grade performance in mathematics.

One probable reason for students dislike in mathematics is the inability of most teachers to expose students to adequate mathematics skills through their method of teaching. For instance, before one can learn how to know how to add numbers with 3 digits, such as $256+128$, it is important to know how to add number with just one digit or two such as $1+5$ or $24+50$. After instructions on these skills, there is need for teachers to determine the level of achievement of their students in these skills. To be able to do this effectively, teachers require valid and reliable test in mathematics skills, but these test (in mathematics) are either scarce or absence in most public and private secondary school in Nigeria. The type of test used by most teachers is teachers-made test which are constructed by class-room teachers and most often lack psychometric properties (Nasreen, Ahmad & Sabiha, 2019). Thus, decisions taken based on scores obtained from the administration of such instruments are inaccurate and misleading.

According to Oduval (2013) some instructor without teaching ability, possess rather vague idea about the requirements for effective evaluation and learning achievement. Thus, it is necessary that students and specialist in education construct and validate tests to use in secondary schools to help improve teaching and learning. Therefore, the main purpose of this study was to find out how to prepare a standardize mathematics test items at the senior secondary school level. Specifically, the study objectives are as follows:

1. Determine the suitability of (MT) items
2. Find out the content validity of the MT
3. What is the cut –off score for the MT
4. What is the reliability coefficients of the various MT
5. How is the difficulty and distracter indices of the MT established

To get the desired study, the research questions is analyzed

1. What is the suitability of the MT items as rated by the content expert?
2. How is the content validity of MT established?
3. How is the cut-off score of the MT determine?
4. How is the reliability coefficient of the MT established?
5. How difficult and distracter are the MT items?

II. METHODOLOGY

This chapter is design to discuss methodology adopted in carrying out the study. The instrument used for this research is instrumentation. It is aimed at developing an instrument (MT) for evaluating SS1 students’ Mastery of mathematics test. This research design has been used by other researchers who carried out similar studies including Opara and Magnus (2017) that conducted a research on development and validation of a test of geographic skills (TOGS) for senior secondary schools. Kpolovie (2010) defined instrumentation as the science of test development that is useful for test construction aimed at measurement and evaluation of psychological traits. Hence, instrumentation is a scientific research tool that is use to determine or measure human abilities and psychological evaluations.

A sample was drawn from the population of 3,326 SS1 mathematics students. This was done by dividing the population into three groupings or strata prior to sampling. Random samples of 823 students in five secondary schools were carried out. Specifically, table of instruments were constructed on:

- i. Solving simple equations
- ii. Bearing
- iii. Statistics,
- iv. Cartesian plan and co-ordinates
- v. Set theory.

The instrument were use to collect data that was used for the determination of its characteristics and performance of students.

Table1. Test blueprint for a 54 items multiple-choice objective test in mathematics.

NO of Weeks	Contents Areas	Objects						
		Knowled ge	Comprehens ion	Applicati on	Analysi s	Synthesis	Evaluation	Total
		15%	25%	20%	25%	10%	5%	100%

2	Solving simple equation	1	2	2	2	1	1	9
2	Bearing	1	2	2	2	1	1	9
3	Statistics	2	3	3	3	1	1	13.5
3	Cartesian co-ordinates	2	3	3	3	1	1	13.5
2	Set theory	1	2	2	2	1	1	9
12	Totals							54

Steps Involved are:

- i. Determine the total number of weeks in teaching all the content areas.
 i.e; 2+2+3+3+2=12 weeks
- ii. Compute the number of items each content area would contribute to the 54 items needed. i.e; 2+2+3+3+2=12 weeks. Now in solving simple equations, 2 weeks was spent in covering the topic therefore,

$$\frac{2}{12} \times \frac{54}{1} = 9$$
- iii. Compute the number of items each cognitive level would contribute to each content area bearing in mind their respective percentages: That is Knowledge (15%), Comprehension (25%), Application (20%), Synthesis (10%), and Evaluation (5%).

For instance, knowledge level here is 15% for solving simple equations i.e;

$$\frac{15}{100} \times \frac{9}{1} = 1.35 = 1$$

Results

The data collected at different stages of the research were analyzed and the result presented. These analysis were focused on the research question earlier stated.

What is the suitability of the MT items as related by the content experts?

Items were rated by five specialists. Thus, only the items with average rating 3.00 or equal to 3.00 are suitable while those average scores below 3.00 are unsuitable.

Table 2: The average rating score of MT items as determined from the rating of five content specialists are shown in the table below:

ITEMS	RATE					Rater Average
	1	2	3	4	5	
1	2	3	1	1	2	1.8
2	3	3	3	3	3	3
3	1	2	1	1	1	2
4	2	2	1	2	1	1.6
5	5	5	4	3	4	4.2
6	4	5	4	3	5	4.2
7	2	2	1	2	2	1.6
8	1	2	2	1	1	1.4
9	5	5	4	4	5	4.6
10	1	2	2	2	1	1.4
11	4	4	5	5	5	4.6
12	1	2	2	2	1	1.4
13	1	2	2	2	1	2.2
14	5	5	5	4	5	4.8
15	2	2	1	2	1	1.6
16	4	4	5	5	5	4.6
17	4	5	4	4	5	4.4

18	5	5	4	5	5	4.8
19	1	2	1	1	1	2
20	4	3	3	4	4	3.6
21	4	4	4	5	4	4.2
22	4	4	5	5	5	4.6
23	5	5	4	5	5	4.8
24	4	4	5	5	5	4.6
25	3	4	4	5	4	4
26	5	5	5	4	5	4.8
27	2	2	1	1	1	1.4
28	1	2	2	1	2	1.4
29	4	4	5	4	5	4.4
30	2	2	2	1	2	1.8
31	2	2	1	1	2	1.4
32	5	5	4	4	5	4.6
33	4	4	5	4	4	4.2
34	4	4	4	5	4	4.2
35	4	4	5	5	5	4.6
36	2	2	3	1	3	1
37	5	5	4	4	4	4.4
38	4	4	3	4	3	3.6
39	1	3	1	1	2	2.6
40	2	2	1	1	1	1.4
41	4	4	3	3	4	3.6
42	1	2	2	2	1	1.8
43	4	4	5	4	4	4.2
44	5	5	4	5	5	4.8
45	2	2	1	2	2	1.6
46	4	4	4	5	5	4.8
47	2	2	2	2	2	1.6
48	1	2	1	2	2	2.2
49	5	5	4	4	5	4.6
50	2	1	2	2	3	2
51	4	4	4	5	4	4.2
52	1	1	2	1	1	2.2
53	2	2	2	1	2	1.8
54	4	5	5	4	4	4.4
55	1	2	2	1	2	1.4
56	5	4	4	4	4	4.2
57	2	2	1	2	2	1.8
58	1	2	1	1	2	1.2
59	4	4	4	5	4	4.2
60	1	2	2	1	2	1.2
61	4	4	5	5	5	4.2
62	2	2	2	1	1	1.4
63	5	4	4	5	5	4.6
64	5	5	5	4	4	4.6
65	4	4	4	5	4	4.2
66	4	4	4	5	5	4.2
67	5	5	5	5	4	4.8
68	1	2	1	2	2	1.4

69	1	1	1	1	2	1
70	4	5	5	4	4	4.4
71	2	2	2	1	2	1.6
72	1	1	2	2	1	1.4
73	4	5	5	4	4	4.4
74	1	2	2	2	2	1.2
75	5	5	4	4	5	4.6
76	2	2	3	3	2	1.4
77	4	4	5	5	4	4.4
78	5	4	4	5	5	4.6
79	5	5	4	4	4	4.4
80	5	5	5	5	4	4.8
81	2	2	2	2	1	1.6
82	1	1	1	1	2	2.2
83	5	4	4	5	5	4.6
84	2	2	2	1	2	4.6
85	4	4	5	4	4	1.8
86	2	2	2	2	2	4.2
87	4	4	3	3	4	2.4
88	2	3	3	2	2	3.6
89	5	5	4	4	5	2.4
90	4	4	5	4	4	4.6
91	5	5	5	5	5	4.2
92	1	2	2	2	2	5
93	1	2	2	2	2	2.6
94	4	4	3	4	4	2.4
95	2	2	2	3	3	3.8
96	2	2	2	3	2	1.2
97	1	2	2	2	2	2.2
98	5	4	4	4	5	2.6
99	5	5	5	5	2	4.4
100	1	2	2	2	2	5
Total	315	318	311	310	319	315
Item Average	3.15	3.18	3.11	3.10	3.19	3.15

A closer look at the table reveals that the average rating score of MT items range from 1.00 to 5.00.

How is the content validity of the MT established?

The validity index of the MT items were rated by two content experts as shown in table 3.

Table 3: Rating of two content experts.

		Specialist 1			
Specialist 2		Item rated 1 and 2	Item rated 3, 4 or 5	Total	
	Items rated 1 and 2	(a) 9	(b) 5	A+b=14	
	Items rated 3, 4 or 5	(c) 5	(d) 35	C+d=40	
	Total	a+c=14	b+d=40	a+b+c+d=54	

How is the cut off score of the MT determine?

The lower and upper group of the MT were established and a frequency distribution of the item score for the groups were plotted on the same graph as shown in figure 1 below. The test score where the two distributions intercept becomes the standard setting.

Table 4: Frequency distribution, for upper and lower group

Class Interval	Tally for U – Group	Frequency for U – Group	Tally for L – Group	Frequency for L – Group	Class Limit
0 – 5					0.5 – 5.5
6 – 10					5.5 – 10.5
11 – 15				5	10.5 – 15.5
16 – 20				10	15.5 – 20.5
21 – 25				25	20.5 – 25.5
26 – 30				32	25.5 – 30.5
31 – 35				45	30.5 – 35.5
36 – 40		10		25	35.5 – 40.5
41 – 45	 	15		15	40.5 – 45.5
46 – 50		20		5	45.5 – 50.5
51 – 55		23			50.5 – 55.5
56 – 60		30			55.5 – 60.5
61 – 65		25			60.5 – 65.5
66 – 70		22			65.5 – 70.5
71 – 75		12			70.5 – 75.5
76 – 80		5			75.5 – 80.5
81 – 85					80.5 – 85.5
		$\sum f = 162$		$\sum f = 162$	

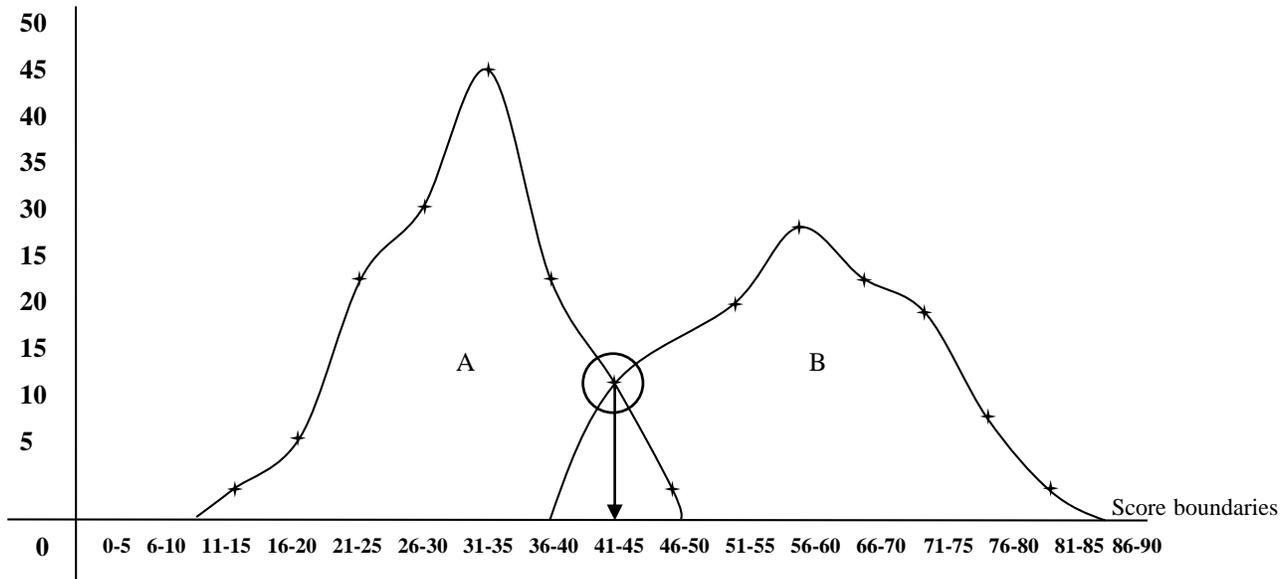


Fig. 1. Graphic presentation of data of lower (A) and upper (B) group of MT.

How is the reliability coefficient of the MT established?

The reliability coefficient of the MT were computed using test – retest technique. The reliability coefficient was base on three statistics , i.e. the Po, K, and Pc. Po measures the degree of agreement by the three administrations and, K measures the agreement uncontaminated by chance. Pc determine the agreement of the two administrations.

Table 5. Po, K and Pc reliability coefficient

	Test 1			Po	K	Pc	
		Master	Non-mastery				Total
Test 2	Mastery	A 108	B 106	214	0.55	0.12	0.49
	Non Mastery	C 40	D 70	110			
	Total	148	176	324			

The analysis in the table above is shown as follows: Po, K and Pc

$$Po = \frac{a+d}{N} = \frac{100+70}{324} = \frac{170}{324} = 0.55$$

$$Pc = \frac{(a+b)(a+c) + (c+d)(b+d)}{N^2}$$

$$Pc = \frac{(108+106)(108+40) + (40+70)(106+70)}{324^2}$$

$$= \frac{(214)(148) + (110)(176)}{324^2} = \frac{31672 + 19360}{104976} = \frac{51032}{104976} = 0.486 \approx 0.49$$

$$K = \frac{Po - Pc}{1 - Pc} = \frac{0.5 - 0.49}{1 - 0.49} = \frac{0.06}{0.51} = 0.117 \quad 0.12 =$$

K of 0.12 implies that 12% of the observed agreement in the decisions made by both test is uncontaminated by chance.

Difficult and distracter Index of the Mathematical Test (MT) items

Item difficulty means how difficulty an item is. Hence, this can be determined by the formula:

$$\text{Item difficult} = \frac{U+L}{N}$$

Where;

- U = Number of candidate that passed the items in the master group
- L = Number of candidate that passed the item in the non-mastery group
- N = Number of candidate that sat for the test

III. DISCUSSION

In table 1 above, out of 100 items only 54 items was found suitable, this was achieved by deleting items that was rated below 3. Hence, only 54 mathematics test questions rated by the specialists as good items was administered to students. This indicates that the content specialists rated each item with 1, 2, 3, 4 or 5.

$$\text{Thus, } CVI = \frac{d}{(a+b+c+d)} = \frac{40}{9+5+5+35} = \frac{40}{54} = 0.74$$

To find the cut –off score of the mathematics test, 54 standardized items as administered to 324 students. These students was classified into lower and upper group i.e. 162 students in a group and their scores presented in a frequency distribution table as shown above (table 4). A graph shown frequency axis and score boundaries us presented. The two group (A & B) scores are plotted in the same graph. Their scores was established ranging from the least score to the highest score in the score boundaries axis. In the frequency axis, the number of time, these score occur is presented. In this case, in the frequency axis of the graph from the lower group, 5 students scored 11-15 marks, 10 students scored 16-20 marks, 25 students scored 21-23 marks, 32 students scored 26-30 marks, 4 students scored 31-35 marks, 25 students scored 36-40 marks, 15 students scored 41-45 marks, and 5 students scored 46-50 marks. In the upper group from the frequency table, 10 students scored 36-40 marks, 15 students scored 41-45 marks, 20 students scored 46-50 marks, 23 students scored 51-55 marks, 30 students scored 56-60 marks, and 25 students scored 61-65 marks.

22 students scored 66-70 marks, 12 students scored 71-75 marks and 5 students scored 76-80 marks. When these scores (A & B) was plotted in the same graph, two curve was obtained and the point where the two curve intercept is 45%. This become the accepted cut-off for the MT. Coefficient of agreement Po; above shows the measure of the proportion of students for whom the same decision, mastery or non-mastery is made on both administration, i.e. test 1 and test 2 by the raters. In the above table, 2 test was administered to a sample of 324 students and result classified for both test.

$$\text{Computation of the } P_o \text{ by the formula: } P_o = \frac{a+d}{N}$$

Where;

Compute the Po by the formula:

$$P_o = \frac{a+d}{N} \text{ where } P_o = \text{Agreement coefficient}$$

- a = Number classified as masters on both administration
- d = Number classified as masters on both administration
- N = Total number of subjects

$$P_o = \frac{a+d}{N} = \frac{108+70}{324} = \frac{178}{324} = 0.55$$

Therefore, 0.55 implies 55% of the subjects were classified consistently in agreement, chance agreement K. This is called coefficient Kappa which takes chance agreement into consideration. It is referred to the proportion of consistent classifications observed beyond that expected by chance.

Expected chance agreement Pc: It measures the proportion of individual to have consistent classification even if there were no genuine relationship between the test. That is if the classification on the two administrations were completely independent. It is completed using the formula:

$$P_c = \frac{(a+b)(a+c) + (c+d)(b+d)}{N^2}$$

$$N^2$$

Where P_c = proportion of agreement expected by chance, a, d and N retain their former interpretations

C = number classified as master and non master for test 1 and 2 respectively.

b = number classified as non-master and master for test 1 and 2 respectively.

Computing P_c using the above, $P_c = \frac{(214)(148) + (110) + (176)}{324^2}$

$$\frac{51,032}{104,976} = 0.49$$

How Difficult and distractor are the MT Items?

The difficulty indices and the distractor indices was computed using the respective formulae. 148 students were found to belong to mastery group since their scores range from 45% and above. While the remaining 176 students were found to belong to non-mastery group.

Formulae:

$$\text{Item difficulty} = \frac{U + L}{N}$$

$$\text{Distractor (DI)} = \frac{X_1 + V_1}{N_u + N_L}$$

Table 6.1. Lower and Upper group that answer item in the test

ITEM	U	L	N	D
1	216	102	324	0.981
2	132	24	324	0.41
3	210	96	324	0.944
4	96	30	324	0.38
5	144	42	324	0.574
6	186	42	324	0.703
7	210	60	324	0.833
8	198	54	324	0.777
9	198	84	324	0.877
10	120	18	324	0.425
11	156	72	324	0.703
12	210	72	324	0.870
13	210	84	324	0.907
14	114	24	324	0.425
15	204	78	324	0.870
16	210	60	324	0.833
17	156	42	324	0.611
18	132	36	324	0.518
19	108	24	324	0.407
20	90	66	324	0.481
21	138	60	324	0.611
22	210	90	324	0.925
23	210	84	324	0.907
24	114	24	324	0.425
25	156	42	324	0.611
26	30	18	324	0.148
27	90	12	324	0.314
28	180	42	324	0.685
29	66	18	324	0.259
30	120	60	324	0.555
31	24	12	324	0.111

32	84	30	324	0.351
33	156	72	324	0.703
34	108	96	324	0.629
35	66	18	324	0.259
36	96	30	324	0.388
37	78	36	324	0.351
38	192	60	324	0.777
39	192	90	324	0.870
40	108	12	324	0.370
41	180	72	324	0.777
42	186	72	324	0.796
43	48	42	324	0.277
44	66	18	324	0.259
45	30	90	324	0.370
46	30	30	324	0.185
47	156	72	324	0.703
48	54	78	324	0.407
49	186	54	324	0.740
50	114	36	324	0.462
51	174	12	324	0.574
52	180	42	324	0.685
53	186	84	324	0.833
54	54	18	324	0.222

Table 6.1 shows a level of clarity for the interpretation of difficulty. It shows how the difficulty items were obtained from the table above, item 1 indicate that: 216 is the number of students in the upper (Mastery) class that got the option in item 1 correct and 102 students in the lower (non-mastery) got item 1 correct. 324 is the total number of candidates that set for the test. Now put the formula above into use:

$$D = \frac{U + L}{N} \text{ i.e. } \frac{216 + 102}{324} = 0.981$$

Therefore, 0.981 = difficult level of item.

Take item 6. 186 is the number of students in the upper (mastery) class that got the option in item 6 correct and 42 students in the lower (non-mastery) class got item 6 correct. 324 is the total number of candidates that sat for the test. I.e. $\frac{186 + 42}{324} = 0.703$ Therefore, 0.703 = difficulty level of item 6, and in that order to 54 items administer in the mathematics test.

Distracter index: A distracter or distractor is an incorrect alternative option. It is a plausible wrong answer designed to be attractive to students who do not know the correct answer more than the students that know the correct answer.

Distracter index D can be computed by the formula: $d = \frac{L - U}{N}$

To get it right, a list of test items showing the number of students in mastery and non-mastery group and option tick in the test. Item 1 option is ‘‘A’’ i.e the key. The table 6.2 below, in the mastery class – 70 students tick ‘‘A’’ in item 1 while 45 students tick ‘‘A’’ in non-mastery class.

Option C item 1. 18 students tick C in the mastery class while 22 students tick C in the non-mastery class. Total candidate that attempt item 1 in the mastery class is 154 while total candidate in non-mastery class that attempt item 1 is 170. Option ‘‘A’’ is the correct answer (the key).

Table 6.2. Shows table of option tick by candidates in the mathematics test (distraction index)

ITEM		A	B	C	D	E	Total
1	Mastery	70*	33	18	20	13	154
	Non-Mastery	45	38	22	26	39	170
2	M	*58	24	22	28	2	134
	N	49	36	27	37	41	190

3	M	14	28	33	9	*60	144
	N	18	36	42	37	47	180
4	M	24	*59	26	18	28	155
	N	34	38	36	28	33	169
5	M	*80	22	19	17	18	156
	N	47	37	24	31	29	168
6	M	15	12	*77	10	15	129
	N	36	27	51	42	38	195
7	M	*68	23	15	23	22	151
	N	47	32	29	38	27	173
8	M	*78	10	8	12	12	120
	N	56	42	27	38	41	204
9	M	24	15	19	*68	21	147
	N	35	27	38	45	32	177
10	M	18	*70	15	16	18	137
	N	40	48	38	20	41	187
11	M	21	17	*69	14	19	140
	N	38	41	43	33	29	184
12	M	*71	19	18	19	17	144
	N	44	37	28	40	31	180
13	M	15	19	13	16	*81	144
	N	29	41	31	32	47	180
14	M	19	*66	18	20	20	143
	N	46	47	26	28	34	181
15	M	15	8	*73	19	18	133
	N	46	38	50	22	35	191
16	M	*84	12	20	19	17	152
	N	48	21	40	36	27	172
17	M	*69	16	19	13	18	135
	N	48	21	40	36	27	172
18	M	58*	23	19	22	25	147
	N	46	37	21	33	40	177
19	M	20	21	*78	12	23	154
	N	27	40	45	20	38	170
20	M	*69	19	16	21	20	145
	N	47	25	31	40	36	179
21	M	22	14	*60	23	25	144
	N	38	27	41	38	36	180
22	M	21	23	21	16	*74	155
	N	27	35	30	28	49	169
23	M	18	*80	5	19	23	145
	N	29	48	27	35	40	179
24	M	25	*52	22	24	21	154
	N	41	46	31	28	24	170
25	M	6	12	*80	14	15	127
	N	36	31	59	27	44	197
26	M	19	18	12	20	*74	143
	N	39	38	27	36	41	181
27	M	19	*69	14	18	20	140
	N	38	48	21	41	36	184
28	M	*70	21	23	24	0	138
	N	49	33	37	42	25	186
29	M	22	17	*74	16	20	149
	N	39	24	50	21	41	175
30	M	15	21	4	*67	18	117
	N	48	37	28	53	41	207

31	M	9	*79	20	27	25	160
	N	15	48	23	34	44	164
32	M	4	15	19	0	*88	126
	N	35	44	39	27	53	198
33	M	*66	18	23	22	14	143
	N	49	27	42	38	25	181
34	M	15	*68	16	6	21	126
	N	36	55	38	29	40	198
35	M	23	18	10	*80	19	150
	N	43	28	26	47	30	174
36	M	10	14	13	18	*75	130
	N	23	39	33	41	58	194
37	M	22	*69	13	25	26	155
	N	28	46	26	31	38	169
38	M	23	10	16	13	*80	142
	N	52	28	44	34	36	194
39	M	23	10	16	13	*80	142
	N	40	37	25	22	58	182
40	M	*88	13	21	24	5	151
	N	53	29	30	38	23	173
41	M	*72	24	26	20	12	154
	N	48	35	27	41	19	170
42	M	*76	12	15	18	15	136
	N	49	25	38	42	34	188
43	M	22	19	*67	24	20	152
	N	40	28	45	32	27	172
44	M	18	11	16	*77	18	140
	N	42	26	31	50	35	184
45	M	13	*83	16	1	18	133
	N	31	60	37	22	41	191
46	M	19	*68	20	2	22	131
	N	32	58	41	26	36	193
47	M	18	*77	6	19	23	143
	N	29	50	26	33	43	181
48	M	*68	10	18	22	18	158
	N	48	29	36	45	40	198
49	M	*86	14	18	22	18	158
	N	45	21	34	40	26	166
50	M	*72	16	20	22	17	147
	N	45	22	36	41	33	177
51	M	21	18	*88	13	4	144
	N	42	24	55	28	31	180
52	M	*77	11	20	18	22	148
	N	48	26	39	23	40	176
53	M	16	23	19	15	*69	141
	N	33	41	25	38	46	183
54	M	*81	16	8	18	15	138
	N	47	36	29	40	34	186

Table 6.3. Shows difficulty and distracter index of MT items

ITEM	D	D.I				
1.	0.981	A *	B 0.02	C 0.01	D 0.02	E 0.08
2.	0.41	*	0.04	0.08	0.03	0.12
3.	0.944	0.01	0.02	0.03	0.09	*

4.	0.38	0.03	*	0.03	0.03	0.02
5.	0.574	*	0.05	0.02	0.04	0.03
6.	0.703	0.07	0.05	*	0.10	0.07
7.	0.833	*	0.03	0.04	0.05	0.02
8.	0.777	*	0.10	0.06	0.08	0.09
9.	0.877	0.03	0.04	0.06	*	0.03
10.	0.425	0.07	*	0.07	0.01	0.07
11.	0.703	0.05	0.07	*	0.06	0.03
12.	0870	*	0.06	0.03	0.06	0.04
13.	0907	0.04	0.07	0.06	0.05	*
14.	0.425	0.08	*	0.02	0.02	0.04
15.	0.870	0.10	0.09	*	0.01	0.03
16.	0.833	*	0.03	0.06	0.05	0.03
17.	0.611	*	0.06	0.08	0.05	0.05
18.	0.518	*	0.04	0.01	0.03	0.05
19.	0.407	0.02	0.06	*	0.02	0.05
20.	0.481	*	0.02	0.05	0.06	0.05
21.	0.611	0.05	0.04	*	0.05	0.03
22.	0.925	0.02	0.04	0.03	0.04	*
23.	0.907	0.03	*	0.07	0.05	0.05
24.	0.425	0.05	*	0.03	0.01	0.01
25.	0.611	0.09	0.06	*	0.04	0.09
26.	0.148	0.06	0.06	0.05	0.05	*
27.	0.314	0.06	*	0.02	0.07	0.05
28.	0.685	*	0.04	0.04	0.06	0.08
29.	0.259	0.05	0.02	*	0.02	0.07
30.	0.555	0.10	0.05	0.07	*	0.07
31.	0.111	0.02	*	0.01	0.02	0.06
32.	0.351	0.10	0.03	0.06	0.08	*
33.	0.703	*	0.08	0.06	0.05	0.03
34.	0.629	0.07	*	0.07	0.07	0.06
35.	0.259	0.06	0.09	0.05	*	0.03
36.	0.388	0.04	0.08	0.06	0.07	*
37.	0.351	0.02	0.05	0.04	0.02	0.04
38.	0.777	*	0.03	0.07	0.05	0.06
39.	0.870	0.05	0.04	0.03	0.03	*
40.	0.370	*	0.06	0.03	0.04	0.06
41.	0.777	*	0.07	0.01	0.07	0.02
42.	0.796	*	0.06	0.07	0.07	0.06
43.	0.277	0.06	0.03	*	0.03	0.02
44.	0.259	0.07	0.05	0.05	*	0.05
45.	0.370	0.06	*	0.07	0.07	0.057
46.	0.185	0.04	*	0.07	0.07	0.04
47.	0.703	0.03	*	0.06	0.04	0.06
48.	0.407	*	0.06	0.06	0.10	0.07
49.	0.740	*	0.02	0.06	0.06	0.03
50.	0.462	*	0.02	0.05	0.06	0.05
51.	0.574	0.07	0.02	*	0.05	0.08
52.	0.685	*	0.05	0.06	0.02	0.06
53.	0.833	0.05	0.06	0.02	0.07	*
54.	0.222	*	0.06	0.07	0.07	0.06

*= Key Option

In the table above, in item 1, distracter B is written 0.02, C is written 0.01, D is written 0.02 and E as 0.08. To obtain this;

Item 1 option B.

$$\frac{38-33}{324} = 0.02$$

i.e. 38 students of non-mastery tick option B and 33 students of mastery tick option B as well. Substituting these figures into the formula below, you obtained 0.02 and in that order.

Option C

$$\frac{22-18}{324} = 0.01$$

Option D

$$\frac{26-20}{324} = 0.02$$

Option E

$$\frac{39-13}{324} = 0.08$$

Formula is $d = \frac{L - U}{N}$

IV. CONCLUSION

Conclusion was drawn after data analyses as follows: The suitability of the MT items was determined after the rating score by the five specialists in term of appropriateness of each item. This finding is related to that of Rufina et al. (2015) who assessed teacher competence in test construction and content validity of teacher made examination questions in Borno state in Nigeria using questionnaires and found out that teachers in Borno state were not capable in test construction. The author also found that teachers questions has low content validity that emphasized lower levels of cognitive domain i.e. remembering, understanding and applying.

V. RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made:

- i. The MT should be used by mathematics teachers for both formative and summative evaluation of SS 1 students' mastery of the mathematics test. Students' results in MT should be used by teachers and guidance and counselors in advertising the students in their choice of mathematics award of scholarship.
- ii. Again, MT should be use as a model test of mathematics test by mathematics teachers and future researchers. The mathematics especially for SS II and SS III students. Future researchers who will work on development and validation of tests of mathematics tests should also use MT as a reference point in constructing their own items. Those researching on the "Level of SS II students mastery" of the mathematics test in other states could administer MT to their subjects instead of taking pains in developing and validating their own test.
- iii. Workshops, seminars and inter-services training programmes should be regularly organized for mathematics teachers which will acquaint them with the most effective instructional objectives for provoking students' acquisition skills.

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INDUSTRIAL IMPACT ON SELECTED HEAVY METALS IN SOIL SAMPLES OF NNEWI-NORTH LOCAL GOVERNMENT AREA, ANAMBRA STATE, SOUTHEAST NIGERIA

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Abstract- The impact of industries on selected heavy metals in soil samples of Nnewi-North, Anambra State, Nigeria was studied. The levels of seven heavy metals (Pb, Mn, Zn, Ni, Cr, Cu, and Cd) in top soil (15-20cm), from the area were determined using Flame Atomic Absorption Spectrophotometric technique. The HNO₃-HCl-H₂O₂ method was used in the soil sample extraction. Accuracy of the method was assessed by the determination of a certified reference soil material, CC-141, obtained from European Commission, Joint Research Centre (JRC) Belgium and the results showed agreement with certified values. The soil pH varied from moderately acidic to neutral (6.00-7.11) from the various locations and these are considered as normal for agricultural production. The mean and range concentrations (µg/g), respectively of metals in the soils of the studied area were 38.30±5.54, 13.33-91.67 for Pb, 101.07±16.18, 25.93-190.93 for Mn, 44.04±15.96, 7.33-137.17 for Zn, 2.22±0.50, 0.27-8.60 for Ni, 21.69±8.93, 3.33-136.66 for Cr, 9.57±5.96, 1.17-78.30 for Cu, 1.16±0.17, ND-5.67 for Cd and with the exception of Cd(1.16µg/g), were lower than the threshold values for agricultural soils for most countries and FAO/WHO guidelines. Pollution indices were developed to assess the pollution status of heavy metals in the studied area. The geoaccumulation index (Igeo), pollution index (PI) and the pollution load index (PLI) calculated for the soils of the studied area showed that the area was unpolluted to moderately polluted. In conclusion, the investigated area has been affected by the industrial activities. It is recommended that control measures should be enforced by the relevant authorities in order to avert any adverse effects.

I. INTRODUCTION

Industrialization is essential for economic growth of any nation as it acts as a vehicle for development. Modern life style with increasing population and industrial growth has impacted negatively on the environment at global scale [1]. In order to fulfil the basic requirements of increasing population, different types of industries have been set up in different regions of our country, Nigeria and these include pulp and paper, textile, cement, petrochemical, metal processing, food processing, fertilizer, sugar, pharmaceutical, distilleries among others. The fermentation industry is considered as one of the most polluting industry and has posed serious environmental problems throughout the world while chemical and metallurgical industries are the most important sources of heavy metals in soils [2].

Heavy metals are released into the environment by both natural and anthropogenic sources. The main natural sources of metals in soils are chemical weathering of mineral; the anthropogenic sources are associated mainly with industrial, agricultural, mining, land disposal of waste, waste incineration, mechanic workshop and filling station [3]. Many heavy metals are environmentally stable and non-biodegradable, toxic to the living beings and tend to accumulate in plants and animals, causing chronic adverse effects on human health [4]. Different studies have revealed that the presence of toxic heavy metals like iron (Fe), lead (Pb), mercury (Hg) reduce soil fertility and agricultural output [5]. Also, heavy metals are in various raw materials, such as fossil fuels and metal ores, as well as in industrial products. Some trace metals are emitted entirely or partially from raw materials during the high-temperature production of industrial goods, combustion of fuels, and incineration of municipal and industrial wastes, entering the ambient air with exhaust gases [6]. Atmospheric emissions from industrial complexes are considered as the main source of the environmental pollution. These emissions travel along vast areas by the effect of the meteorological factors and become accumulated in soil, plant and animal whether aquatic or terrestrial and may reach the food chain [7].

Cultivation of crops on polluted soil can adversely affect the health of plants and animals as well as man in the food chain. For instance, cadmium contaminated soil was known to have caused the itai-itai disease as a result of

consumption of rice grown on contaminated soil in Japan in the 1950s [8]. So, increasing the heavy metal content in soil increases the uptake of heavy metals by plants which depends upon the soil type, plant growth stages and plant species. The balancing of agricultural soils for mineral components, organic matter, air and water allow for water retention and drainage, enough oxygen which help to provide physical support and nutrients for plant growth [9].

Nnewi-North Local Government Area is known to be an area with a large number of industries which include petrochemical, metal fabrication, food processing, automobile spare parts industries among others. Apart from meeting the environmental impact assessment (EIA) conditions required for the setting of new industry or factory, most industries in this part of the world never bother on the disposal of their wastes. However, no work has been carried out to holistically evaluate the impact of industries on the heavy metal concentration in soil samples of Nnewi-North Local Government Area of Anambra State, Nigeria. It was against this backdrop that this work was carried out. The aim of this study was to assess the impact of industries on selected heavy metals in soil samples from Nnewi-North Local Government Area. The analysis of heavy metals was conducted using the Flame Atomic Absorption Spectrometry (AAS) situated in Sheda Science and Technology Complex, Abuja.

II. MATERIALS AND METHODS

Study Area

Nnewi is the second largest city in Anambra state, southeastern Nigeria (Figure 1). Nnewi-North Local Government Area is commonly referred to as Nnewi central, and comprises four autonomous quarters: Otolo, Uruagu, Umudim, and Nnewichi [10]. Its geographical coordinates are $6^{\circ}1'0''$ North and $6^{\circ}55'0''$ East. The city is located east of the Niger River, and about 22 kilometers south east of Onitsha in Anambra state, Nigeria [11]. Nnewi is home to many major indigenous manufacturing industries. Nnewi is part of eastern Nigeria's industrial axis and acts as sophisticated networks expanded to include an international dimension through trading relations with exporters from Asia [10]. Infact, Nnewi is usually referred to as the Japan of Nigeria because of its high industrialization and has about thirty giant manufacturing plants and over a hundred cottage industries [12]. By 1940, Nnewi residents were at the center of an international trading network that dominated the supply of motor parts in Nigeria. The town subsequently became a center for commerce and industry, and is known to have one of the largest automotive spare parts markets in Africa today [13].

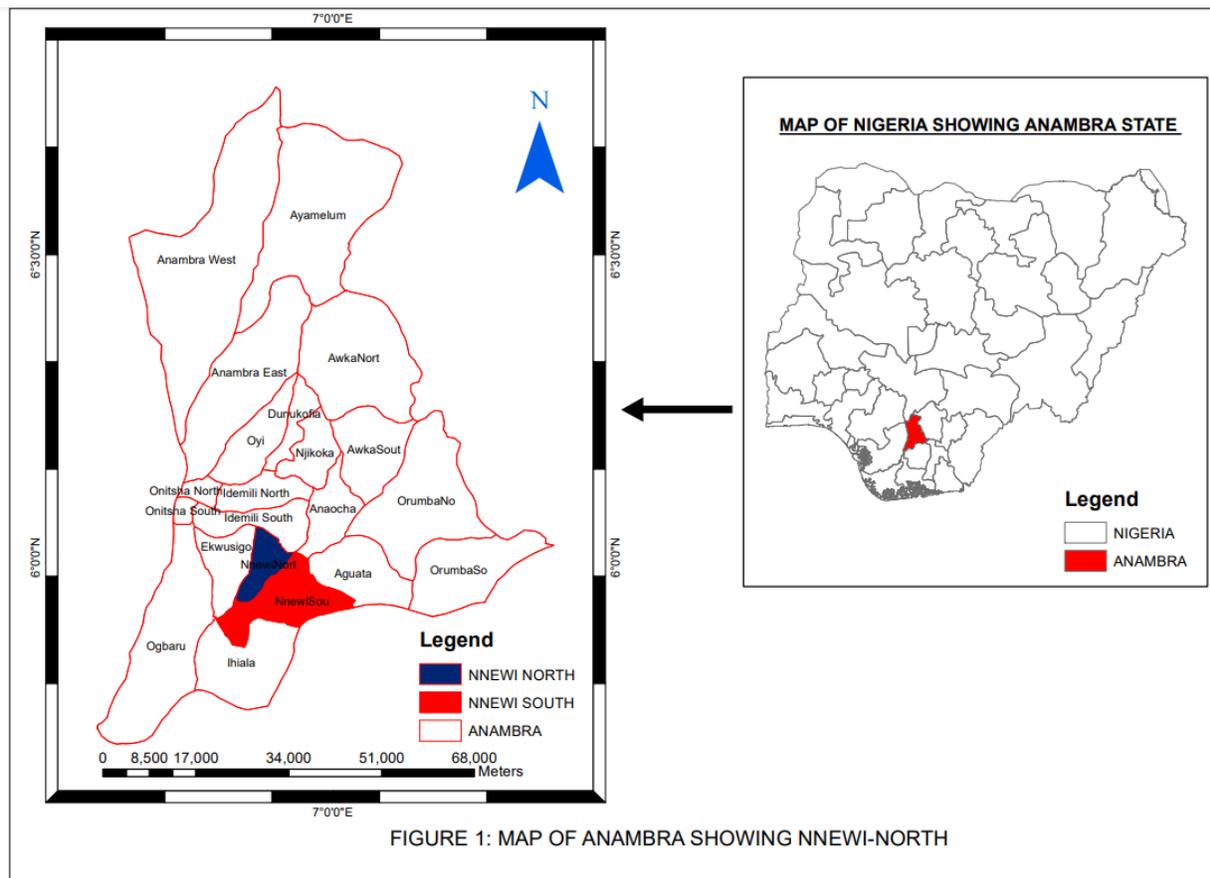
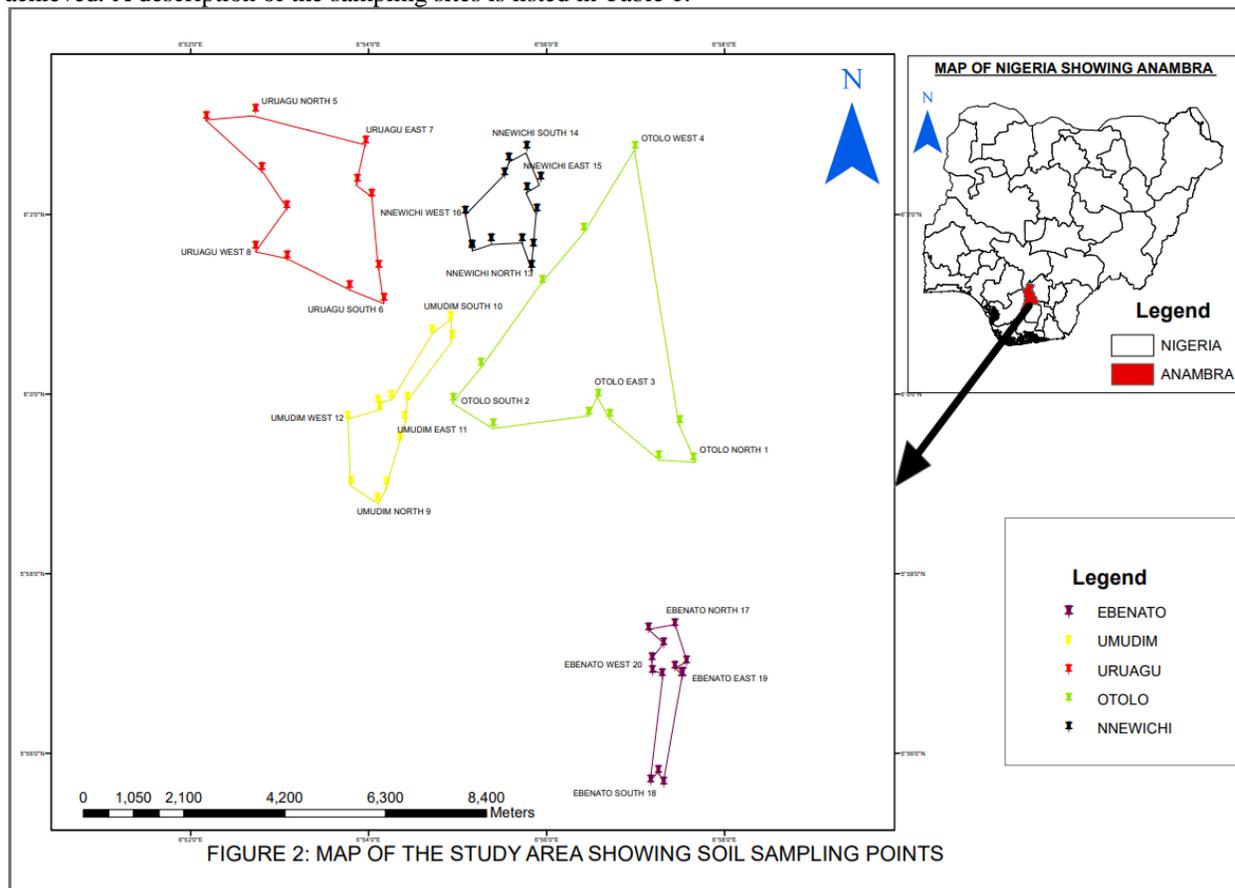


FIGURE 1: MAP OF ANAMBRA SHOWING NNEWI-NORTH

Sample Collection and Preservation

Soil samples were collected from four areas in Nnewi-North Local Government Area. The four areas include Otololo, Uruagu, Umudim, and Nnewichi (Figure 2). Control soil samples were collected from Ebonato. Triplicate samples (15-20cm depth), from each study site and control site were collected ten meters apart in a straight form using a stainless steel knife and pooled into polythene bags labelled with site locations. The soil samples were collected twice in rainy and dry seasons. In the laboratory, the soil samples were mixed thoroughly to obtain a composite sample for each site. The composite samples were air-dried for seventy-two hours at room temperature, ground in a glass mortar with pestle and sieved through 2.0mm sieve, further pulverized to a fine powder and passed through 0.5mm sieve for the total metal content determination [14]. This ensured that the analyte is not lost and good results were achieved. A description of the sampling sites is listed in Table 1.



Preparation of Samples for Metal Determination

5.0g of soil sample was digested with 10cm³ of hydrogen peroxide for 10–15 min to oxidize any organic matter. After cooling, 15ml mixture of aqua regia was added and boiled gently on hot plate in a fume chamber for about 40mins [15]. After digestion, the digest was filtered into 50ml volumetric flask and diluted to volume with distilled water.

Analysis of Certified Reference Material (ERM –CC 141)

Accuracy was assessed by analyzing three (3) replicates of certified reference materials, soil samples CC-141, obtained from European Commission, Joint Research Centre(JRC) Belgium.

Determination of pH in Soil (H₂O)

The pH of the soil samples was determined according to [16] at a ratio of 1:2.5. Ten grams (10.0g) of the air dried sample were weighed into 100cm³ beaker and 25cm³ of distilled water was added and stirred. The suspension was allowed to stand for 30mins with occasional stirring with glass rod. The pH of the supernatant suspension was then determined using a pH meter.

Table 1 Description/Identification of Sampling Sites

S/N	Areas	Code	Sample site address	The Coordinates	Number of samples
1	Otolo	OTN	Otolo North	05°59.282 ¹ N/06°57.656 ¹ E	9
2	Otolo	OTS	Otolo South	06°00.342 ¹ N/06°55.264 ¹ E	9
3	Otolo	OTE	Otolo East	05°59.768 ¹ N/06°56.716 ¹ E	9
4	Otolo	OTW	Otolo West	06°01.258 ¹ N/06°55.958 ¹ E	9
5	Uruagu	URN	Uruagu North	06°02.512 ¹ N/06°52.800 ¹ E	9
6	Uruagu	URS	Uruagu South	06°01.059 ¹ N/06°54.175 ¹ E	9
7	Uruagu	URE	Uruagu East	06°02.225 ¹ N/06°54.038 ¹ E	9
8	Uruagu	URW	Uruagu West	06°01.575 ¹ N/06°56.032 ¹ E	9
9	Umudim	UMN	Umudim North	05°59.009 ¹ N/06°54.209 ¹ E	9
10	Umudim	UMS	Umudim South	06°00.860 ¹ N/06°54.927 ¹ E	9
11	Umudim	UME	Umudim East	05°59.662 ¹ N/06°53.915 ¹ E	9
12	Umudim	UMW	Umudim West	05°59.928 ¹ N/06°54.594 ¹ E	9
13	Nnewichi	NNN	Nnewichi North	06°01.647 ¹ N/06°55.738 ¹ E	9
14	Nnewichi	NNS	Nnewichi South	06°02.462 ¹ N/06°55.530 ¹ E	9
15	Nnewichi	NNE	Nnewichi East	06°01.654 ¹ N/06°55.165 ¹ E	9
16	Nnewichi	NNW	Nnewichi West	06°02.210 ¹ N/06°55.823 ¹ E	9
17	Ebenato	EBN	Ebenato North	05°57.440 ¹ N/06°57.446 ¹ E	9
18	Ebenato	EBS	Ebenato South	05°55.675 ¹ N/06°57.318 ¹ E	9
19	Ebenato	EBE	Ebenato East	05°56.962 ¹ N/06°57.446 ¹ E	9
20	Ebenato	EBW	Ebenato West	05°56.886 ¹ N/06°57.305 ¹ E	9

III. RESULTS AND DISCUSSIONS

The results of the analysis of the ERM-CC141 reference materials are listed in Table 2. The results showed good agreement with certified values indicating that the sample preparation method adopted for this work is reliable and accurate.

The pH of the soil ranged from 6.00-7.11 with the mean value of 6.52±0.39, moving from moderately acidic (6.24±0.19) to neutral (6.80±0.20) (Table 3 and 4). Generally, the soil pH during the dry season were slightly acidic with the soil pH of Uruagu being the highest with a value of 6.46±0.64 across the study sites (Table 4) whereas Otolo with a soil pH of 6.00±0.50 was the lowest during the dry season. The trend in this result showed that acidity increases with decrease in soil moisture. The soils were acidic during the dry season and as the rainy season increases, pH values also increased even reaching to moderately alkaline. This trend can be attributed to the fact that increased moisture in the soil dissolves more soluble salts for instance, exchangeable Ca²⁺ and Mg²⁺ which has the potential to increase pH to a neutral value (6.00-7.11) thus, reducing acidity [17].

Table 2 Result of the Analysis of the Certified Reference Material (ERM –CC 141) based on Aqua Regia Extractable Content

METAL	CERTIFIED VALUE(µg/g)	EXPERIMENTAL VALUE±sd(µg/g)
Zn	50.00	47.50±2.16
Pb	32.20	32.50±3.53
Ni	21.90	21.80±2.82
Cu	12.40	12.15±0.69
Cd	0.25	0.29±0.14

Statistical Summary of Heavy Metals Concentrations ($\mu\text{g/g}$) in the soils during rainy, dry, and the studied area are summarized in Tables 3, 4, and 5 respectively. The concentrations of the metals in the studied area were found to be higher than the concentrations of the metals in control soils (Table 3 and 4) during both the raining and dry season. The mean abundance of the metals in the soils of Nnewi-North is in the order $\text{Mn} > \text{Zn} > \text{Pb} > \text{Cr} > \text{Cu} > \text{Ni} > \text{Cd}$ (Table 5). Lead, Manganese and Nickel were more abundant during the dry season whereas Zinc, Chromium, Copper and Cadmium were more abundant during the rainy season.

Table 3 Statistical Summary of Heavy Metals Concentrations ($\mu\text{g/g}$) in the Soils of the Studied Area During Rainy Season

Metal	Location					
	Otolo	Uruagu	Umudim	Nnewichi	Total Mean	Ebenato Control
Pb						
mean\pmsd	32.73 \pm 9.01	34.14 \pm 11.80	34.10 \pm 9.76	36.14 \pm 5.88	34.28 \pm 1.40	11.01 \pm 3.81
Range	24.50-41.60	20.00-45.60	24.50-48.66	28.80-47.83		8.30-14.25
Mn						
mean\pmsd	94.47 \pm 24.50	118.22 \pm 52.14	59.70 \pm 29.45	73.85 \pm 48.30	86.56 \pm 25.48	29.14 \pm 9.07
Range	67.60-160.93	55.93-190.93	25.93-100.93	34.26-139.26		21.06-38.10
Zn						
mean\pmsd	33.73 \pm 4.05	65.40 \pm 0.79	30.00 \pm 1.31	53.54 \pm 3.88	45.67 \pm 16.73	10.82 \pm 3.38
Range	22.83-45.16	28.33-93.50	7.33-48.83	22.50-101.83		6.33-15.77
Ni						
mean\pmsd	1.54 \pm 0.06	2.90 \pm 0.45	1.48 \pm 0.28	1.42 \pm 0.09	1.83 \pm 0.71	1.10 \pm 0.28
Range	0.90-2.20	0.90-8.50	1.10-2.10	1.10-1.85		0.90-1.35
Cr						
mean\pmsd	23.91 \pm 11.45	51.04 \pm 15.61	14.80 \pm 6.78	39.60 \pm 5.90	32.34 \pm 16.14	7.615 \pm 0.97
Range	10.00-46.60	10-136.66	3.33-28.33	16.66-81.66		5.00-8.86
Cu						
mean\pmsd	7.00 \pm 3.88	28.00 \pm 0.40	7.00 \pm 2.86	15.54 \pm 8.28	14.39 \pm 9.93	3.05 \pm 1.13
Range	1.50-25.30	6.80-78.30	2.66-18.16	5.80-34.80		1.50-4.60
Cd						
mean\pmsd	1.73 \pm 0.22	2.10 \pm 0.04	1.91 \pm 0.10	2.03 \pm 0.10	1.94 \pm 0.16	0.925 \pm 0.95
Range	1.50-2.00	1.80-2.50	1.70-2.20	1.80-2.20		0.23-1.70
pH						
(1:2.5)	6.77\pm0.41	7.11 \pm 0.90	6.70 \pm 0.50	6.64 \pm 0.84	6.80 \pm 0.20	8.43 \pm 0.74
Range					6.64-7.11	

Table 4 Statistical Summary of Heavy Metals Concentrations ($\mu\text{g/g}$) in the Soils of the Studied Area During Dry Seasons

Metal	Location					
	Otolo	Uruagu	Umudim	Nnewichi	Total Mean	Ebenato Control
Pb						
mean\pmsd	56.45 \pm 1.45	28.63 \pm 13.63	39.99 \pm 10.62	44.16 \pm 11.78	42.31 \pm 11.48	12.42 \pm 8.13
Range	30.00-81.70	17.70-56.60	13.33-91.67	13.33-70.00		5.00-18.33
Mn						
mean\pmsd	98.42 \pm 21.20	126.78 \pm 6.44	107.52 \pm 2.86	129.59 \pm 23.08	115.58 \pm 15.06	37.83 \pm 7.81
Range	64.26-144.2	70.90-177.60	85.43-135.10	70.43-164.26		29.82-45.70
Zn						
mean\pmsd	34.06 \pm 8.22	56.23 \pm 18.47	24.69 \pm 3.29	54.67 \pm 13.90	42.41 \pm 15.55	23.66 \pm 2.70
Range	11.83-52.33	17.83-89.83	11.83-40.16	26.33-137.17		21.08-30.05
Ni						
mean\pmsd	2.56 \pm 0.88	2.40 \pm 1.08	1.65 \pm 1.66	3.85 \pm 2.94	2.61 \pm 0.89	1.43 \pm 0.60
Range	1.00-5.00	0.77-3.33	0.27-3.50	1.28-8.60		0.50-2.10
Cr						
mean\pmsd	10.41 \pm 3.48	11.95 \pm 2.71	8.56 \pm 0.55	13.30 \pm 0.80	11.06 \pm 2.04	7.36 \pm 0.98
Range	5.16-16.67	6.80-19.80	4.00-5.33	8.30-17.16		3.33-10.00
Cu						
mean\pmsd	3.31 \pm 0.61	7.58 \pm 4.82	3.31 \pm 0.84	4.56 \pm 2.02	4.69 \pm 2.01	2.32 \pm 1.86
Range	2.00-5.50	2.00-78.30	1.17-5.33	1.50-9.00		0.50-4.17
Cd						
mean\pmsd	1.11 \pm 1.32	0.15 \pm 0.02	0.14 \pm 0.04	0.19 \pm 0.06	0.39 \pm 0.44	0.15 \pm 0.00
Range	ND-5.67	ND-0.23	0.09-0.22	0.03-0.34		0.14-0.16
pH (1:2.5)	6.00 \pm 0.50	6.46 \pm 0.64	6.18 \pm 0.66	6.33 \pm 1.03	6.24 \pm 0.19	6.62 \pm 0.26
Range					6.00-6.46	

Table 5 Statistical Summary of Heavy Metals Concentrations ($\mu\text{g/g}$) in the soils of the Studied Area

Metal	Mean\pmsd	Range
Pb	38.30 \pm 5.54	13.33-91.67
Mn	101.07 \pm 16.18	25.93-190.93
Zn	44.04 \pm 15.96	7.33-137.17
Ni	2.22 \pm 0.50	0.27-8.60
Cr	21.69 \pm 8.93	3.33-136.66
Cu	9.57 \pm 5.96	1.17-78.30
pH (1:2.5)	6.52 \pm 0.39	6.00-7.11

The Pb concentration from the studied area ranged from 13.33-91.67 $\mu\text{g/g}$ dry weight (Table 3 & 4) with a mean value 38.30 \pm 5.54 $\mu\text{g/g}$ dry weight (Table 5). The highest and lowest concentration of 91.67 and 13.33 $\mu\text{g/g}$ dry weight were respectively recorded during the dry season. Pb content was more abundant during the dry season with a mean value of 42.31 \pm 11.48 compared to raining season with a mean value of 34.28 \pm 1.40 (Table 3 & 4). Ebenato, the control site recorded the least mean value of 11.01 \pm 3.81 during the raining season compared to dry season with a mean value of 12.42 \pm 8.13 $\mu\text{g/g}$ dry weight.

The highest lead contents from Umudim East could be attributed to the presence of lead batteries and chemical industries in the area which could affect the level of lead in the soil. The area is close to a clustered mechanical and automobile fitting workshop, where automobile repair and related activities (disposal of used batteries) are carried out. Various authors have identified sources of lead to industrial effluents [18], paint flakes [19], refuse dumps [20] and electronic wastes [21].

Manganese has the highest concentration range for all the heavy metals examined in the soil samples from Nnewi-North; varying considerably from 25.93-190.93 $\mu\text{g/g}$ dry weight (Table 3 & 4). The mean value recorded was 101.07 \pm 16.18 $\mu\text{g/g}$ dry weight and the highest concentration of 190.93 $\mu\text{g/g}$ dry weight was recorded during rainy season in Uruagu (Table 3). The lowest concentration was found during rainy season also but in Umudim with a concentration of 25.93 $\mu\text{g/g}$ dry weight. (Table 3). In all, the control site (Ebenato) had the least Mn values during the rainy and dry seasons (Table 3 & 4). The highest concentrations of 190.93 $\mu\text{g/g}$ dry weight obtained from Uruagu could be attributed to the use of manganese as an alloying constituents in fabrication/welding of industrial machines, as fuel-oil additives, smoke inhibitors, and pigments for paints used in spraying of vehicles along the various sampling points [22]. The highest concentrations of Mn, Cu and Cr were found within Uruagu community, probably because Nkwo Nnewi market where a lot of anthropogenic and commercial activities take place is located in Uruagu community.

Zinc concentration from the studied area ranged from 7.33-137.17 $\mu\text{g/g}$ dry weight (Table 3 & 4). The mean value recorded was 44.04 \pm 15.96 $\mu\text{g/g}$ dry weight and the highest concentration of 137.17 $\mu\text{g/g}$ dry weight was recorded during dry season in Nnewichi (Table 4). The lowest concentration was found during rainy season in Umudim with a concentration of 7.33 $\mu\text{g/g}$ dry weight. (Table 3). Sampling locations in Nnewichi East are mainly cultivated farmlands and highest concentrations recorded here could be attributed to agricultural chemicals or materials such as impurities in fertilizers, pesticides and wastes from poultry production. [23].

The Zn contents of 7.33-137.17 $\mu\text{g/g}$ dry weight obtained in this study were higher than the normal concentration range of 17-125 $\mu\text{g/g}$ dry weight for top surface soils suggested by [24]. A lower ranged value of 10-85 $\mu\text{g/g}$ dry weight than the value obtained in this study have also been reported by [25] in their study of cultivated farmlands in the Bida City. The heavy metals concentrations are below the European Commission and WHO/FAO's recommended threshold values of both 300 $\mu\text{g/g}$ as reported by [26] and within a soil level range of 0-250 $\mu\text{g/g}$ classified as being typical of no contamination by the UK Department of the Environment for the recreational and Agricultural uses [27].

The Chromium contents in the examined soil samples from Nnewi North varied widely between 3.33-136.66 $\mu\text{g/g}$ dry weight (Table 3 & 4) with the highest concentration of 136.66 $\mu\text{g/g}$ dry weight (Table 3) seen in Uruagu during the rainy season while the lowest concentration of 3.33 $\mu\text{g/g}$ was recorded in Uruagu during the raining season also. The highest concentration of 136.66 $\mu\text{g/g}$ dry weight recorded in Uruagu south may probably be ascribed to the industrial waste water from paper and paint industry located along the sampling points. The mean value of 21.69 \pm 8.93 dry weight (Table 5) were higher than the mean value of 4.86 \pm 2.21 $\mu\text{g/g}$ reported by [28] in their study on phytoremediation of contaminated soils from Challawa industrial estate, kano State, Nigeria, but lower than the allowable limit of 65 $\mu\text{g/g}$ set by WHO, 2000.

As explained by [29] with increasing pH their solubility tends to increase. This explains why the Cr values in the soils were relatively much higher during the rainy season (where the pH values were more neutral to alkaline in

concentration). The finding here is similar to the report of [30] whose report showed that Cr in the soils was relatively higher in alkaline soils than in acid solutions in crude oil contaminated soils remediated with mushroom plants. Chromium concentrations range between 1 and 3000mg/kg in soil [31].

The nickel concentration from the study area ranged from 0.27-8.60 $\mu\text{g/g}$ dry weight (Table 3 & 4). The mean value recorded was 2.20 \pm 0.50 $\mu\text{g/g}$ dry weight and the highest concentration of 8.60 $\mu\text{g/g}$ dry weight was recorded during dry season in Nnewichi as against the lowest concentration of 0.27 $\mu\text{g/g}$ dry weight in Umudim (Table 4).

The highest concentrations of 8.60 $\mu\text{g/g}$ dry weight obtained from Nnewichi South could be ascribed to the use of nickel as an alloy in fabrication/welding of industrial machines and as an additive in batteries and plastics littered along the sampling points. A report by [26] had a higher mean range values of 54.03-57.77 $\mu\text{g/g}$ dry weight of nickel than obtained in this study. However, the mean values obtained in this study were higher than the mean values of 1.9 \pm 0.96 $\mu\text{g/g}$ reported by [25] in their study of heavy metal levels around ceramics and pharmaceutical industrial sites in Niger State, Nigeria. The heavy metals concentrations are below the European Commission and WHO/FAO's recommended threshold values of 75 and 50 $\mu\text{g/g}$ as reported by [26].

The copper concentration from the study area ranged from 1.17-78.30 $\mu\text{g/g}$ dry weight (Table 3 & 5). The mean value recorded was 9.57 \pm 5.96 $\mu\text{g/g}$ dry weight and the highest concentration of 78.30 $\mu\text{g/g}$ dry weight was recorded during rainy season in Uruagu (Table 3). The lowest concentration was found during dry season in Umudim with a concentration of 1.17 $\mu\text{g/g}$ dry weight (Table 4). The highest concentrations of 78.30 $\mu\text{g/g}$ dry weight obtained from Uruagu North could be ascribed to the use of copper metal in fabrication/welding or painting of industrial machines, production of various auto parts and passage of industrial/ domestic waste water along the sampling points [32]. The area is known predominantly for industrial activities where repair of car brakes and tyres, car fitting occur. Copper could also be released from brakes of vehicles that ply the road every day [32]. The high concentrations in some locations could be as a result of burnt vehicles along the major roads as copper is commonly found in electrical wirings, engine wear, brake linings [33].

The cadmium concentrations varied considerably across the various seasons with three sites in dry season having cadmium contents that were too low to be detectable. The cadmium concentration from the studied area ranged from ND-5.67 $\mu\text{g/g}$ dry weight Table (3 & 4). The mean value recorded was 1.16 \pm 0.17 $\mu\text{g/g}$ dry weight and the highest concentration of 5.67 $\mu\text{g/g}$ dry weight was recorded during dry season in Otolu South (Table 4). The highest concentrations of 5.67 $\mu\text{g/g}$ dry weight obtained from Otolu South could be as a result of industrial effluent from auto battery and petrochemical products manufacturing plant located along the sampling points.

The trend in the results shown in Tables 3 & 4 shows that the mean value of Cd was lower in the dry season than in raining season. This implied that reducing the soil moisture content also reduced the availability of Cd in the soils. This suggest that in the dry season, Cd does not portend any significant hazard. However, it is important to note that industrial activities have generally increased the concentration of Cd in the soils especially during the rainy season [34].

Comparison of Study Area with soil quality criteria/guidelines for Agriculture

The mean heavy metal contents from this study were compared with criteria from other Countries, European Commission and WHO/FAO upper limit values for soil quality guidelines specified for environmental protection and human health. All metals analyzed in this study were found to be lower than the soil quality guidelines stipulated for some countries except for cadmium whose mean value (1.16 $\mu\text{g/g}$) exceeded the 0.3 $\mu\text{g/g}$ and 0.6 $\mu\text{g/g}$ by [47] and [35] guidelines respectively (Table 6). The toxic effects of these metals on the environment at this level may be regarded as significant. The farmlands are mainly within the vicinity of manufacturing industries and some experience high vehicular emission.

Assessment of Pollution Indices in Soil

The range and mean of the Igeo of the study area were respectively 0.83-1.34 and 1.11 for Pb, 0.74-1.29 and 1.00 for Mn, 0.08-1.23 and 0.69 for Zn, 0.10-0.48 and 0.34 for Ni, 0.06-1.49 and 0.85 for Cr, 0.36-2.14 and 1.04 for Cu, 0.34-0.80 and 0.50 for Cd and these were in the order of Ni<Cd<Zn<Cr<Mn<Cu<Pb (Table 7). The area is categorized uncontaminated to moderately contaminated soils [36]. Pb and Cu are in the class of moderately polluted and this can be due to the release of Pb into the environment from the Pb-acid battery plants in the area as well as several other metal fabrication plants such as welding, painting and automobile fittings and repairs that lead to the discharge of copper into the environment [12, 32].

The mean of the Pollution Index is 3.26, 3.02, 2.56, 1.74, 2.90, 3.54 and 2.15 for Pb, Mn, Zn, Ni, Cr, Cu and Cd respectively and these are in the category of low contamination to considerable contaminated soils [37]. Pb and Cu are in the class of moderately polluted and this can be due to burnt vehicles along the major roads as copper is commonly found in electrical wirings, engine wear, brake linings [33] as well as release from brakes of vehicles that ply the road every day [32]. PLI value ranged from 1.69-3.23(Table 7) with a mean value of 2.61 indicating deterioration of site quality [38].

Table 6 Soil Quality Guidelines for Some Countries Compared to Levels ($\mu\text{g/g}$) Obtained in this Study

Country	Pb	Mn	Zn	Ni	Cr	Cu	Cd	Reference
Kwali, Nigeria	3.98	-	8.39	7.24	-	5.35	0.07	[41]
Republic of Korea, Agriculture	120	-	80	100	-	100	10	[42]
Denmark, Agriculture	40	-	500	30	-	500	5	[43]
Canada, Agriculture	70	-	200	50	-	63	10	[44]
UK, Agriculture	40	-	70	29	-	20.10	1.00	[45]
Canada, Residential	140	200	200	50	-	63	10	[44]
France	100		200	50	-	100	-	[46]
Taiwan	55		200	120	-	150	-	[46]
EU	300		300	75	100	100	-	[47]
FAO/WHO	50		300	50	-	100	0.3	[48]

Table 7 Geoaccumulation Index, Pollution Index and Pollution Load Index

Metal	Geoaccumulation Index		Pollution Index		Pollution Load Index	
	range	mean	range	mean	PLI	mean PLI
Pb	0.83-1.34	1.11	2.67-3.80	3.26	3.23	2.61
Mn	0.74-1.29	1.00	2.50-3.66	3.02	2.99	
Zn	0.08-1.23	0.69	1.59-3.53	2.56	2.42	
Ni	0.10-0.48	0.34	1.22-2.09	1.74	1.69	
Cr	0.06-1.49	0.85	1.56-4.20	2.90	2.69	
Cu	0.36-2.14	1.04	1.92-6.61	3.54	3.08	
Cd	0.34-0.80	0.50	1.90-2.61	2.15	2.12	

IV CONCLUSION

The metal contamination state in farmlands is very important in monitoring heavy metals health of populace as plants can directly take up metals from contaminated soils and accumulate such metals. The levels of Pb, Ni and Mn in soils were higher in dry season whereas that of Zn, Cu, Cr and Cd were higher in raining season. These heavy metals could be attributed to the presence of chemical industries in the area and their use as an alloying constituent in fabrication/welding of industrial machines, fuel-oil additives, and smoke inhibitors, production of various auto parts and passage of industrial / domestic waste water along the sampling points [18], [22] and [32]. All the heavy metals analyzed in this study were found to be within acceptable limits of soil quality criteria/guidelines for agriculture stipulated by some countries except for cadmium whose value exceeded the maximum of $0.3\mu\text{g/g}$ by FAO/WHO guideline [39]. With these levels, the possibility of food crop being contaminated may likely be experienced in the nearest future as plants are known to absorb metals from the soil which have adverse effects on those who consume such food [40]. The toxic effects of these heavy

metals on the environment of the studied area may be regarded as significant and as the area grows industrially, there is need to continuously monitor the place to avoid an outbreak of metal poisoning.

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Comparative Analysis Of Systems Of Vocational Education In Ukraine, The United States Of America And Great Britain

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Abstract- We emphasize that in an autonomous mode, in a closed pedagogical and industrial environment, the modernization of vocational education is impossible and not a real thing. International cooperation, pedagogical dialogue, identification of commonalities and differences in the systems of vocational education of different countries and Ukraine are extremely necessary here.

It is a well-known truth about the impossibility and inexpediency of mechanical transfer of this or that model of education, which was born, formed and developed in another country, or specific methods of foreign scientists and practitioners to the educational field of Ukraine and other countries. Domestic ideas, respectively - concepts, models, methods, educational institutions of a new type must go their own way, with consistent, scientifically sound consideration of national traditions, specific conditions and opportunities, as well as global trends that meet the needs of solving global problems.

The way of revealing progressive ideas of this or that foreign experience, their philosophical, comparative-pedagogical analysis, clarification of conceptual bases of formation and development of concrete educational models, their comparison with domestic approaches, concepts and models can be expedient and perspective. On this basis, possible directions for the implementation of these ideas in another country, including Ukraine, provided scientific and methodological support, taking into account a set of factors (socio-cultural, economic, sociological, psychological, personnel, material, technical) and direction of public policy in this area.

We emphasize that the achievement of this goal contributes to comparative pedagogical and psychological research aimed at comprehensive objective study and understanding of the world educational process, identifying global trends, progressive ideas in concepts and models of education in different countries and forecasting education in each country, specific region or the world. Thus the main purpose of the research is very important, namely to study systems of vocational education in Ukraine, the United States of America and Great Britain and to conduct their comparative analysis.

Index Terms- vocational education, comparative analysis, educational system, English-speaking countries.

I. INTRODUCTION

Education is not preparation for life, it is life." (James Watson) According to an American scientist, education is life; it is such a long and complex process that it just needs a lot of attention, time and effort.

Education systems in any country are designed to promote the main tasks of socio-economic and cultural development of society, because it is the school, university prepares a person for active work in various spheres of economy, culture, political life of society. The successful development of a country largely depends on the level of knowledge. The most important thing is in human destiny.

Relevance: Determining strategic directions for the development of education systems worries almost the entire world community. Current and future employers are interested in such an employee who has the following qualities: - think independently and solve various problems (i.e. to apply the gained knowledge to solve them); - have creative thinking; - have a rich vocabulary based on a deep understanding of the humanities. Vocational education is a qualitatively defined level of the education system, which occupies a significant place in meeting the educational needs of the individual and society. Due to the fact that education is being modernized all over the world, we wondered what a modern young person needs in order to realize himself in modern living conditions. What is the role of vocational education, and what should it be in the 21st century to prepare people for life in our rapidly changing world? How are school graduates taught in different countries of the world, how do vocational institutions abroad differ from our Ukrainian ones? To answer these questions, we decided to compare the education systems in developed countries, namely the systems of vocational education in Ukraine and English-speaking countries (UK and USA).

The object of research is the system of vocational education. The subject of the research is the features of vocational education in Ukraine and English-speaking countries. The purpose of this

work is to describe and analyze the system of vocational education in Ukraine and abroad. These are the United States, Great Britain and Ukraine. The purposes of this work are 1. To study the system of vocational education in Ukraine. 2. To study the system of vocational education in Great Britain and the USA. 3. Conduct a comparative analysis of vocational education systems in these countries.

Research methods: Theoretical (analysis of the literature on education in English-speaking countries and Ukraine); descriptive and comparative.

II. RELEVANT LITERATURE

Many Ukrainian and foreign scholars have addressed the problems of vocational education in Great Britain. General issues of teaching and education, trends in the development of the English system of vocational education were studied by Ukrainian scientists (V. Kudin [6], O.Kurbatov [7]). Some issues of professional training in the UK are analyzed in the works of S. O. Sysoeva, A.M. Aleksyuk, P.M. Volovik, O.I. Kulchytska, L.E. Sigaeva [8]. Among the well-known Ukrainian scientists who studied the main characteristics of the vocational education system are Luzan P.G., Manko V.M., Nesterova L.V., Romanova G.M. [14] and others. This question was the subject of research by foreign scholars S. Price [9], A. Smithers [12], J. Tolley [15]. Ukrainian scientists V.Radkevych, N.Bugay [11] and foreign scientist R. Dearing [2] approached the issue of determining the process of formation of professionalism of specialists of certain professions at different times.

Many scientists have studied the system of education in the United States such as V.Bondarenko [1], L.N. Tarasyuk [13]. The issues of general historical development of the US higher education system are discussed in the works of W. James, and others. The main trends in the development of US higher education in modern conditions are highlighted in the studies of E. Kaverina, V. Kudina, N. Nychkalo [3]. Problems of improving the quality of education in the United States are considered in the works of A. Varlamova [16], O. Kalinina [5]. Some of the benefits of American education are reflected in the sites of Harvard, Illinois, Columbia, and other universities. K.N. Tseikovich [12] and Internet resources study the current state of the education sector in the United States.

III. VOCATIONAL EDUCATION IN UKRAINE

Vocational education as a component of the education system of Ukraine is a set of pedagogical and organizational and managerial measures aimed at ensuring the acquisition of knowledge, skills and abilities in their chosen field of professional activity, development of competence and professionalism, education of general and professional culture.

Considering the first question, it is necessary to analyze the system of vocational education, which is made up in accordance with Art. 4 of the Law of Ukraine "On Vocational Education" vocational schools, regardless of ownership and subordination, conducting activities in the field of vocational education,

educational and methodological, scientific and methodological, scientific, educational and industrial, educational and commercial, publishing and printing, cultural and educational, physical culture and health, computer and other enterprises, institutions, organizations and their governing bodies that provide or provide training for skilled workers. It is necessary to characterize each component of this system, highlighting the features of each of its components.

The issue of management and organization of vocational education is regulated by Section II of the Law of Ukraine "On Vocational Education".

The state bodies of management of vocational education include:

- specially authorized central executive body in the field of vocational education;
- ministries and other central executive bodies which vocational schools are subordinated to;
- the Council of Ministers of the Autonomous Republic of Crimea, regional, Kyiv and Sevastopol city state administrations and the bodies of management of vocational education created by them;
- intersectoral council for vocational education. Vocational education is carried out in vocational and technical educational institutions in the following forms: day, evening, full-time and part-time, distance, external, according to individual curricula.

The degree of vocational education of citizens is determined in vocational schools by the appropriate levels of qualification and complexity of professions and educational qualification level. Each degree in a vocational school has theoretical and practical completion and is confirmed by assigning graduates (students) educational and qualification levels "skilled worker", "junior specialist", "bachelor" in accordance with the acquired professional knowledge, skills and abilities. Regulations on vocational and technical education are approved by the Cabinet of Ministers of Ukraine. Organizational and legal principles of the vocational school are determined by Section III of the Law of Ukraine "On Vocational Education". Using the recommended regulations, it is necessary to know the definition of vocational school and its types, which include:

- vocational school of the relevant profile;
- vocational school of social rehabilitation;
- higher vocational school;
- professional lyceum;
- colleges;
- professional lyceum of the relevant profile;
- vocational school;
- art vocational school;
- higher art vocational school;
- agricultural school;
- higher school-agricultural firm;
- school-factory;
- center of vocational education;
- center of professional education;
- training and production center;
- center for training and retraining of workers;
- training and course plant;
- training center;
- other types of educational institutions that provide vocational education or provide vocational training [4].

Since independence, Ukraine has formed a network of vocational schools (hereinafter - vocational schools) of various

forms of ownership, namely: state vocational schools - 991, including vocational schools of the Ministry of Education and Science - 870 (with a contingent of 405.1 thousand students); Vocational schools in the structure of universities - 46 (with a contingent of students - 18.4 thousand); Vocational schools in penitentiary institutions - 75 (with a contingent of students - 7.7 thousand); non-state ownership - 924 vocational schools (with a contingent of students, listeners - 89 thousand) (as of 01.01.2020). The network of vocational schools of the Ministry of Education and Science is formed in the following sectoral directions: industry - 309 vocational schools; construction - 177 vocational schools; agro-industrial complex - 252 vocational schools; sphere of services - 132 vocational schools. At the same time, a network of state vocational schools of a new type was created. In particular (as of 01.01.2020): 181 higher vocational schools; centers of vocational education - 57; professional lyceums - 482.

Article 22 of the Law of Ukraine "On Vocational Education" defines the main powers and activities of vocational schools, which include:

- organization of the educational process, choice of forms and methods of teaching; educational-production, educational-educational, educational-methodical, financial-economic and production-commercial activity;
- development of working curricula for professions and working curricula for subjects based on standard curricula and standard curricula, determination of the regional component of the content of vocational education, which are approved in the prescribed manner; - development of rules of admission of students to the educational institution on the basis of standard rules of admission;
- formation together with the governing bodies of vocational education of admission plans for students, listeners, taking into account the state order, the needs of the labor market and the needs of citizens in vocational education and orders of enterprises, institutions and organizations;
- organization of food, material support and household services for students;
- certification of pedagogical workers;
- organization of internships for teachers at enterprises, institutions, organizations;
- implementation of professional training of the unemployed population;
- organization of industrial training of students, trainees at enterprises, institutions and organizations;
- providing measures for labor protection of students, trainees, employees;
- material and technical support of the educational process;
- determining the structure and staffing, taking into account the established salary fund; - ensuring the quality of vocational training and education of students.

A graduate of a vocational school who has successfully passed the qualification attestation is awarded the educational and qualification level "skilled worker" in the acquired profession of the relevant category (category).

A graduate who has completed the relevant course of study in an accredited higher vocational school, college, center of vocational education of a certain level of accreditation, may be awarded the educational qualification level "junior specialist" and "bachelor". A graduate of a vocational school who has been awarded the educational and qualification level "skilled worker"

is issued a diploma, a sample of which is approved by the Cabinet of Ministers of Ukraine. A graduate of a vocational school who has completed general secondary education is issued a relevant document on standard secondary education. A person who has mastered the course of vocational training and successfully passed the qualification certification is issued a certificate of assignment or improvement of working skills, a sample of which is approved by the Cabinet of Ministers of Ukraine.

A graduate of a higher vocational school and a center of vocational education, who has been awarded the qualification of "junior specialist" and "bachelor", is issued a diploma, a sample of which is approved by the Cabinet of Ministers of Ukraine.

The legislation foresees types of control of knowledge, skills and abilities of students, listeners, determines the study and vacation time of the student (listener, student), the rules of training and industrial practice. Vocational educational institutions, education management bodies, founders carry out current, thematic, intermediate and initial control of knowledge, skills and abilities of students, listeners, their qualification certification.

Vocational education may include science and mathematics, humanities, physics, general engineering, vocational theory and vocational training. Natural-mathematical, humanitarian, general technical, professional theoretical training is carried out in specialized classrooms, classrooms, laboratories and is conducted in the following forms: different types of lessons, lectures, theoretical seminars, practical seminars, laboratory-practical classes, etc .; individual lessons for students, listeners; performance of individual tasks by students, listeners (abstract, calculation work, course project, final and intermediate stage qualification work, diploma project); study tour; other forms of organization of theoretical training [7].

IV. VOCATIONAL EDUCATION IN THE UNITED KINGDOM

Today, the United Kingdom is a highly developed country, and its education system is considered one of the most prestigious and best in the world. There are a number of reasons for this: first, diplomas and certificates obtained in the UK are recognized worldwide. Secondly, studying in the UK is a great opportunity to improve your English language skills, which is very important for building a future career in any field of international business. And thirdly, nowadays it is considered very prestigious to have an education obtained abroad, especially in the UK. Why is it considered so prestigious? And why do so many young people now want to get an education in this country and not in ours, for example? To answer these questions, we conducted a scientific research. Vocational education in the UK is very popular and in demand among both local students and foreigners. The reason for this popularity is the availability and quality of vocational education in the UK. The details of the study in the three parts of the United Kingdom - England, Wales and Scotland - differ. In general, the whole education system is divided into two sectors: public and private. Admission and payment conditions, curriculum, and semester length in different sectors may vary, but the basic structure of education, exam conditions, and state-level training are the same for all educational institutions. Vocational education in the UK provides the full range of knowledge and skills needed for a successful career in your chosen profession.

There are several types of vocational schools in the UK: 1. Many schools offer secondary special education programs such as A-level, International Baccalaureate, Scottish Higher, NVQ and SVQ. 2. Sixth grade colleges give students an academic specialization and prepare them for admission to higher education. 3. Colleges of professional and higher education. There are two types of colleges: Colleges of Further Education (graduates are issued a certificate of profession, although excellent students receive a diploma equivalent to A-level) and colleges of higher education (College of Higher Education). These colleges, like universities, offer degrees (bachelor's level only) and issue diplomas of higher education. Colleges are usually smaller than universities. College of Further Education (FE) The concept of "further education" (FE) The concept of "further education" includes all types of post-secondary education, except higher education, designed to obtain or improve skills. Colleges can be private or public, multidisciplinary, working in only a few areas of study or specialized. The duration of the training course varies greatly - from a few weeks to two years. It all depends on the specialization and what qualification the student wants to get. The "ceiling" for the college is a higher diploma of professional education. Further education usually means learning the professional skills or the skills needed by employers. At the same time, after completing most courses or institutes of further education, no document is issued - in this case, for most graduates, the acquired skills are more important than a diploma. Vocational training is a very flexible structure that is constantly reviewed and updated. Further education also provides continuing general education and admission to higher education for people of all ages. Students use further education to study academic disciplines, training and simply for general development. Further education colleges usually offer a number of professional courses as well as academic programs. After completing many of these courses, the student can immediately enter the second year of university [3].

There are about 500 further colleges in England and Wales. There are about half a million full-time students in these colleges. More than three million students study at the evening department. Many people rush to college for financial reasons: it is much cheaper to study there than in universities, (tuition costs about 2.5-3.4 thousand pounds or \$ 4-5.5 thousand per year, depending on the course). In the UK, you can always find a suitable program of secondary special education to master almost any specialty. In addition, it should be noted that the qualifications awarded by educational institutions in the UK in such specialties as business administration, information technology, engineering, art and design, are among the most prestigious and recognized in the world. In the same range are such professional fields as hotel and restaurant business, tourism, clothing design, photography, sound design, film production and advertising. A high school diploma (GCSE) is enough to enter the college.

Each educational institution in the UK independently forms the requirements for entrants. In British colleges, a wider range of subjects than in schools, among the subjects studied may be, for example, psychology or sociology, and there are courses that prepare for the GCSE certificate. In addition, seminars, refresher courses for professionals, foreign language teaching, tailoring and sewing, embroidery, computer science, yoga, floristic. As a rule, in such educational institutions there is no specialization in one area - on the contrary, they have many faculties of different

profiles. For example, Barry College in Cardiff (Wales) has faculties of aerospace engineering, business and management, health, design and art, tourism, hospitality, sports, construction. Falkirk College in Scotland trains kindergarten teachers, furniture makers, musicians, employees of radio stations, etc. In almost every college, you can get a specialty, one way or another related to the beauty industry. These are not only traditional manicures, pedicures and hairdressing, but first of all cosmetology, massage, aromatherapy and a set of procedures related to face and body care, health and relaxation. Among the professions offered by colleges are not only socially significant (nurses, environmentalists, specialists in working with children with developmental disabilities), but also simply in demand (fitness trainers, accountants, web designers, etc.). Among Langside College's most popular programs are gardening and golf field management. It is not necessary to prove that the most skilled florists in the world live in Great Britain, it is enough to look at gardens in British suburbs, flower beds in parks and facades of local pubs hung with cascades of plants; what to say about the exhibition in Chelsea, which defines high fashion in floriculture. On the territory of the college, there are playgrounds where students work on their projects: they get abandoned pieces of land on which they must arrange their own flower beds, alpine slides, raspberries, vegetable beds. There is a lot of work for those who are learning to create and maintain golf courses: choosing grass, mowing, planning a field with artificial obstacles, etc. In other colleges, you can find similar courses for those who practice, for example, football fields. The teaching methods in the UK are such that the responsibility for the success of learning rests largely with the student. All research work is done by them independently, and, therefore, a lot of work.

Each British college seeks to provide a variety of forms of education that allow students to improve their skills, rise to degrees and levels of education. The purpose of college is to teach a person to learn. It is believed that the student and the teacher are not subordinates and superiors, but partners in the learning process; in the classroom they address each other by name as peers. Independent work in the library and writing various essays and essays take a lot of time.

From the very beginning, students are encouraged to look for their own style and defend their own ideas, even the craziest. Teachers teach wards to work in a team - to consult with each other, to criticize, to share ideas. Qualification standards for vocational training have been adopted in England and Scotland. Qualification certificates are issued to persons who have demonstrated the appropriate level of knowledge and practical skills. This is a great incentive for lifelong learning. The National Vocational Qualification (NVQ) is based on national qualifications standards. It has five levels, the certificate of the first level implies the controlled mastery of the simplest work operations, while the certificate of the fifth gives the right to hold positions that involve the most complex management functions. A similar Scottish Certificate of Professional Qualification, SVQ, is recognized throughout the UK. NVQ (National Vocational Qualification) - a qualification that confirms the ability of the graduate to work in any field of business or industry. Training takes place in the workplace. Moreover, certain deadlines for the program are not set. To qualify, a student must demonstrate their ability to perform work in accordance with all standards. GNVQ

(General National Vocational Qualification) is a multilevel qualification that provides the basis of knowledge in the chosen field. GNVQ will help a British student to continue their education in Further Education Colleges or get a job. To enter the university you need to undergo advanced training in this program (GNVQ Advanced). ND (National Diploma) - a qualification similar to the advanced level of GNVQ. Training for this qualification ends with examinations and the issuance of a Higher National Diploma in almost any academic or professional specialty. It is of great importance for those who plan to pursue a career immediately after graduation without a bachelor's degree. However, with such a diploma, career opportunities are limited. At the same time, he allows you to enter the University for a bachelor's degree. Many vocational colleges offer study programs, after which you can immediately enter the 2nd year of university. The training period will last only 2 years. Benefits of vocational education in the UK Secondary vocational education in the UK is more accessible than higher education.

In addition, there are other significant advantages of obtaining vocational education in this country: 1. Higher education. 2. Obtaining prestigious qualifications that are recognized worldwide. 3. Wide choice of educational programs. 4. Active and high-quality preparation for employment. 5. Development of English skills. 6. Study in a multicultural and multinational environment, combined with the age-old academic traditions of Great Britain [5].

The prospect of developing professional education in the UK is the comprehensive implementation of the practical component in the educational process, as well as taking into account the latter in the certification system. For example, the National Federation of Hairdressers, as well as physicians, lawyers, financiers, set certain requirements for the quality of training of future professionals. Higher professional education significantly improves its position in the market of educational services. The main reason for this progress is the organization of joint training and methodological councils, in the activities of which employers participate, which help to develop curricula, practical component and provide funding for such education. The future of higher professional education in the UK depends on such fruitful cooperation. It is known that if higher professional education can provide real opportunities for young people to acquire practical skills that will help them get a good job in the future, then young people will strive to get it. In the UK, unfortunately, the opposite trend is happening: vocational education is considered provincial, ie for those who cannot get an academic education. Those who did not pass the 11+ level study in modern secondary schools. ONCs and HNCs are designed for those who have achieved a sufficient level in the secondary education program and seek to obtain an A-level, and new "professional" courses at universities are designed for those who have a level lower than "A". This approach, of course, has certain advantages in flexibility and motivation. However, there are still doubts about the objectivity of the examination. There are attempts to compare internal and external verification systems, but this has only a partial impact on performance.

The most prominent feature of our vocational education system, therefore, is the bewildering variety of different approaches. The menu for 14-19 year olds currently includes:

- work-related courses at 14-16, some bearing qualifications, others on a largely experiential basis (largely resulting from a perception that vocational education is appropriate for those who find mainstream academic courses unattractive or just too difficult);
- new GCSEs in vocational subjects' beginning this year (resulting from a desire to place vocational education courses in a relationship of 'parity of esteem' with general ones);
- intermediate and foundation GNVQs (resulting from a worry that replacing these with vocational GCSEs, which was the original intention, might cut off options for some students);
- Key Skills offered as part of all post-16 curricula (resulting from a belief that a general preparation for work in the form of 'employability' skills was the best approach and could be fostered in any subject context);
- vocational A- levels in both single and double form, and also in AS variants (resulting from a desire to promote parity of esteem by following an A-level format while keeping the option of 'large' courses equivalent to two A- levels open);
- BTEC First and National Diplomas and Certificates (the qualifications which GNVQs were meant to replace before they were – nearly – replaced by vocational A- levels);
- technical certificates (resulting from a desire to introduce elements of theoretical knowledge into apprenticeships, but also – no doubt – available for full-time students);
- 'traditional' CGLI and RSA awards (which, together with modified versions of the BTEC Certificates, may be counted as technical certificates);
- NVQs taught on a full-time basis in colleges (resulting from the desire for a comprehensive desire for competence-based qualifications moderated by a realization that not all young people had access to the workplace and that the workplace was not always the most efficient location to teach and assess competence);
- a range of other taught courses with varied provenance ranging from the Certificate in Ear Piercing offered by the Vocational Training Charitable Trust, through the Awarding Body Consortium's Certificate in Cake Decoration to the Certificate in Employment Skills awarded by the Northern Council for Further Education [6].

In this regard, the UK government set the following recommendation for further development of vocational education in this country:

Priorities for employer engagement should be clearly defined and the rationale for seeking that engagement should be set out by the governments of England and Wales. Evidence on employer engagement should be further developed. Fragmented surveys should so far as possible be consolidated and coordinated.

Given that complexity and volatility in the VET system hinder employer engagement, the institutions of the VET system should be simplified and stabilized.

As a way to engage employers so as to reach the skills targets identified in the Leitch report, governments in England and Wales

should explore measures including those designed to reduce the cost of training, the establishment of a stronger evidence base to encourage employer support for training, and, possibly, the use of compulsive measures including training levies.

Attempts to foster employer engagement in England and Wales should be closely linked to the development of the apprenticeship system.

Governments in England and Wales should take account of previous experience, including international experience, when extending the market in VET provision. In particular users need good information about the quality of different programmes and institutions.

England and Wales should take account of international evidence more routinely in its policy-making process.

VOCATIONAL EDUCATION IN THE USA

The 1990 Perkins Act defines vocational education as "organized educational programs offering a sequence of courses which are directly related to the preparation of individuals in paid or unpaid employment in current or emerging occupations requiring other than a baccalaureate or advanced degree." While vocational education is provided at both the secondary and postsecondary levels, its focus differs somewhat at each level.

The objectives of vocational education are more varied at the secondary than at the postsecondary level. Secondary vocational courses can be classified into three types: (1) consumer and homemaking education; (2) general labor market preparation; and (3) specific labor market preparation. Specific labor market preparation courses teach students the skills needed to enter a particular occupational field. Such courses can be grouped into the following occupational program areas:

Agriculture;

Business and office;

Marketing and distribution;

Health;

Occupational home economics;

Trade and industry (including construction, mechanics and repairs, and precision production);

Technical and communications [1].

In addition to this occupationally specific curriculum, some secondary vocational courses provide general labor market preparation, teaching general employment skills-- such as introductory typing or wordprocessing, industrial arts, career education, and applied academic skills--rather than preparing students for paid employment in a specific occupation. Finally, consumer and homemaking education courses, unlike occupational home economics courses, prepare students for unpaid employment in the home. While this publication provides information on all three types of secondary vocational courses, it focuses primarily on the occupationally specific curriculum.

Vocational education at the secondary level has traditionally had several objectives, including providing students with general employability skills and preparing them to enter paid and unpaid employment in specific occupations. However, in recent years, the goals of vocational education have expanded to include preparing students not only for entry into work but also for career advancement and entry into further education and training. For instance, educators have been called upon to integrate academic and vocational education. Secondary vocational education is

provided primarily through three types of public high schools: (1) comprehensive high schools (the typical U.S. high school); (2) area vocational schools (regional facilities that students attend part of a day to receive their occupational training); and (3) full-time vocational high schools (schools that offer academic studies but focus on preparing students for work in a particular occupation or industry). The latter two types are referred to collectively as vocational schools. The National Assessment of Vocational Education (NAVE) recently found that most secondary vocational education is provided in comprehensive high schools, with vocational schools enrolling about 10 percent of secondary students and accounting for about 12 percent of vocational course taking. Because of the limited capacity of available datasets to provide information on the three types of schools, this publication generally treats secondary vocational education as a single system. While occupationally specific courses are organized into program areas, high school students typically do not formally enroll in an occupational program. Instead, they may take one or more courses in a single occupational program, or courses scattered throughout the occupationally specific curriculum. Moreover, while the majority of students take occupational courses during their high school careers, they do so for a variety of reasons. Some students take introductory business or technical and communications courses to gain hands-on computer experience, whereas others are required by their high schools to complete a vocational course in order to graduate. Only a minority of students complete a coherent sequence of courses preparing them for employment in a specific occupational field. Indeed, the sequence of courses defining an occupational program varies among high schools and school districts across the country.

Consequently, it is not possible--nor very useful--to label students as "vocational students" based on a single definition. Instead, this publication provides several alternative measures of participation in vocational and occupationally specific education at the secondary level. The smallest unit of measure is a course or a credit, and data are provided on the percentage of public high school graduates completing at least one course and on the average number of credits they earned in different vocational and occupational areas. Some tables provide information on heavy vocational course takers, those earning large numbers of vocational or occupationally specific credits.

The federal regulations associated with the 1990 Perkins Act defined a coherent sequence of courses as "a series of courses in which vocational and academic education are integrated, and which directly relates to, and leads to, both academic and occupational competencies. However, federal datasets rely largely on analyses of student transcripts to determine high school course-taking patterns. While both flexible and reliable, these transcript studies have limited capacity to provide information on the content of courses, such as what specific competencies they teach. Alternatively, this publication uses several measures of concentration in vocational education to examine graduates' propensity to take a series of related vocational courses. Specifically, public high school graduates are identified as vocational "concentrators" if they earned 3 or more credits in a single occupational program, and as vocational "specialists" if they earned 4 or more credits in a single program with at least 2 of these credits beyond the introductory level. Data are also provided on the levels of occupational courses graduates completed,

including introductory, second- or higher level, and specialty courses.

Vocational education at the non-baccalaureate postsecondary level primarily focuses on providing occupationally specific preparation. Postsecondary-level occupational programs generally parallel the program areas identified at the secondary level:

Agriculture;
Business and office;
Marketing and distribution;
Health;
Home economics;

Technical education (including protective services, computers and data processing, engineering and science technologies, and communication technologies); and Trade and industry [2].

While emphasis at the postsecondary level has traditionally been providing students with skills needed to enter a particular occupational field, these skills have typically been at a more advanced level than those provided through secondary occupational programs.

Postsecondary vocational education is offered at several types of institutions, including public and private, and 4-year and less-than-4-year postsecondary institutions. This publication provides comparable information on participation in six different institutional types: public 4-year institutions; private, nonprofit 4-year institutions; public 2- to 3-year institutions (community colleges); public vocational-technical institutes; private, nonprofit less-than-4-year institutions; and private proprietary (for-profit) institutions.

As was the case at the secondary level, postsecondary occupational education is delivered in the form of courses that are organized into program areas. In a few cases, students are required to enroll formally in an occupational program. In other cases, students may be required to declare a major upon enrolling in an institution. However, students often sample courses from a variety of program areas, whether or not they have declared a major. This tendency to "mill around" in postsecondary vocational education has been well documented. Moreover, postsecondary institutions, particularly community colleges, serve a student population with diverse educational goals. Some students enter with the intention of completing a degree or certificate, while others intend only to take one or a few courses and then leave. In most cases, it is only possible to identify with accuracy vocational program participants once students have completed a program and obtained a degree or certificate. However, this captures only a portion of non baccalaureate postsecondary students.

Because of the timing of this publication, transcript data were unavailable for detailed analysis of participation patterns in postsecondary vocational education. Instead, this report relies on students' self-reported majors. Consequently, in contrast to the secondary level, the discussion of postsecondary vocational education does not provide information on varying levels of participation by students.

In the United States, vocational education is available at regional (community) colleges and junior technical colleges. According to experts, now these educational institutions are ahead of all others in terms of development. In 2013, there were about three thousand such institutions in the United States. Community

College (or Junior College, City College) is an analogue of Ukrainian colleges, schools and technical schools, i.e. an educational institution that offers secondary special education. Of course, they are much less prestigious than universities, but most often they are chosen by high school graduates. First, because they are easier to do for those whose academic performance at school was not high enough. And second, the cost of studying in community colleges is much lower than in universities where many American families cannot afford to study. The curriculum at community college is usually for two years. After graduation, the graduate is awarded the so-called associate's degree. This degree does not apply to scientists (as a master or bachelor), but confirms the completion of secondary special education. In addition to a diploma with the above degree, a student of the school can receive a Graduate Certificate - a certificate of completion. The difference between these two documents is that this certificate is not a document of completed education. As in Ukraine, a certificate of completion indicates that the course has been taken by a student. Such a document can be obtained by taking separate courses offered by the curriculum. Although the certificate does not replace a diploma, it can be very useful if the graduate wants to continue his studies and enter the university. Thus, according to statistics, about 40% of students in the United States complete two-year courses in college, and then continue their studies with 2-3 courses to obtain a bachelor's degree. This option is more economical - the cost of vocational education is many times lower than higher (on average, an academic year at the college costs six thousand dollars). The quality of vocational education in the United States meets international standards. In addition to the affordable price, colleges have a number of other advantages. This is a simplified procedure for submitting documents, and the ability to recalculate the subjects studied in case of further admission to the university, and comfortable learning conditions - small groups, cozy dormitories. The training is more applied, practical in nature, which includes various internship programs at enterprises and large companies in the region where the college is located. Thus, a graduate of a vocational school is quite ready to be hired. Junior Colleges train narrow specialists who are needed in a particular region in a particular field, so they are mostly designed for American students. There are also private primary colleges, which are designed to prepare students in technical specialties for further study at the university. Upon graduation, the graduate is awarded an Associate Degree. Private colleges of primary education have the same curricula as public and public ones, but pay relatively more attention to preparing for four year colleges in technical disciplines. Community Colleges are ideal for students because they are easier to enroll in and correspond to the first two courses of the university. Thus, a graduate of such a professional institution, having received the degree of Associate Degree, can be enrolled in the third year of university. Typically, local colleges work closely with universities and can transfer students on time. Two-year colleges have the advantage that entrants do not need to take exams and tests. It is enough to provide a high school diploma / certificate. Some colleges may require a certificate of a student's financial capacity. At the time of admission to college, the applicant must be 16 years old. Applications for admission can be left on the official websites of selected colleges. The number of students in municipal colleges is different, as a rule, one or another college reflects the culture and traditions of the district and state

in which it is located. As a rule, the academic year in municipal colleges begins in September and ends in August. Training is divided into two semesters of 15 weeks, at the end of each tests and exams. In the summer, future associates go on vacation. In order to obtain an associate's degree, it is necessary to obtain about 60 credits, which corresponds to two years of study. It will be recalled that one credit is 50 minutes of class work per week for one semester (a semester equals 15 weeks). Community college is usually taught in small groups. This indicator, by the way, characterizes good private universities. Colleges have a friendly atmosphere. Many community colleges offer campus accommodation. On the campuses of two-year colleges there are educational buildings, libraries, art centers, museums, cafeterias. Colleges often have their own college radios, shops, and malls. Laboratories are equipped in technical colleges. The technical equipment of college laboratories can make other scientific institutes pale with envy; the richness of libraries - today not only "paper" but also electronic - amazes the imagination; the organization of the educational process, as well as the life and leisure of students will meet the most demanding requirements. Community colleges have been renowned for decades for their achievements in sports: many graduates become famous athletes, and it's no coincidence. All campuses of municipal colleges have gyms, football fields, various sports grounds. Professional education in the United States is provided by specialists in such fields as engineering, data processing, drawing, office work, aviation, interior design, photography, health care, business, and food technology. About 80 percent of United States firefighters, law enforcement, and EMT (Emergency Care) workers are enrolled in municipal colleges. Most U.S. health professionals are educated in municipal colleges: for example, 60 percent of nurses in the United States have associate degrees. This is one of the most popular specialties in the US labor market. According to the recruiters, graduates of medical, law and economics colleges are currently the most popular in the US labor market.

V. COMPARATIVE ANALYSIS

1. In the United States there is no single state system of vocational education, each state has the right to determine its structure independently. In Ukraine, there is a single state system.
2. In the UK and the US there are no common curricula, programs, textbooks. In Ukraine - the only curricula, programs.
3. In American colleges there are a limited number of subjects required for study, but most students choose themselves. The diploma is issued for the total amount of passed material. While studying the subject, the student has the opportunity to choose the teacher and time of classes. There are few options, but they are there. In vocational education institutions the number of subjects is the same.
4. Control of knowledge in the US education system is carried out during the testing of students, in Ukraine this area has also been successful in recent years.
5. The grading system in the United States and the United Kingdom is usually alphabetical, according to the first five letters of the English alphabet. In Ukraine – 12 points.
6. Reforms in domestic education began in 90s with the adoption of the Law "On Education". He legitimized new concepts for us:

bachelor's, multilevel system, which has long been common in the United States and Britain.

7. Tuition in secondary vocational institutions in the UK and USA is paid, in Ukraine - free, in addition, students receive a scholarship.
8. Material and technical equipment of foreign colleges far exceeds Ukrainian ones. Despite the significant differences between the systems of vocational education in the UK, USA and Ukraine, there are common problem: insufficient general education level of graduates.
9. Besides, in Ukraine it is necessary to develop network of VEIs as in the USA and UK. Because we have only vocational technical institutions and colleges. Comparative table is the following.

Table 1: Types of VEIs in the USA, UK and Ukraine

Vocational education institutions in the USA	Vocational education institutions in the UK	Vocational education institutions in Ukraine
Junior Colleges, Community Colleges, City Colleges	Schools, colleges of sixth class, colleges of further education, colleges of higher education	Vocational technical institutions and colleges

Table 1

10. In Ukraine in comparison with the USA and the UK more students study in universities and only 16% from number of students of universities make students of VEIs. In the UK and the USA on the contrary majority students study in VEIs. Comparative table is the following:

Table 2: Number of students in VEIs and universities in the USA [13], UK [4] and Ukraine [3].

Number of students	USA	UK	Ukraine
VEIs	19,7 millions	3,27 millions	245775
Universities	15,1 millions	2,66 millions	1,4 million

VI. CONCLUSION

A distinctive feature of vocational education compared to general education - a great variety of professions and specialties, forms of training, relatively short life of educational and program documentation, as the content of vocational training is directly related to rapid change in scientific and technological progress. And there is the following pattern: for junior vocational education,

these changes occur more often than for seniors (for example, for workers who deal directly with machinery and technology, the content of work changes faster than for an engineer who deals with scientific and technical basics and methods of designing equipment and technology).

Thus, the main characteristic of the vocational education system today is the formation of accessible, open and continuously evolving training system designed to ensure a high level of qualification of citizens, which allows meeting the needs of the economy and socio-cultural sphere in qualified personnel, continuously improving their professional skills on high level. In addition, in order to make the system more effective, it is necessary to study and identify the most important features of the education systems of other countries, especially Britain and the United States.

The system of vocational education in Britain has a number of important features that play a significant role in the professional education of students. The main feature is its practical orientation. In this regard, the diploma projects of graduates of British colleges are much more complex than Ukrainian ones, because they include a powerful practical component. Theoretically, Ukrainian students know a lot, but everything studied, for the most part, remains very abstract. It seems important in the practice of Ukrainian education to review the content of standards taking into account the requirements of the employer, to take into account the principles of developing "cross-cutting" standards of primary, secondary and higher vocational education (for example, British) to modernize continuing vocational education in Ukraine. Positive experience that is suitable for the national and cultural characteristics of our country, the national character of the Ukrainians, in line with the goals and objectives facing us at this stage of development, is necessary and important to adopt. However, at the same time we do not need to give up our positive traditions that have developed and enriched over the decades. Combining fundamental theoretical knowledge in leading industries with a strong practical component could yield tremendous results in the near future and bring our country's economy to a leading position in the world.

Also the analysis allows to identify elements of progressive experience in vocational education of the United States of America and Great Britain, which can be used in the process of modernization of domestic educational legislation in the field of vocational education: its modernization in Ukraine should be aimed at attracting, quality and flexibility, the core areas of modernization should be to promote the attractiveness of vocational education, ensuring its quality in the context of building a world educational space, funding programs, ensuring economic development and social inclusion. Attractiveness of such education and training is derived from its image and coherence with academic pathways, flexible learning trajectories that enable mobility between vocational and academic education. It is necessary to ensure involvement of stakeholders in education management to provide qualifications, which meet existing labor market requirements, employment, increasing the competitiveness of the worker in the Ukrainian labor market, and, consequently, public policy should strengthen these relationships. Ensuring the quality of vocational education in Ukraine should be embodied in the use of relevant principles, increasing the level of responsibility of stakeholders for the quality of vocational education and training, constant involvement of all partners in the process of

improving its attractiveness, use of measurable indicators It is expedient to build stimulating models of its financing, which provide a mechanism for joint spending by social partners and are a direct incentive to improve the quality of relevant educational services.

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Digital transformation in healthcare

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Abstract- Many health systems around the world are increasingly facing challenges when it comes to providing comprehensive care and treatment options, for example, due to ongoing demographic changes and aging societies ¹, leading to more patients and increasing age-related health problems ². These issues are often paired with structural and spatial disparities, especially in rural locations, resulting in an unfair distribution of medical facilities and practitioners, as well as barriers to access to care. At the same time, the exodus of general practitioners and specialists, as well as the absence of heirs to continue their practice, can be observed in many rural regions.³ Reasons include, for example, a lack of attractiveness among young graduates to assert themselves in such fields or an inferior work-life balance due to high demand per capita.

Index Terms- health care management, organizational culture, technology application

I. INTRODUCTION

The application of technology in care delivery processes can change the relationship between practitioners and patients, calling for new forms of cooperation based on mutual trust. Furthermore, for the efficient and satisfactory application of technologies in healthcare, users are increasingly obliged to

develop higher levels of technological efficiency as well as health literacy.

Further, the trend towards the establishment of specialized clinics in urban and more central regions can be overcome, potentially disadvantaging remote areas by taking away much-needed expertise. These challenges put increasing pressure on practitioners, who are obliged to adapt and cope with higher workloads. To this end, the application of digital technologies and telemedicine solutions in healthcare has proven to be an appropriate measure to deal with the threat of insufficient supply and shortage of care, thus functioning as a catalyst for change through technological progress. The adoption of digital approaches in nursing has led to a multitude of use cases that seek to modify medical routines to make them not only more robust and efficient, but also outcome-oriented and therefore satisfactory. Technologies, for example, appear in the form of video communications and consultation systems, mobile health solutions (mHealth), such as sensory equipment worn on the body, units of measurement,⁴ mobile applications⁵, visual guidance systems⁶, as well as orthoses and smart implants.⁷ These technological advances have enabled multiple digitally supported treatment scenarios, such as remote consultations with general practitioners, remote therapeutic examination and treatment, spatially independent measurement of patient data and subsequent transfer to the clinic, online appointment, digital prescription,

¹ Davis, S. and Bartlett, H. (2008), "Healthy ageing in rural Australia: Issues and challenges: Rural healthy ageing", *Australasian Journal on Ageing*, Vol. 27 No. 2, pp. 56–60.

² Demiris, G. and Hensel, B.K. (2008), "Technologies for an aging society: a systematic review of 'smart home' applications", *Yearbook of Medical Informatics*, Vol. 17 No. 01, pp. 33–40.

³ Adarkwah, C.C., Schwaffertz, A., Labenz, J., Becker, A. and Hirsch, O. (2019), "Hausärzte (GPs) for Medical education in Siegen-Wittgenstein (HaMedSi) - Assessment of the occupational perspectives of General Practitioners in a rural area", *MMW Fortschr Med*, Vol. 161 No. S6, pp. 9–14.

⁴ Aggarwal, D., Zhang, W., Hoang, T., Ploderer, B., Vetere, F. and Bradford, M. (2017), "SoPhy: A Wearable Technology for Lower Limb Assessment in Video Consultations of Physiotherapy", *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, ACM Press, Denver, Colorado, pp. 3916–3928.

⁵ Barry, M., Doherty, K., Marcano Belisario, J., Car, J., Morrison, C. and Doherty, G. (2017), "mHealth for Maternal Mental Health: Everyday Wisdom in Ethical Design", *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, ACM Press, Denver, USA, pp. 2708–2756.

⁶ Tang, R., Yang, X.-D., Bateman, S., Jorge, J. and Tang, A. (2015), "Physio@Home: Exploring Visual Guidance and Feedback Techniques for Physiotherapy Exercises", *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, ACM Press, Seoul, Republic of Korea, pp. 4123–4132.

⁷ Ledet, E.H., Liddle, B., Kradinova, K. and Harper, S. (2018), "Smart implants in orthopedic surgery, improving patient outcomes: a review", *Innovation and Entrepreneurship in Health*, Vol. Volume 5, pp. 41–51.

online disease information and symptoms and telemonitoring of at-risk patients.⁸

II. MODERN TECHNOLOGY APPROACH TO HEALTHCARE CULTURE

As addition to influencing treatments and therapeutic procedures, digital technologies also affect the people who use them, as well as their routines, habits and attitudes. As research has shown, the application of technology in care delivery processes can change the relationship between practitioners and patients, calling for new forms of cooperation based on mutual trust. Furthermore, for the efficient and satisfactory application of technologies in healthcare, users are increasingly obliged to develop higher levels of technological efficiency as well as health literacy. On the contrary, traditional care does not require consumers to actively contribute to treatment, the use of supportive digital technologies therefore requires new forms of engagement, with associated skills.⁹

Furthermore, patients need to develop their health literacy, which allows them to see their health problems and whether digital solutions are appropriate for solving them. These advances may eventually lead to new spending behaviors. There is a need to integrate the perspectives of more stakeholders in the design and application of technology, as a result, to take into account different expectations, attitudes, needs and reservations when it comes to the use of digital technology in healthcare. To this end, multiple approaches have been developed and used, which take an ethical and inclusive stance; they seek to integrate different stakeholder perspectives on the use of digital technologies in care when it comes to the development, testing and application of new systems. The research identified that the design of such technological solutions should be in line with the perceptions of their users in order for these technologies to be more acceptable, desirable and satisfactory for use. In light of the currently low rate of IT adoption in healthcare,¹⁰ such efforts represent a major scientific task. Several approaches, such as “Responsible Innovation”¹¹ and “Value-Sensitive Design”), now enable holistic and deliberative design and development of stakeholder-oriented digital technologies in healthcare.¹²

III. ARTIFICIAL INTELLIGENCE (AI) AND HEALTH CARE

Health care in the United States, which has historically focused on encounter-based care and treatment of diseases as they arise, rather than preventing them, is now undergoing a major transformation toward a more health-based approach to population health. This transformation occurs through a series of changes in the refund. Among these changes are multiple eras of managed care and population management research per capita and increases in value-based care and prevention, both of which attempt to manage the patient's overall health beyond treatment.¹³ Despite this, health care costs in the United States continue to rise without adequate gains in key health outcomes compared to many similar countries. To assess where and how artificial intelligence (AI) can provide opportunities for improvement, it is important to understand the current context of health care and the drivers of change. AI is likely to promote automation and provide a synthesis of context-relevant information and recommendations (through a variety of tools and in many settings) to patients, “families” (friends and unpaid caregivers), and the clinical team. Artificial intelligence developers and stakeholders should prioritize the ethical collection and use of data and support the visualization of data and information using artificial intelligence.¹⁴ Technological innovation and financing are guided by business criteria such as profit, efficiency and return on investment. It is important to explore how this will affect the development, evaluation and implementation of AI health. This reality is further challenged by the views of the US public and government on health and health care, which oscillate between health care as a social good and health care as an economic product. These considerations are likely to lead to some clear use cases in healthcare business operations: AI tools can be used to reduce costs and achieve efficiency by prioritizing the focus of human work on more complex tasks; to identify the workflow of the optimization strategy; to reduce medical waste (failure to provide care, failure to coordinate care, over-treatment or low-value care, failure to set prices, fraud and abuse, and administrative complexity); and to automate highly repetitive business and workflow processes using reliably recorded structured data.¹⁵

When applying these tools, it is crucial that you are thoughtful, fair and inclusive to avoid unwanted events and unintended consequences. This requires ensuring that artificial

⁸ Aamodt, I.T., Lycholip, E., Celutkiene, J., Strömberg, A., Atar, D., Falk, R.S., von Lueder, T., *et al.* (2019), “Health Care Professionals’ Perceptions of Home Telemonitoring in Heart Failure Care: Cross-Sectional Survey”, *Journal of Medical Internet Research*, Vol. 21 No. 2, p. e10362.

⁹ Hojat, M., Louis, D.Z., Maxwell, K., Markham, F., Wender, R. and Gonnella, J.S. (2010), “Patient perceptions of physician empathy, satisfaction with physician, interpersonal trust, and compliance”, *International Journal of Medical Education*, Vol. 1, pp. 83–87.

¹⁰ Karsh, B.-T., Weinger, M.B., Abbott, P.A. and Wears, R.L. (2010), “Health information technology: fallacies and sober realities”, *Journal of the American Medical Informatics Association*, Vol. 17 No. 6, pp. 617–623.

¹¹ Owen, R., Stilgoe, J., Macnaghten, P., Gorman, M., Fisher, E. and Guston, D. (2013), “A framework for responsible

innovation”, in Owen, R., Bessant, J. and Heintz, M. (Eds.), *Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society*, John Wiley & Sons, pp. 27–50.

¹² Friedman, B., Kahn Jr, P.H., Borning, A. and Huldgren, A. (2013), “Value sensitive design and information systems”, *Early Engagement and New Technologies: Opening up the Laboratory*, Springer, Dordrecht, pp. 55–95.

¹³ Kissam, S. M., H. Beil, C. Cousart, L. M. Greenwald, and J. T. Lloyd. (2019). States encouraging value-based payment: Lessons from CMS’s state innovation models initiative. *The Milbank Quarterly* 97(2):506– 542.

¹⁴ Israni, S. T., and A. Verghese. 2019. Humanizing artificial intelligence. *JAMA* 321(1):29–30.

¹⁵ Bauchner, H. and P. B. Fontanarosa. (2019). Waste in the US Health Care System. *JAMA* 322(15): 1463- 1464.

intelligence tools are aligned with user preferences and the end goals of these technologies, and that the tools do not exacerbate further historical inequalities in approach and outcomes. Driven by a shift to compensation and incentives for higher health management to increase personalization, innovation in AI technologies is likely to improve patient health outcomes through applications, workflows, interventions, and support for distributed health care delivery outside the traditional system, a meeting-based paradigm. The challenges of data accuracy and privacy protection will depend on whether AI technologies are regulated as a medical device or classified as an entertainment application. These consumer-facing tools are likely to support fundamental changes in the interactions between healthcare professionals and patients and their carers. Tools such as single-electrode ECG monitoring or continuous blood glucose monitors will transform the way health data is generated and used. They offer an opportunity to incorporate social determinants of health (SDoH) to identify patient populations for targeted interventions to improve outcomes and reduce health care utilization.¹⁶ Since SDoH interventions are labor intensive, their scalability is poor. AI can reduce the cost of using SDoH data and provide effective means to prioritize scarce clinical resources to impact SDoH.¹⁷

The well-intentioned introduction of electronic health records and the incentives of the HITECH Law have contributed to the transformation of doctors into data entry officers, worsening of physician burnout and reducing patient satisfaction. To ensure that AI health care tools do not exacerbate this burden, a fundamental issue is the potential impact of AI on the patient-provider relationship. This could include further degradation of empathic interactions, as well as a mismatch between existing and required skills in the workforce. Throughout this publication, we emphasize the power of artificial intelligence to increase, not replace, human intelligence, because desirable attributes of people who choose to care for others include, in addition to scientific knowledge, the ability to love, empathize, care and care, be generous, be courageous in advocating for others, do no harm and work for the greater good and advocate for justice.

How can AI help clinicians nurture and protect these qualities? This type of challenge is rarely discussed or discussed at conferences on artificial intelligence and medicine, perhaps because it is considered messy and difficult to define. But if the goal is for AI to mimic the best qualities of human intelligence, it is precisely the territory that cannot be avoided. The American health care system can learn important lessons from the aviation industry, whose history includes many examples of automation that deals with small challenges, but also occasionally creates extraordinary catastrophes. The crash of an Air France plane from Rio to Paris in 2009 showed the potential "unintentional consequence of designing airplanes that anyone can fly: anyone

can accept you." In addition to degrading the basic skills of people who were once competent pilots, fourth-generation jets have enabled people who probably never had those skills to begin with and should not have been in the cockpit. As a result, the mental composition of the airline pilots has changed. More recently, disasters with the Boeing 737 Max caused by software problems offer another caution: complaints from competent pilots about next-generation aircraft have not been sufficiently addressed. Finally, just because technology allows a particular solution to be applied, it may still not be appropriate to do so. Recently, a doctor in California used a robot with a video link screen to tell a patient that he was going to die. After the disaster on social media and public relations, the hospital apologized, saying: "We do not support or encourage the use of technology to replace personal interactions between our patients and their care teams - we understand how important this is for all concerned, and we regret not fulfilling family expectations."¹⁸ Techno-chauvinism in artificial intelligence will only further complicate the already complex and overburdened health system. In short, health care is a complex field that includes genetics, physiology, pharmacology, biology, and other related sciences with social, human, and cultural experience in health management. Health care is both a science and an art and calls into question the idea that simple and elegant formulas will be able to explain significant parts of health care delivery and outcomes.¹⁹

IV. CONCLUSION

In the modern health care system, many different decision makers communicate to care for patients and manage operations. The term health care describes a range of activities that may include, but are not limited to, any of the following: drug delivery / treatment, psychological assessment, physical examination of the patient, services provided by related health disciplines. This review mainly focuses on hospitals. Relevant research on health decision making is rare. Just as in the public sector as a whole, health care management has often drawn inspiration from the manufacturing industry, where the concepts of standardization and mass production are often central, and the customer is reduced to a passive recipient role. In which the customer is a passive recipient who receives a product at the end of the chain in the form of a "medicine" or "repair". In the late 1980s, Berwick developed the transfer of industrial quality management ideas into a healthcare context. In the decades that followed, different quality models from industry were introduced in different healthcare facilities. In general, change management in health care follows the same principles as change management in other types of organizations. The main difference is hierarchical structures that

¹⁶ Lee, J., and C. Korba. (2017). Social Determinants of Health: How are Hospitals and Health Systems Investing in and Addressing Social Needs? *Deloitte Center for Health Solutions*. <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/life-sciences-health-care/us-lshc-addressing-social-determinants-of-health.pdf>. (Pristupljeno: 21.02.2022).

¹⁷ Basu, S., and R. Narayanaswamy. (2019). A Prediction Model for Uncontrolled Type 2 Diabetes Mellitus Incorporating Area-

level Social Determinants of Health. *Medical Care* 57(8):592–600.

¹⁸ BBC News. (2019). *Man told he's going to die by doctor on video-link robot*. March 9. <https://www.bbc.com/news/world-us-canada-47510038>. (Pristupljeno: 22.02.2022).

¹⁹ Toon, P. (2012). Health care is both a science and an art. *British Journal of General Practice* 62(601):434.

are more pronounced in health care than in other organizations. This can make communication difficult because hierarchical levels and professional privileges must be kept in mind. Management should improve the quality of services and care by understanding the requirements of patients with constant interaction with them and providing efficient health services through innovations in service management. Management should train its staff to properly communicate with patients and understand their problems and to address them in a timely manner to satisfy their clients. This, in turn, results in organizational improvement and helps health systems make a profit because clients trust them and spread positive feedback through word of mouth, which is one way of spreading information. This makes health systems sustain and flourish in the global market for a long time.

In addition, health management should collect feedback from patients after treatment and change the strategy accordingly

to satisfy users. Healthcare managers must be creative thinkers to be innovators, in order to improve the organization. As well as the opportunity to appoint innovative employees for the development of the organization, because it is important to have an innovative climate with innovative staff. The culture of an organization depends on innovative staff and the manager should establish a culture of innovation by having flexibility and providing assistance and feedback to staff as well as collaborating with them.

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Digital Television Migration In Zambia: Who Are The Real Beneficiaries?

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Abstract- Analogue terrestrial television has been in existence since the 1940s but was rendered obsolete due to advancement in technology and its inefficient use of the frequency spectrum which is a limited resource. Analogue Terrestrial Television is said to use one frequency to carry one programme channel while Digital Terrestrial Television (DTT) can use one frequency to carry multiple programme channels. What this means is that Digital Terrestrial Television allows for transmission of many television programmes using one frequency channel and at lower cost. So what is Digital Broadcasting Migration? It is generally a process in which broadcasting services offered on the traditional analogue technology are replaced with digital networks over a specific period. The transition or switch from analogue television to digital television is referred to as the Digital Migration. This is a process that was started in phases and which Zambia was obliged to carry out after the International Telecommunications Union (ITU), a United Nations Agency, set 17th June, 2015 as the deadline for countries to switch over from Analogue to Digital Television Broadcasting. The migration is therefore a global agreement. Not having the technological know-how and the financial resources, the Zambian government entered into partnership with Star Times, a Chinese company that had the technology. This engagement resulted in the birth of a company called Top Star which entered into an agreement with Zambia National Broadcasting Corporation (ZNBC). In this agreement Top star has 60% shares while ZNBC has 40% shares. With that Top star started providing the resources needed for the digital migration and the Zambian government set October 1, 2017 as the date for a complete switchover to digital broadcasting from analogue television services along the line of rail. With just a few months remaining before hitting a five (5) year mark, it is necessary to take stock in terms of benefits among the stakeholders, namely; the Zambian people with the general television media landscape, some political figures in the Zambian government and Star times. Of these three camps, which camp has benefited the most? The real owners of ZNBC are the Zambians. Under normal circumstances the owner of any project benefits much more than the company hired to do the work. Is this the case in this project?

Index Terms- digital; migration; analogue; television; terrestrial; Star Times; Top Star; ZNBC

I. HISTORY OF TELEVISION IN ZAMBIA

According to the Zambia National Broadcasting Corporation Strategic Plan, the first television station in Zambia was set up in 1961 in Kitwe by Tiny Rowland's London Rhodesia Mining Company (Lonrho) and was known as Rhodesia Television Limited (RTL) (2015: 10-11). The television station was privately owned. When Zambia became independent in 1964, the government entered into a partnership with the owners of the television station and changed its name from Rhodesia Television Limited to Zambia Television Limited and the government appointed one person to sit on its board (ZNBC Strategic Plan 2015: 11).

1. In 1965, the Zambia Television Limited launched an experimental service in Lusaka operating from the Zambia Broadcasting Service premises (ZNBC Strategic Plan 2015: 11). In 1967, the government took over full ownership of the Kitwe studios under Zambia Broadcasting Service (ZBS) (ZNBC Strategic Plan 2015: 11). Colour transmission was launched in 1977, using modified monochrome or black and white studio equipment and transmitters (ZNBC Strategic Plan 2015: 11).
2. In 1987, through an Act of Parliament, ZBS became the current Zambia National Broadcasting Corporation (ZNBC) on 1st April, 1988. Though being parastatal, ZNBC was commercialised. Government funding became minimal. ZNBC had to sustain its operations through its commercial service (ZNBC Strategic Plan 2015: 11).
- 3.

II. ZNBC AND TOP STAR PARTNERSHIP IN SIGNAL DISTRIBUTION OF DIGITAL NETWORK FROM ANALOGUE

Analogue television is the original television technology that uses analogue signals to transmit video and audio (MIBS 2012: 6). All [broadcast television \(TV\) systems](#) preceding [digital transmission](#) of [digital television](#) (DTV) used analogue signals (Gupta 2006: 62). An analogue signal is a continuous signal which represents physical measurements, denoted by sine waves and uses continuous range of values to represent information (MIBS 2012: 6). Furthermore, terrestrial television is a type of television broadcasting in which the television signal is transmitted by radio waves from the terrestrial (earth based) transmitter of a television station to a television receiver having an antenna (MIBS 2012: 6). In other words, terrestrial television is a term which refers to modes of television broadcasting which do not involve satellite transmission. Analogue terrestrial television has been in existence since the 1940s.

Analogue television around the world has been in the process of shutting down since the late 2000s. The reason for migrating from analogue to digital TV was necessitated by the fact that analogue requires a lot of bandwidth frequency to transmit one channel. According to Armstrong and Collins, “digital systems encode (and decode) signals in a manner whereby inputs, whether sound or video, are converted into (and from) a single stream of zeros (0) and ones (1), or “ons” and “offs,” in the electrical current” (2004: 3). Since digital signals require less power to transmit, therefore, digital transmission allows approximately six – to – ten digital channels to be squeezed into any single spectrum which normally accommodate one analogue channel (Cave 2002: 162). The freed up frequency can also be used for a variety of communication functions including the provision of broadband function and other additional functions (MIBS 2014: 1).

In order to enable the world to move into the digital age, in 2004 and 2006, the International Telecommunication Union (ITU), a United Nations global telecommunications body, held two conferences dubbed the Regional Radio Communications (RRC -04 and RRC- 06) whose purpose was to develop a digital terrestrial broadcasting plan. During the last of these conferences (RRC-06) held in Geneva, Switzerland, an agreement (GE06) was reached which set June 2015 as the date for the switch over from analogue to digital. By this date, all countries party to this agreement (101 countries in Europe, Africa and the Middle East) had obliged to switch from analogue to digital broadcasting technology (ITU 2012: 11).

Zambia, like other members of ITU, became a signatory to a treaty with a resolution that all countries around the world were to migrate from analogue to digital services within six years from the conference. Following this ratification, ZNBC complied with the ultimatum and began the simulcast on the 17th June, 2015 along the line of rail from Chililabombwe to Livingstone as phase one of the transition process (ZNBC News, June 17, 2015). Installation of digital transmitters around the country was expected to be completed by June 2018. In the first phase, 10 digital transmitters were installed. In phases two and three of the transition process, 36 transmitters were going to be installed between June 2017 and September 2017. Aside from transmission and other attendant equipment being installed at the six provincial centres, there were also subsidiary transmission sites at 64 sites where small

transmitters have been erected to ensure total coverage of the entire country.

In areas where the landscape cannot allow for digital terrestrial television transmission, these are served by satellite.

Not having the technological know-how and the financial resources, the Zambian government entered into partnership with Star Times, a Chinese company that has the technology. Initially, Star Times was awarded the contract, but afterwards the tender for the digital migration was later cancelled due to irregularities. The Ministry of Information and Broadcasting Services cancelled a USD 220 million tender for the supply, delivery and commissioning of a national digital terrestrial television (DTT) broadcast network, awarded to the Star Times Group in May 2013 via its Star Software Technology subsidiary. The tender was cancelled following a recommendation from the Zambia Public Procurement Authority (ZPPA) which cited irregularities in both the original tender document and the award process following appeals from two of the four unsuccessful bidders – Huawei Technologies, ZTE Corporation, Gospel Digital Technology Company Limited, and King Tai investments Zambia Limited. After the cancellation of this tender, then Star Times and the Zambian Government created a special purpose investment vehicle called Top Star. This is how Top Star was born and bid for the tender and ultimately won the tender (Nextv News International, Zambia cancels Star Times DTT contract, 24/09/2013, <https://nextvnews.com/zambia-cancels-startimes-dtt-contract/>, viewed on 12/05/2020). In accordance with the wishes of government, Top Star then entered into an agreement with Zambia National Broadcasting Corporation (ZNBC). Through this venture the government now procured a loan of US\$273 million from China for the implementation of phases two and three of the Digital Migration programme. Furthermore, in this agreement Top Star became the majority shareholder at 60% shares while ZNBC got minority shares at 40%. With that, Top Star started providing the technology and the resources needed for the digital migration and the Zambian government set October 1, 2017 as the date for a complete switchover to digital broadcasting from analogue television services along the line of rail. Following this digital migration process from analogue to digital television broadcasting, ZNBC was part of the National Task Force Committee on digital migration and was given a role of a signal carrier and hence distributor responsible for rolling out the digital network infrastructure on behalf of broadcasters (MIBS 2014: 6).

III. STATEMENT OF THE PROBLEM

Access to information is a basic human right. Television, as a broadcast medium, is a cornerstone of modern democracy and cultural diversity, enhances people’s identity and capacity to live together and therefore contributes to social cohesion. In the digital era, with an unprecedented proliferation of sources of communication, most people still rely mainly on television broadcasting for information (Communication and society Journal 2011: 4).

In order to promote a more efficient utilisation of television broadcast, it has been found worthy to migrate from analogue to digital television broadcast. As mentioned already, there are several advantages for migrating to digital television such as: Better utilisation of frequencies; Better picture quality; More

access to channels; Better viewing pleasure; Outstanding services for the elderly and disabled; Audio descriptions for the visually impaired; Adjustable speaking speed; Participation in quizzes and questionnaires and Electronic Programme Guides (EPGs).

Looking at these advantages, migration from analogue to digital terrestrial television (DTT) was inevitable. The challenge for the Zambian Government was in terms of the technology and the financial resources. So in order to be able to implement the digital migration, the Zambian government entered into an agreement between the Zambia National Broadcasting Corporation (ZNBC) and the digital TV operator Star Times of China. This memorandum of understanding gave birth to Top Star company which is a joint venture company created by the Zambia National Broadcasting Corporation (ZNBC) and the digital TV operator Star Times of China. Top Star Communications is the only mandated public signal distributor operating in Zambia. Top Star Company has been given the full mandate to carry out the countrywide digital migration of television signal from the analogue to digital. According to this memorandum of understanding, it was agreed in this deal that ZNBC would get 40% shareholding, whereas Top Star would get 60%. The contract between Star Software Technologies and the Zambian government comprised of the supply, delivery, installation and commissioning of digital terrestrial broadcasting to cover the entire country and studio equipment for the national broadcaster, the Zambia National Broadcasting Corporation (ZNBC) - as well as for ten new provincial broadcasting stations that the government would like to establish. It also involves the construction of the national operating centre for the Public Signal Distributor and rehabilitation of ZNBC and Zambia News and Information Services (ZANIS) studios.

The Television digital migration has been implemented, no doubt about it. However, it is necessary now to take stock in terms of benefits between these three camps, namely; the Zambian people with the general television media landscape, the political figures in the Zambian government and Star Times. Of these three camps, which camp has benefited the most?

IV. OBJECTIVE OF THE RESEARCH STUDY

4.1. Main Objective of the Research Study

The main objective of this research study is to find out who has benefited most in this digital migration among the Zambian people with the general television media landscape, the political figures in the Zambian government and Star Times which is a Chinese company.

4.2. Specific Objectives of the Research Study

- i. To identify what the Zambians have benefitted from this deal and if they are the ones who have benefitted most.
- ii. To find out if the Zambian government figures have benefitted most from this deal.
- iii. To find out what Star Times, a Chinese company, has benefitted from this deal and if it is the one that has benefitted most.

V. THE THEORETICAL FRAMEWORK

In this research study, only one theory was used in guiding the researchers. This was the Technological Determinism theory.

5.1. Technological Determinism theory

This is the theory upon which this study is anchored. According to Griffin (2000: 313-325) the term 'technological determinism' was coined by Marshall McLuhan (1962) and this theory revolves around the proposition that technology in any given society defines its nature. Technology is viewed as the driving force of culture in a society and it determines its course of history.

The theory states that media technologies shape how individuals in society think, feel, act and how a society operates as it moves from one technological age to another (McLuhan, 1962: 77). This article is being supported with the technological determinism theory as advanced by Marshall McLuhan (1962: 78). This theory holds that media technology shapes how people move from one technological age to another. Technological determinism is a reductionist theory that aims to provide a relevant link between technology and a society's nature. It tries to explain as to whom or what could have a controlling power in human affairs. The theory questions the degree to which human thought or action is influenced by technological factors (McLuhan 1962: 78).

According to Karl Max (Griffin, 2000: 313-325), technological progress leads to newer ways of production in a society and this ultimately influences the cultural, political and economic aspects of a society, thereby inevitably changing society itself. He cited the example of how a feudal society that used a hand mill slowly changed into an industrial capitalist society with the introduction of the steam mill.

Technological determinism manifests itself at various levels. Initially it starts with the introduction of newer technologies, introduces various changes and at times these changes can also lead to a loss of existing knowledge as well. For example, the introduction of newer agricultural tools and methods has seen the gradual loss of knowledge of traditional means of farming. Therefore, technology is also influencing the level of knowledge in a society (Griffin 2000: 313-325).

History shows numerous examples to explain why technology is considered to be determining the society. The invention of the gun changed how disputes were sorted out and changed the face of combat. A gun required minimum effort and skill to be used successfully and could be used from a safe distance. Griffin explains that when this is compared to how earlier wars were fought with swords and archery, it led to a radical change in the weapons used in war (2000: 313-325). Today with the discovery of nuclear energy, future wars will be fought with nuclear arsenal. Each new discovery causes a transition to a different society. The discovery of steam power led to the development of the industrial society and the introduction of computers has led to the dawn of the information age. Equally the coming of the digital migration has led to better television usage. Changes in technology sometimes have unintended or unexpected results and effects as well. This phenomenon is referred to as 'technological drift' where people start drifting more and more among a sea of unpredictable and uncertain consequences. According to Langdon Winner, technology is not the slave of the

human being but rather humans are slaves to technology as they are forced to adapt to the technological environment that surrounds them (Littlejohn 1999: 329-330).

McLuhan explains that new media are not only an addition to existing media, they are also new technologies and therefore do have a deterministic factor as well (1962: 78). Marshall McLuhan made a famous statement that “the medium is the message.” This means that the medium used communicated and influenced the mind of the receiver. The introduction of news print, television and the internet have all shown how technological advances have an impact on the society. Today internet is the latest through which journalism thrives. Humans do not have much free will at all, at one point, letters were used for business communication, however this is history now as people can easily communicate by emails. Interpersonal (word of mouth) was equally used at one time, but with technological advancement, email took centre stage in business communication. People readily adapt to the medium they are using so that they can send and receive messages like everyone else (McLuhan (1962: 89).

Within journalism, technology and its deployment should be viewed as part of a complex social and institutional matrix which stretches across a wide range of social institutions (Marx 2010: 14). The lines separating different technologies from one another and from society should thus be seen as relative and contingent upon a prevailing social consensus (Marx 2010: 19). Consequently, it is important to view technologies as both ‘socially constituted and constituting’. This calls for a non-reductionist approach that is sensitive to the complex interplay between multiple elements. Such a ‘multiple-determinations’ approach, according to Dahlberg, recognises that each determining factor is itself embedded within and constituted by a system of interlinked constitutive processes (2001: 19). These processes and relationships are in no way linear or fixed, nor are they of equal influence.

At the end of the day, any technology worthy a pinch of salt increases the efficiency of the business process; performs more tasks in less time; is hassle free; is faster; is more efficient; is more agile; has more space for storage and sharing; has more mobility; has more remote connectivity; has more automation and communication and the clients have more benefits at a cost effective price. Simply put, there are more benefits with the introduction of a new technology. For example, with the coming of the digital television migration, there are several advantages such as Better utilisation of frequencies; Better picture quality; More access to channels; Better viewing pleasure; Outstanding services for the elderly and physically challenged; Audio descriptions for the visually impaired; Adjustable speaking speed; Participation in quizzes and questionnaires and Electronic Programme Guides (EPGs).

VI. LITERATURE REVIEW

Star Times has won tender awards in other countries in Africa for the digital migration. It is therefore, important to know and learn from those countries how things transpired.

6.1. Star Times and its digital migration deal in Ghana

In Ghana, Star Times in 2017 was engaged in litigation with that country’s government over a cancelled digital terrestrial television contract (<https://www.zambianobserver.com/top-star-in-more-controversy/>, viewed on 05/11/2018). It was discovered that the company was secretly taking a lion’s share going beyond what they had agreed upon in the contract and that people realised that the Chinese company was benefiting much more than the Ghanaians.

It is a normal practice in contracts that if the economy in the country wobbles, the contractor may adjust the cost, but in agreement with the other party. However, in this case, Star Times did not show reason why it was dubiously and discreetly getting more than they had agreed upon. Therefore, it could be learnt from Ghana that Star Times was not an honest company and wanted to gain much more than the Ghanaian people.

6.2. Star Times and its digital migration deal in Nigeria

In Nigeria, Parliament in December 2016 challenged Top Star’s joint venture with the Nigerian Television Authority signed in 2009 aimed at increasing content, building a terrestrial wireless, digital television system and operating a pay television service. The partnership saw Star Times gaining effective control of the entire Nigerian Television Authority infrastructure and a 70 percent shareholding in the joint venture, with the Nigerian telecaster getting 30 percent. Nigeria’s Parliament believed the deal was reached at fraudulently and members of Parliament called for the investigation of Star Times (<https://www.zambianobserver.com/top-star-in-more-controversy/>, viewed on 05/11/2018). It was discovered that the company was fraudulently awarded the tender taking a lion’s share to the detriment of the Nigerians thereby the Chinese company benefiting much more than the owners. Similar results can be seen here. Star Times got the contract fraudulently and wanted to gain much more than the Nigerians.

6.3. Star Times and its digital migration deal in the Democratic Republic of Congo

In the Democratic Republic of Congo (DRC), Star Times operating license was revoked after the company illegally used the public frequency for its telecasts (<https://www.zambianobserver.com/top-star-in-more-controversy/>, viewed on 05/11/2018). It was discovered that the company was secretly taking a lion’s share going beyond what they had agreed upon in the contract and that people realised that the Chinese company was benefiting much more than the Congolese themselves. The trend is the same here. Star Times wanted to benefit much more than the Congolese themselves.

6.4. Star Times and its digital migration deal in Uganda

Uganda had mid 2017 halted a tender given to Star Times to run the digital terrestrial television migration for the Uganda Broadcasting Corporation as the deal was giving it majority control of the country’s television space (<https://www.zambianobserver.com/top-star-in-more-controversy/>, viewed on 05/11/2018). Of what benefit is it that the owners of the project would benefit less as compared to those hired to implement it? This forced the Ugandans to halt the contract and revisit it for better gains for the Ugandans.

As can be observed from the literature reviewed in these five Sub Sahara African countries, Star Times seems to have a legacy of abnormalities shrouded in getting contracts through fraudulent means, being a bigger shareholder as compared to the owners of the project and getting more benefits as compared to the nationals. Such a deal stinks and can only be taken with a pinch of salt.

VII. RESEARCH METHODS

The researchers used a descriptive research design because of the descriptive and analytical nature of the study. As can be seen from the literature reviewed, the researchers have shown how the Star Times Chinese Company has not created an even media landscape while being involved in the digital migration in some sub Saharan African countries. Although in Zambia this Company has been welcomed by government, the researchers are interested in knowing whether there are no teething issues as compared to what happened in other sub Saharan African countries.

In researching on this topic, the researchers used Qualitative research methods. The researchers used qualitative research methods because the techniques used in data collection was literature review, interviews and observation of how this Star Times Chinese Company, the Zambian government, ZNBC, and the general (private, commercial and church) television broadcasting media landscape is operating in Zambia.

7.1. Data Collection Methods

In the data collection, the researchers collected the data in two ways, namely; primary data collection and secondary data collection methods.

7.2. Primary Data Collection

In the primary data collection, the researchers used qualitative methods. In the qualitative methods, the researchers used the Literature Review, Interviews and Observation methods because these were the best methods to achieve the required results. The researchers needed to review the literature in order to learn of what was going on in the governance of Zambia in terms of the television broadcasting media landscape, conduct interviews in the various television media houses so that they could get the views of the media houses on how they were being impacted after the television digital migration and also do their own observations to see whether the general television media landscape following the digital migration, had brought a lot of benefits to the Zambian public or not.

7.3. Secondary Data Collection

The researchers used some books, magazines, newspapers and the internet to beef up on the primary data that was collected. This is reflected in the section dealing with literature review across the breadth and length of Sub Saharan Africa. Document data collection is crucial for the purposes of reinforcing the primary data as well as the entire research so that there is more substance and evidence. This added up to the credibility of the research findings.

7.4. Sampling Technique

This research applied the purposeful/judgemental sampling technique because the researchers knew the target group which is the television media houses. Another sampling technique that was used was the expert sampling technique which meant surveying experts in the media field and get their views on this subject matter.

7.5. Data Analysis

In analysing the Literature Reviewed, the researchers focused on the actual content to determine whether in the implementation of the television digital migration by the Chinese Star Times Company which had been awarded the tender was doing it fairly, so that all the stakeholders could enjoy the benefits justly and fairly.

VIII. RESEARCH FINDINGS ABOUT THE REAL BENEFICIARIES IN THE DIGITAL TELEVISION MIGRATION IN ZAMBIA

The research findings are in two parts: the first part presents a scenario where the digital television migration has benefitted the Zambian television media landscape. The second part presents a scenario of the digital television migration has not benefitted the Zambian television media landscape. It instead shows other beneficiaries. At the end a conclusion will be drawn to see who the greatest beneficiaries in this project are.

8.1. Benefits of the digital television migration to the people of Zambia and the general television media landscape

Some of the benefits to the people of Zambia and the general television media landscape are as follows:

- i. **Better utilisation of frequencies:** A digital signal carries much more data than an analogue signal. Therefore, more than one channel of television programmes can be broadcast at the same time. This is known as multi-channeling. This efficient utilisation of channels reduces the number of frequencies required for the broadcasting sector (MIBS 2014: 3). The Digital Terrestrial Television (DTT) is able to reduce the use of spectrum and provides more capacity for transmitting more channels. This is what exactly has happened to the Zambian television media scenario. With the coming of the digital migration, there is better utilisation of frequencies such that now there are more channels of television programmes which are being offered by the television media houses. That means the Zambia Information and Communication Authority (ZICTA) has more frequencies to put at the disposal of the television media industry (Nkole Nkole, What digital television switch-over entails, 04/10/ 2017, <http://www.daily-mail.co.zm/what-digital-television-switch-over-entails/>, viewed on 08/11/2018). This is in line with the technological determinism theory which has improved the efficiency of the business process; performs more tasks in less time; is hassle free; is faster; is more efficient; is more agile; has more space for storage and sharing; has more mobility; has more remote

- connectivity; has more automation and communication and the clients have more benefits at a cost effective price. Simply put, there are more benefits with the introduction of a new technology.
- ii. **Better picture quality:** The Digital Television Broadcasting offers sharper; brighter picture, and reduced interference. Therefore, the Zambian viewers now enjoy sharper, brighter picture quality and reduced interference with improved sound quality (Balancing Act 2011: 1). This also is in line with the technological determinism theory has increased the efficiency of the business process; performs more tasks in less time; is hassle free; is faster; is more efficient; is more agile; has more space for storage and sharing; has more mobility; has more remote connectivity; has more automation and communication and the clients have more benefits at a cost effective price. Simply put, there are more benefits with the introduction of a new technology.
- iii. **More access:** When the Set Top Box (STB) receives the digital signal it also has the capability to interface with devices such as a cell phone, memory card or internet modem. This, therefore provides viewers with access to many more services and information (ITU 2012: 10). As can be observed, this is in line with the technological determinism theory which has increased the efficiency of the business process; performs more tasks in less time; is hassle free; is faster; is more efficient; is more agile; has more space for storage and sharing; has more mobility; has more remote connectivity; has more automation and communication and the clients have more benefits at a cost effective price. Simply put, there are more benefits with the introduction of a new technology.
- iv. **Better viewing pleasure:** With analogue, the viewers are only able to have standard definition television. With Digital Broadcasting, High Definition Television (HDTV) is the premium version of digital television, offering picture and sound quality which is much better than analogue television. This means that the benefits of HDTV are particularly noticeable on larger screen sets and when using projection equipment. HDTV is in widescreen format and provides cinema-quality viewing with Dolby surround sound (ITU 2014: 7). Thus the Zambian viewer is now able to enjoy better and higher picture and sound quality thereby having better viewing pleasure. As can be observed, this is in line with the technological determinism theory which says that any technology worthy a pinch of salt increases the efficiency of the business process; performs more tasks in less time; is hassle free; is faster; is more efficient; is more agile; has more space for storage and sharing; has more mobility; has more remote connectivity; has more automation and communication and the clients have more benefits at a cost effective price. Simply put, there are more benefits with the introduction of a new technology.
- v. **Outstanding services for the elderly and physically challenged:** Enjoy subtitled caption broadcasting. Captioning is a service that displays comments and dialogue as text at the bottom of the screen. In the case of terrestrial analogue TV broadcasts, a special adaptor was required, but with digital TV, captioning is offered as a standard function. Captioning is even available for some live broadcasts (Balance Act 2011: 1). As can be observed, this added advantage is in line with the technological determinism theory which could be summarised as saying any technology worthy a pinch of salt increases the efficiency of the business process; performs more tasks in less time; is hassle free; is faster; is more efficient; is more agile; has more space for storage and sharing; has more mobility; has more remote connectivity; has more automation and communication and the clients have more benefits at a cost effective price. Simply put, there are more benefits with the introduction of a new technology.
- vi. **Audio descriptions for the visually impaired:** Audio description of the plots in dramas and other programmes are available for visually impaired users (Armstrong and Collins 2010: 15). As can be observed, this added advantage is in line with the technological determinism theory which could be summarised as saying any technology worthy a pinch of salt increases the efficiency of the business process; performs more tasks in less time; is hassle free; is faster; is more efficient; is more agile; has more space for storage and sharing; has more mobility; has more remote connectivity; has more automation and communication and the clients have more benefits at a cost effective price. Simply put, there are more benefits with the introduction of a new technology.
- vii. **Adjustable speaking speed:** Some new digital TVs have an audio speed adjustment function that allows viewers to slow down the speed of an announcer's voice. It is very useful for the elderly and partially deaf people (Ocholi 2009: 3). As can be observed, this added advantage is in line with the technological determinism theory which could be summarised as saying any technology worthy a pinch of salt increases the efficiency of the business process; performs more tasks in less time; is hassle free; is faster; is more efficient; is more agile; has more space for storage and sharing; has more mobility; has more remote connectivity; has more automation and communication and the clients have more benefits at a cost effective price. Simply put, there are more benefits with the introduction of a new technology.
- viii. **Participation in quizzes and questionnaires:** Viewers can participate in interactive programmes by connecting the digital TV to the network via a phone line or Internet connection. Then, they can use their remote control to join in user participation programmes, such as quiz games or request

programmes (Flew 2003: 19). As can be observed, this added advantage is in line with the technological determinism theory which could be summarised as saying any technology worthy a pinch of salt increases the efficiency of the business process; performs more tasks in less time; is hassle free; is faster; is more efficient; is more agile; has more space for storage and sharing; has more mobility; has more remote connectivity; has more automation and communication and the clients have more benefits at a cost effective price. Simply put, there are more benefits with the introduction of a new technology.

ix. **Creation of job opportunities:** According to Top Star, "The DTT model of digital migration in Zambia can create huge job opportunities and economic growth. The PPP (Public-Private Partnership) model brings in capital, technology, management skills, talents, and training and cultivates a new industry, which involves realising national digitalisation on schedule, creating job opportunities and contributing to economic growth." The migration has created jobs in the dealer network (Nkole Nkole, What digital television switch-over entails, 04/10/ 2017, <http://www.daily-mail.co.zm/what-digital-television-switch-over-entails/>, viewed on 08/11/2018). As can be observed, this added advantage is in line with the technological determinism theory which could be summarised as saying any technology worthy a pinch of salt increases the efficiency of the business process; performs more tasks in less time; is hassle free; is faster; is more efficient; is more agile; has more space for storage and sharing; has more mobility; has more remote connectivity; has more automation and communication and the clients have more benefits at a cost effective price. Simply put, there are more benefits with the introduction of a new technology.

x. **Electronic Programme Guides (EPGs):** Electronic Programme Guides (EPGs) are a feature of digital television broadcasting that comes fitted in the Set Top Box. An Electronic Programme Guide (EPGs) can be used by viewers to navigate between channels, identify the currently screening programme and the next programme ('now and next') on each channel. More sophisticated EPGs are being used to set reminders for programme viewing, provide a short synopsis of the content of programmes, identify programming in advance for several days, search for programmes by genre, and provide access to some enhancements among others (Crinon et al., 2006: 102-118). As can be observed, this added advantage is in line with the technological determinism theory which could be summarised as saying any technology worthy a pinch of salt increases the efficiency of the business process; performs more tasks in less time; is hassle free; is faster; is more efficient; is more agile; has more space for storage and sharing; has more mobility; has more remote connectivity; has more automation and

communication and the clients have more benefits at a cost effective price. Simply put, there are more benefits with the introduction of a new technology.

xi. **Affordability of STBs among low-income TV owning households:** According to the research findings done by Conceptor Ilinanga for her master's dissertation in the Department of Media and Communications Studies at the University of Zambia in 2017 (Ilinanga, 2017), the digitally integrated TV sets were costing not less than US\$300 (approximately K3, 000) which was costly and hence out of reach for many (Balancing Act 2011: 1). In order to ensure that the migration to digital terrestrial television (DTT) was successful, the free-to-air DTT set top box was the best alternative. In this regard, in the first phase of digital migration Zambia National Broadcasting Corporation (ZNBC), a public broadcaster, responsible for signal distribution and rolling out the digital network infrastructure on behalf of broadcasters, was selling the set-top-boxes via Zambia Postal Offices (ZAMPOST). The initial price was K800, but even before going to the market, the government subsidised the price. So the set top box was brought down to K130 and the antenna at K80 which came to a total of K210 (ZNBC News, June 17, 2015). Critical success factors identified by the European Union were the "low cost and widely available" set top boxes and audience awareness (Rosenberg 2013: 1).

All these benefits agree with the introduction of any technology. As mentioned already, any technology worthy a pinch of salt increases the efficiency of the business process; performs more tasks in less time; is hassle free; is faster; is more efficient; is more agile; has more space for storage and sharing; has more mobility; has more remote connectivity; has more automation and communication and the clients have more benefits at a cost effective price. The only problem where there is a bit of hitch is in terms of the cost effective price. In this technology, the price was not cost effective to the Zambian people.

8.2. Benefits of the digital television migration to Star Times

Some of the benefits to Star Times are as follows:

i. **ZNBC is both a signal carrier and a content provider:** The new global trends in digital terrestrial television broadcasting are that broadcasters are being unbundled into content service provisioning and signal distribution. No television broadcasters are allowed to own network and at the same time perform content service provisioning. However, this does not seem to apply to the Zambian digital television environment. Following the digital migration process from analogue to digital television broadcasting, Zambia National Broadcasting Corporation (ZNBC) in collaboration with Top Star (a subsidiary company of Africa's leading digital TV operator Star Times of China) have been given the

role of being a signal distributor responsible for rolling out the digital network infrastructure on behalf of broadcasters (MIBS 2014: 6). The company has been given the full mandate to carry out the countrywide digital migration of television signal from analogue to digital. Therefore, ZNBC is both a signal carrier and a content provider which is contrary to modern trends. The greediness of Star Times seen by other sub Saharan African countries reviewed can be observed here. For example, in Nigeria, the partnership saw Star Times gaining effective control of the entire Nigerian Television Authority infrastructure and a 70 percent shareholding in the joint venture, with the Nigerian telecaster getting 30 percent only (<https://www.zambianobserver.com/top-star-in-more-controversy/>, viewed on 05/11/2018). It was a similar case in Uganda whereby Star Times wanted to get majority control of the country's television space (<https://www.zambianobserver.com/top-star-in-more-controversy/>, viewed on 05/11/2018). Government was forced to cancel the deal. Star Times has taken a lion's share in this project. However, unlike other African countries reviewed here, when parliament noticed the discrepancy, they cried foul and were heard and the project was halted. In Zambia instead, even if parliament cries foul, government continues moving on the project. It does not respect the voice of the people.

- ii. **IBA lacking capability and legal framework to regulate ZNBC:** To regulate the broadcasting sector, Parliament passed a law "the Independent Broadcasting Authority (IBA) Act No. 17 of 2002", which provides for the registration of broadcasting stations and regulation of their content. The broadcasting licenses are issued under the IBA Act while the frequency licenses are issued by ZICTA under the Information and Communication Technologies (ICT) Act No. 15 of 2009. While it is the mandate of the Independent Broadcasting Authority to regulate the broadcast sector in Zambia, IBA has no capability and legal framework to regulate ZNBC, because it does not need a licence to operate. The mandate comes from Parliament. Hence IBA has no powers to stop ZNBC from operating. So no matter how ZNBC defaults, IBA is incapable of doing anything. This poses a lot of challenges knowing that ZNBC is the part owner of the infrastructure on which all other television stations subscribed to Top Star ride on.
- iii. **Signal distribution is undertaken by signal distributors:** These entities provide network infrastructure that receive content after aggregation from Content Providers for multiplexing and signal distribution and provide Subscriber Management System (SMS). The signal distributors are required to provide up to five (5) free-to-air programme channels for public service and are required to establish and operate help desks. Each signal

distributor is required to develop service level agreements with Content Service Providers which shall be non-discriminatory. Under this category the following licenses apply: a) **Public Signal Distributor** – The signal distributor shall be required to provide national-wide coverage and services to Content Service Providers (licensees) on a non-discriminatory basis in order to provide universal access. However, this has not been implemented. b) **Private Signal Distributor** – The Signal Distributor shall be required to provide national-wide coverage and service to Content Service Providers (licensees) on a competitive and non-discriminatory basis. The private signal distributor shall be established through competitive open tender. There is no private signal distributor currently operating in Zambia. This has also not been implemented. In short, all content providers are supposed to be given free to air licenses but under the current arrangement these stations are not free to air as the end user has to be subscribed to, and be given a package for them to view a station of their choice. The ugly head of the greediness of Star Times continues which was noticed and stopped in other countries can be observed here being played insidiously.

- iv. **TV revenue levy and subscriber fees taken by ZNBC alone:** Top Star Communications is the only mandated public signal distributor operating in Zambia. Top Star is a joint venture company created by the Zambian government between the Zambia National Broadcasting Corporation (ZNBC) and Star Times of China. The company has been given the mandate to carry out the countrywide digital migration of television signal from analogue to digital. It, therefore, implies that the revenue raised through Television Levy and subscriber fees should be shared with the other content providers. Unfortunately, this is not the case as ZNBC enjoys the national levy cake alone. It can be observed that just as it was noticed in other sub Saharan African countries which have been reviewed here that Star Times was getting a lion's share. In Ghana for example, it was discovered that the company was secretly taking a lion's share going beyond what they had agreed upon in the contract and that people realised that the Chinese company was benefiting much more than the Ghanaians digital terrestrial television contract. (<https://www.zambianobserver.com/top-star-in-more-controversy/>, viewed on 05/11/2018).
- v. **Top Star gets double pay by being both a signal distributor and a content provider through its own channels:** When Top Star came on board as a Public Signal Distributor, the expectations from all stakeholders were that they would stick to signal distribution as provided for in the legislation. Unfortunately, this is not the case at the moment. Top Star is a signal distributor and a content provider too. Top Star came with its own channels that have

narrowed the operational space for the available local channels. For example, in 2018, Kenmark Broadcasting Network (“KBN”), a Zambian owned independent broadcasting network, was licensed to provide various programmes of an entertainment, informative, educational and Christian nature. KBN was successfully granted a Content Service Provider Licence – Commercial Free to Air by the Independent Broadcasting Authority in January, 2017. Following this, KBN applied at that time to the Zambia National Broadcasting Corporation for a TV signal of which they were told to wait until the digital migration was done by 2018. On the strength of that pronouncement they went ahead and sourced and secured office space to commence preparations for broadcasting and started incurring operational costs since October, 2017. Some of the milestones achieved in preparation for commencing broadcasting include; contracting a consultant to get the studio and control rooms ready, procurement of a loan to fund the purchase of high quality studio and broadcasting equipment, commencement of filming and production of a number of shows in readiness for broadcasting, employment of a multi-skilled team of 16 young talented Zambians comprising of journalists, camera operators, video editors, marketing staff, transmission controllers, graphics designers and other support staff among others. To demonstrate the channel’s readiness, live Facebook broadcasts for news at 19:00hrs and a breakfast show every morning from Monday to Friday were started. KBN had no alternative other than to suspend these trial broadcasts due to cash flow constraints arising from the network having not commenced commercial broadcasting. All the operating expenses including salaries were funded from resources of the local promoters and directors of the company. Above all, even inspectors from IBA, Top Star and ZICTA went and conducted inspection and confirmed the technical readiness of KBN to commence broadcasting. After meeting all these benchmarks Top Star refused to carry them under the disguise of not having sufficient bandwidth to accommodate them. The real reason was that Top Star had filled the available bandwidth with their own Asian content (Natalie Ngosa, KBN writes Lungu over Chinese Top star’s digital migration handling, The Mast newspaper, <https://www.themastonline.com/2018/07/20/kbn-writes-lungu-over-chinese-topstars-digital-migration-handling/>, viewed on 07/05/2020. This shows clearly how Top Star had gone beyond its mandate of being just a national signal distributor. It had also assumed the role of a content provider as well. It cannot be both. As things stand, it is playing both roles of being a signal carrier as well as a content provider. This clearly has an adverse impact on competition and is depriving Zambian investors of the chance to enter the market and compete

favourably (Natalie Ngosa, KBN writes Lungu over Chinese Top star’s digital migration handling, The Mast newspaper, <https://www.themastonline.com/2018/07/20/kbn-writes-lungu-over-chinese-topstars-digital-migration-handling/>, viewed on 07/05/2020. This also shows how Star Times has continued getting a lion’s share like it was doing in other sub Saharan African countries reviewed.

- vi. **Top Star compresses signals of all the TV Stations or content providers it carries to the detriment of picture quality:** As mentioned in the above point, Top Star, despite being a distributor, it has also come with its own channels. This implies narrowing down the operational space for the local channels. Because of capacity issues, Top Star has to compress significantly the signals of all the TV Stations or content providers it carries. This compromises the picture quality and consequently takes away the very reason for which digital terrestrial television was established, to provide crystal clear quality picture and sound to a wider audience at a low cost. This is what also happened in the Democratic Republic of Congo. Star Times illegally used the public frequency for its telecasts (<https://www.zambianobserver.com/top-star-in-more-controversy/>, viewed on 05/11/2018). However, unlike the Democratic Republic of Congo (DRC), for Zambia this activity has been accepted. Instead the DRC revoked its license after the company illegally used the public frequency for its telecasts (<https://www.zambianobserver.com/top-star-in-more-controversy/>, viewed on 05/11/2018).
- vii. **Top Star runs adverts and gets advertising revenue:** Despite Top Star being contracted by the government of the Republic of Zambia as a distributor, it also competes for advertising revenue with local stations and sometimes even runs worded adverts on local stations without sharing revenue with the content providers. Thus Top Star is not being honest and in essence this is theft. This continues showing the greediness of Star Times as observed in other African countries reviewed.
- viii. **Expensive annual license fees:** The annual license fees of K20, 000 plus the carrier fees will make many stations to be out of business in no time. The fact that they have to compete for the same advertising revenue with the so-called signal distributor makes the situation extremely hard for the local stations to survive.
- ix. **Payment of fees by TV media houses to be carried by Top Star per zone:** The content providers have to pay Top Star for them to be carried. The country has been divided into 11 zones and the content providers have to pay for each of the zones for them to be able to be carried by Top Star. Each province is considered as a zone with Lusaka being split in two. In 2018, for those along the line of rail or in simple terms those in towns, they had to pay K16,

000 per zone while in rural areas they had to pay K11, 000. Now what it means is that if a TV media house has to broadcast country wide, it means it had to pay for each zone. Five out of these eleven zones are considered urban while the remaining six are considered rural. This means that if a TV media house wants to cover the entire country, it has to pay K146, 000 annually. Furthermore, Top Star is also enjoying revenues from advertisements which should only be handled by content providers. How possible is it for the TV media houses to manage to raise K146, 000 to pay Top Star? Advertisements are some of the methods in which TV media houses raise substantial revenues and these are being shared with Top Star. So how will the TV media houses raise this amount of money when some of the avenues are being encroached upon- by the very company to be paid? This again shows the greediness of Startimes, getting a lion's share.

x. **Private television stations outside Lusaka to send their signals to Top Star in Lusaka as the relaying point bearing the cost of sending the signal themselves from their base:** According to the initial understanding, the private television media houses outside Lusaka were meant to understand that Zambia Telecommunications Company (ZAMTEL), was going to carry their signals to Top Star in Lusaka using its optic fibre. However, when ZAMTEL realised that it was being offered a raw deal, it backed out of this deal. So now what it means is that these private television stations outside Lusaka have to send their signals to Top Star in Lusaka as the relaying point and they have to bear the cost of sending the signal from their base. In the absence of ZAMTEL, the alternative is to use other internet service providers and they are demanding for a monthly payment of K550, 000 which is impossible for the media houses to raise even if this was going to be an annual payment. This is extremely expensive and unimaginable. For example, in 2018, Chipata Television in Eastern Province wanted to be carried by Top Star, but they were asked to relay their signal to Lusaka at their own cost. So when they tried to engage a private internet service provider, to relay their signal to Top Star in Lusaka, they were asked to pay K550, 000 which was impossible for them to raise. Hence they backed out.

xi. **Top star was highly expensive as compared to other bidders:** From the information obtained in the *Zambian Watchdog* online newspaper, when this project was advertised by the Ministry of Information and Broadcasting Services, some of the bidders were Huawei Technologies, ZTE Corporation, Gospel Digital Technology Company Limited, and King Tai investments Zambia Limited for the Phases II and III of the digital migration process. In fact it is said that the bids of these companies were in the range of \$15 million and \$21 million compared to Star Times whose bid was \$220

million

(<https://www.zambiawatchdog.com/chipimo-queries-dora-siliya/>, viewed on 8/11/2018). After the government cancelled the tender that had been awarded to Star Times, then it went behind and formed a marriage of convenience with Star Times and formed a company called Top Star and gave it this project costing USD273 million. That means Star Times has reaped huge amounts of profits unnecessarily. This again shows the fraudulent under hand methods used by Star Times of getting the deal like in some other African countries which have been reviewed.

xii. **Top star enjoying the comfort of being rooted in ZNBC without any signs of moving out:** Top Star is charging for a local bouquet in the region of K40 per subscriber. It is said that by 2018 there were over 1.4 million active subscribers on Top Star. If these numbers are correct, it means that Top Star was earning in the range of \$4, 9 million every month without including the TV levy. Assuming costs of \$1 million per month, this gives a balance of nearly \$3.9 million per month. And if you multiply \$3.9 m by 12months the total is \$46.8 million. This would mean that the loan would be repaid in less than 5 years and even less if one takes the counterpart funding into consideration. (<https://www.zambiawatchdog.com/chipimo-queries-dora-siliya/>, viewed on 8/11/2018). That means Star times is reaping huge profits. But Star Times is known for shifting camps. Hence what has been experienced in other sub Saharan African countries may come to pass also here. Star Times may inflate the costs thereby staying longer in Zambia and reaping more profits.

8.3. Benefits of the digital television migration to the Political figures in the Zambian Government

Some of the benefits to the Zambian Government are as follows:

- i. **Ability of the country to do the digital television migration despite the poverty levels:** Although Zambia had become a signatory to a treaty with a resolution that all countries around the world were to migrate from analogue to digital television services by 2015, yet the truth was that the economy was so bad that it was doubtful as to whether the country would manage to migrate around the set time. But following this ratification, ZNBC complied with the ultimatum. This was made possible by the Zambian government entering into partnership with Star Times, a Chinese company that had the technical know-how and also the government procuring a loan of US\$273 million from China for the implementation of phase two of the Digital Migration programme. Hence, despite the Zambian economy being bad, government managed to abide by the international ultimatum.
- ii. **Suspicious fraudulent costs:** In 2011, the Zambia Digital Migration Task force announced that Zambia

needed \$30 million to carry out a successful digital migration. To this effect, in the first phase migration, government spent \$9 million. This first phase migration comprised of 4 provinces namely; Southern, Lusaka, Central and the Copperbelt Provinces. This figure resonates well with what other countries in the continent spent. It is surprising that the figures changed after the Chinese came on board. Initially, Star Times was awarded the contract costing USD 220 million. The tender was cancelled following a recommendation from the Zambia Public Procurement Authority (ZPPA) which cited irregularities in both the original tender document and the award process following appeals from two of the four unsuccessful bidders – Huawei Technologies, ZTE Corporation, Gospel Digital Technology Company Limited, and King Tai investments Zambia Limited. After the cancellation of this tender, then Star Times and the Zambian government created a special purpose investment vehicle called Top Star. This is how Top Star was born and bade for the tender and ultimately won the tender (<https://nextvnews.com/zambia-cancels-startimes-dtt-contract/>, viewed on 12/05/2020). In accordance with the wishes of government, Top Star then entered into an agreement with Zambia National Broadcasting Corporation (ZNBC). Through this venture the government now procured a loan of US\$273 million from China for the implementation of phase two of the Digital Migration programme. Now the new cost was even higher by USD53 million. There has been no proper explanation as to how the figure of \$30 million proposed in 2011 by the Task Force rose to \$220 million and finally rose to over \$273 million. Botswana spent \$18 million while South Africa, which has a far bigger population and geographical orientation, spent \$78 million. How is it that Zambia has spent close to \$300 million? (<https://www.lusakatimes.com/2018/03/16/topstar-deal-one-biggest-financial-scandals-modern-day-zambia-sanac/>, viewed on 04/05/2020). While the Southern Africa Network Against Corruption (SANAC) has written to the Minister of Information Dora Siliya over the Top Star Digital Migration deal, the Anti-Corruption Commission, a Zambian parastatal, has not raised any alarm against such seemingly inappropriate activities and hence whoever dipped their fingers in this pot have gone scot-free with blessings from government. SANAC instead says that the Top Star deal is one of the biggest financial scandals in modern day Zambia. Whereas other countries in the continent have spent far less, the Zambian digital migration deal is the most expensive in Africa costing government a whopping \$282 million.

- iii. **Suppression and muzzling of the freedom of the media:** Ordinarily, all things being equal, Zambia was supposed to have 2 signal carriers or distributors to allow for TV media houses to choose. However, the Zambian government refused to allow for 2 carriers and instead made sure that there was only one carrier which is Top Star and through ZNBC. So the competitive mechanism was not implemented. But the real crux of the matter is the fact that since ZNBC is government owned, it would

be in charge of allowing which television media house to accept and equally which television media house not to allow or throw out. This has been made possible by government refusing to sign the Right to Information since 2002. Furthermore, government has also tinkered with the Independent Broadcasting Authority (IBA). This has been done by IBA being housed in the ZNBC premises which is government property. Then when the job for the Director General of IBA was initially advertised, applicants wrote to the Permanent Secretary of the Ministry of Information and Broadcasting. So the Ministry picked the IBA Director General. The IBA Board was only appointed after the Director General had been employed. So naturally, the IBA Director General is answerable to the Ministry and not to the Board. A vivid example is what happened in 2020 to the Prime Television Station. On 13 March 2020, Prime TV owner Gerald Shawa, in his capacity as Chairperson of the Zambia Independent Media Association, a local trade group, told government officials that independent outlets were not prepared to air the government's coronavirus-awareness campaign for free because the government owed them money for airing previous government advertisements and, unlike the public broadcaster, they were not subsidised by the State. On 17 March 2020, the Information and Broadcasting Services Minister Hon. Dora Siliya, accused Prime TV of being unpatriotic and banned government officials from conducting any business with it, including appearing on its broadcasts and also barred the network's journalists from attending official events. On 27 March 2020, Topstar which is a signal carrier, informed Prime TV that it would stop carrying its broadcasts. On 9 April 2020, The Independent Broadcasting Authority, Zambia's broadcasting regulator, cancelled Prime TV's license "in the interest of public safety, security, peace, welfare or good order". Hence Prime TV was told to surrender its license and cease broadcasting immediately (Committee to protect journalists, Zambia cancels broadcaster Prime TV's license, police shutter office, 13 April 2020, <https://cpj.org/2020/04/zambia-cancels-broadcaster-prime-tvs-license-police.php>, viewed on 04/05/2020). The conclusion was that the revocation of Prime TV's broadcast license confirmed that the government's aim was to silence a key independent media house that had at times been critical of the government's stance on the governance issues.

IX. CONCLUSION

Ultimately the Digital Television Migration in Zambia has created serious bottlenecks that need to be sorted out if the broadcast sector is to grow and prosper. The current environment stifles growth and makes it hard for the local TV sector to be competitive and profitable. The company that has benefitted most in terms of finances is Star Times, the Chinese Company. The Zambian government has instead benefitted in terms of migrating at the agreed upon time in accordance with the treaty, and it has

also benefitted in terms of individual government officials embezzling and enriching themselves from this project and above all government has benefitted in terms of usurping power to control, suppress and muzzle media freedom. Zambia, which had achieved so much after the Movement for Multiparty Democracy (MMD) liberalised the airwaves in 1993, has in essence gone backwards to state media era of the UNIP rule from 1964 to 1991. The people of Zambia have benefitted only in terms of the aesthetics which have come with the progress made by the digital television migration.

Recommendations

i. Anti-Corruption Commission to revisit the financial costs of this digital television migration: In 2011, the Zambia Digital Migration Task force of professionals announced that Zambia needed \$30 million to carry out a successful digital migration. To this effect, in the first phase migration, government spent \$9 million. This first phase migration comprised of 4 provinces namely; Southern, Lusaka, Central and the Copperbelt Provinces. This figure resonates well with what other countries in the continent spent. It is surprising that the figures changed after the Chinese came on board. There has been no proper explanation as to how the figure of \$30 million proposed in 2011 by the Task Force rose to \$220 million and finally rose to over \$273 million. Botswana spent \$18 million while South Africa, which has a far bigger population and geographical orientation, spent \$78 million. How is it that Zambia has spent close to \$300 million? The Anti-Corruption Commission (ACC), if it is worthy any pinch of salt, should raise an alarm and carry out independent free investigation. Failure to doing that may bring about future political boomerang effects. According to Bwalya and Kunda, when government entertains and hides corruption, when a different political party forms government later, the former government officials are hunted down by the new government and suffer adverse effects with unwelcome repercussions. That is why the ACC should rise to the occasion to help the Patriotic Front government 'put their house in order' lest they are hunted down, once they leave office (Bwalya and Kunda, 2019).

ii. Delayed review of the broadcasting environment to reflect new realities of the digital broadcasting: According to the insights of the policy on digital migration, the major hurdle of the television broadcasting industry in Zambia is the delayed review of the broadcasting environment, to reflect new realities of digital broadcasting in tandem with the policy. For example, there is need to review the operations of ZNBC as a public broadcaster in line with the new business model in the digital environment. Secondly there is need to ensure that regulators develop and implement tariff and universal access guidelines before switching off analogue terrestrial television and thirdly, there is need to facilitate the establishment of a private signal distributor through competitive mechanisms.

iii. Review downwards the fees being paid by local TV stations to Top Star: The fees to pay the carrier are extremely high. They are only meant to benefit the carrier while the local TV stations are getting stifled. Adverts by government should be paid for. This is the best way to show support to the local TV stations.

iv. Top Star to remain a signal distributor only: Top Star is a signal distributor and a content provider too. Top Star came with its own channels that have narrowed the operational space for the

available local channels. This is illegal. Top Star should remain as a signal distributor because by also being a content provider, it has encroached on the market for the local TV stations to do business. Otherwise the television broadcasting spectrum will turn out to be unprofitable for the local television stations and in the end Top Star will take over the show.

v. Sharing of TV levy and subscriber fees with other local TV stations: All things being equal, since ZNBC is a content provider and also a carrier, it therefore, follows that the revenue raised through Television Levy and subscriber fees should be shared with the content providers.

vi. Freedom of the media and freedom of expression: First it is important to understand that within the communications field, technology has been a great driver for diversity and pluralism. So, whether one is looking at the invention of the printing press or at radio and television and their capacity to disseminate information at the mass level, technology always provides a good opportunity to reach people with information and for people to provide feedback on governance, thereby creating a public sphere for social dialogue. Technology is always at the heart of the question of free expression. In the current situation, the movement from analogue to digital television creates an opportunity to expand media diversity and pluralism.

Digital broadcasting also eliminates the need for the infrastructure that traditional television relied upon. Unfortunately, almost all African countries are transitioning to an infrastructure model where there is only one platform for the distribution of content, which means that if somebody took hold of that one point then the totality of public expression could be compromised. It's a choke point: it is almost like holding somebody's neck and strangling the whole space for public expression. Hence there is need to develop policies and frameworks that take advantage of the diversity that digital migration allows, but also avoid the dangers it can present. There is need for distinction to determine who bears liability for offensive content and who can access constitutional protections for free expression. If broadcast distributors are designated as technology, they may not benefit from the constitutional protections available to the media.

Ordinarily, technology and infrastructure do not benefit from constitutional protections for free expression. If one looks at the analogy of the telephone, traditionally it has been considered as a common carrier: the telephone company will not be held liable for any offensive material communicated between two people over the telephone network. The downside of this is that, as a result of the principle of mutuality, common carriers don't receive constitutional protections for freedom of speech and expression. In the case of digital migration in Africa, without policy clarity, this could create problems: what if, in the future, intermediaries are asked to enforce government content restrictions for reasons that are ostensibly related to public safety but in reality are politically motivated? So since signal distributors stand at the gateway of public communication and have the capacity to choke public expression, it is important that they receive both freedom from liability for the content as well as legal protection from infringements on free expression. They should be given all the constitutional protections that are afforded to the media so that they are insulated from impermissible political encroachment. But

as intermediaries, they also need to be free from liability for content.

If they are not, distributors could be left vulnerable to lawsuits or government intervention and so may seek to limit their liability by refusing to broadcast critical content—effectively turning them into private censors. The question of how to treat intermediaries between content creators and the public is thorny and persistent, re-emerging with each major advance in communications technology. It is the same question about whether search engines and hosting sites should be held liable for the content of third parties. Indeed, Zambia also needs transparent, democratic legislation that addresses the relationship between content producers and the broadcast platform because at present, that relationship is usually regulated by contractual agreement. This means that if the signal distributor chooses not to broadcast particular content, the content producer can only sue for breach of contract. Remedies for breach of contract cannot remedy the costs of censorship: for example, if during an election a TV station is critical of the government and is subsequently removed from the airwaves by the signal distributor, suing for breach of contract may provide financial restitution but cannot address censorship's political ramifications (George Sarpong, National endowment for democracy, Forum Q&A, George Sarpong on defending media freedom during Ghana's digital migration, 14/02/2019, <https://www.ned.org/forum-qa-defending-media-freedom-during-ghanas-digital-migration/>, viewed on 04/05/2020).

vii. Introduction of the hire purchase pay slow system:

The "Set Top Box" costs K130 and the antenna K80 which altogether comes to a total cost of K210. This is about USD10. Even though poor people can afford, the problem is how is government, which is almost choked by the debt burden, going to raise up money and pay back the loan without being suffocated? Government could have reduced the burden of paying this loan by introducing the hire purchase system of buying the STBs. In this way, even poor people could have managed to be buying even at a higher price, but paying under the hire purchase system without realising that they were paying so much.

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A Critical Analysis Of The Introduction Of Comprehensive Sexuality Education In The School Curriculum In Zambia

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Abstract- Comprehensive Sexuality Education (CSE) provides young people with opportunities to explore their values and attitudes and build skills so that they can make safe decisions; including reducing their risk of getting diseases such as HIV and AIDS, avoiding Child marriages and unintended pregnancies, Gender Based Violence, delay sexual debut and sexual abuse. That is why from 2011 an Adolescent Health Strategy was established to start providing interventions on Health issues for the adolescents and young people: unintended pregnancies; identity crisis, drugs and substance abuse; sexual relationships and experimentation; lack of decision making skills and assertiveness; HIV & AIDS; lack of information and Gender Based Violence; lack of access to medical services e.g. contraception; negative cultural and religious practices; failure of parents to educate their children and lack of adherence to proper use of contraception. The school curriculum was seen as the best conduit to reach out to the adolescents. Hence in 2014 the Ministry of General Education and other partners flagged off the programme. So the objective of this research is to critically analyse whether Comprehensive Sexuality Education has met the benchmarks needed for it to be taught to the youths in schools or elsewhere from the cultural, religious and moral point of view in the Zambian context. The Research Findings have left a sour taste in the mouth. As a result, a few recommendations have been done so that the Ministry of Education and its partners bring the programme to what is acceptable in accordance with the cultural, moral and religious world view of the people of Zambia.

Index Terms- comprehensive; sexuality; education; Adolescent Health Strategy; culture

I. INTRODUCTION

It is important that young people know Comprehensive Sexuality Education because in some parts of the world, two out of three girls reported having no idea of what was happening to them when they began menstruating. Comprehensive Sexuality Education assists young ladies to know that pregnancy and childbirth complications are the second cause of death among 15 to 19 year

olds with approximately 70,000 adolescents affected annually and hence never to rush into intimate sexual affairs, but instead wait until they are mature enough. Through Comprehensive Sexuality Education, the girl-child is made alive to the fact that early and forced marriage is a risk factor – approximately 90 per cent of births to teenage mothers in developing countries occurs within marriage. Every year, an estimated 246 million children are subject to some form of gender-based violence (GBV), including mistreatment, bullying, psychological abuse and sexual harassment, in or on the way to school. It is a fact that around 120 million girls worldwide (slightly more than 1 in 10) have experienced forced intercourse or other forced sexual acts or any other form of intimate partner violence at some point in their lives. Then at global level, only 34 per cent of young people can demonstrate accurate knowledge about HIV prevention and transmission.

It is important that young people know Comprehensive Sexuality Education because in some parts of the world, two out of three girls reported having no idea of what was happening to them when they began menstruating. Comprehensive Sexuality Education assists young ladies to know that pregnancy and childbirth complications are the second cause of death among 15 to 19 year olds with approximately 70,000 adolescents affected annually and hence never to rush into intimate sexual affairs, but instead wait until they are mature enough. Through Comprehensive Sexuality Education, the girl-child is made alive to the fact that early and forced marriage is a risk factor – approximately 90 per cent of births to teenage mothers in developing countries occurs within marriage. Every year, an estimated 246 million children are subject to some form of gender-based violence (GBV), including mistreatment, bullying, psychological abuse and sexual harassment, in or on the way to school. It is a fact that around 120 million girls worldwide (slightly more than 1 in 10) have experienced forced intercourse or other forced sexual acts or any other form of intimate partner violence at some point in their lives. Then at global level, only 34 per cent of young people can demonstrate accurate knowledge about HIV prevention and transmission.

According to the High Commissioner for Human Rights in the United Nations, “Human rights are rights inherent to all human beings, whatever nationality, place of residence, sex, national or ethnic origin, colour, religion, language, or any other status. We are all equally entitled to our human rights without discrimination. These rights are all interrelated, interdependent and indivisible” (<http://www.ohchr.org/EN/Issues/Pages/WhatAreHumanRights.aspx>, viewed on 23/10/2021). Therefore, human rights are understood as rights belonging to any individual by virtue of being a human being, independent of any law. Since they are supposed to be recognised everywhere, they are therefore, universal guarantees which protect individuals and groups against actions and omissions which interfere with fundamental freedoms, entitlements and human dignity.

However, human history is a witness to many grave injustices suffered by children. According to the U.S. Chargé d’Affaires who was in Zambia by then in 2015, David Young, “the statistics provided by UNICEF, are sobering. Nearly 300 million boys and girls live with violence, abuse, child labour, neglect, sexual exploitation, physical and humiliating punishments, armed conflict, defilement, rape and harmful cultural traditional practices (<http://zambia.usembassy.gov/op-ed-children.html>, viewed on 21/12/2015). That is why even before the United Nations was born in 1948, the League of Nations already in 1925 declared June 1 as the International Children’s Day. (<http://www.ohchr.org/Documents/Publications/FactSheet10rev.1en.pdf>, viewed on 23/10/2021).

Although society has seen fundamental changes since then, yet some truths remain valid: all adults were once children; children remain the most vulnerable members of society; and each generation of parents wants to create a better future for their children. The stakes are high if a child is failed today, there will be a failed tomorrow (<http://zambia.usembassy.gov/op-ed-children.html>, viewed on 21/12/2021).

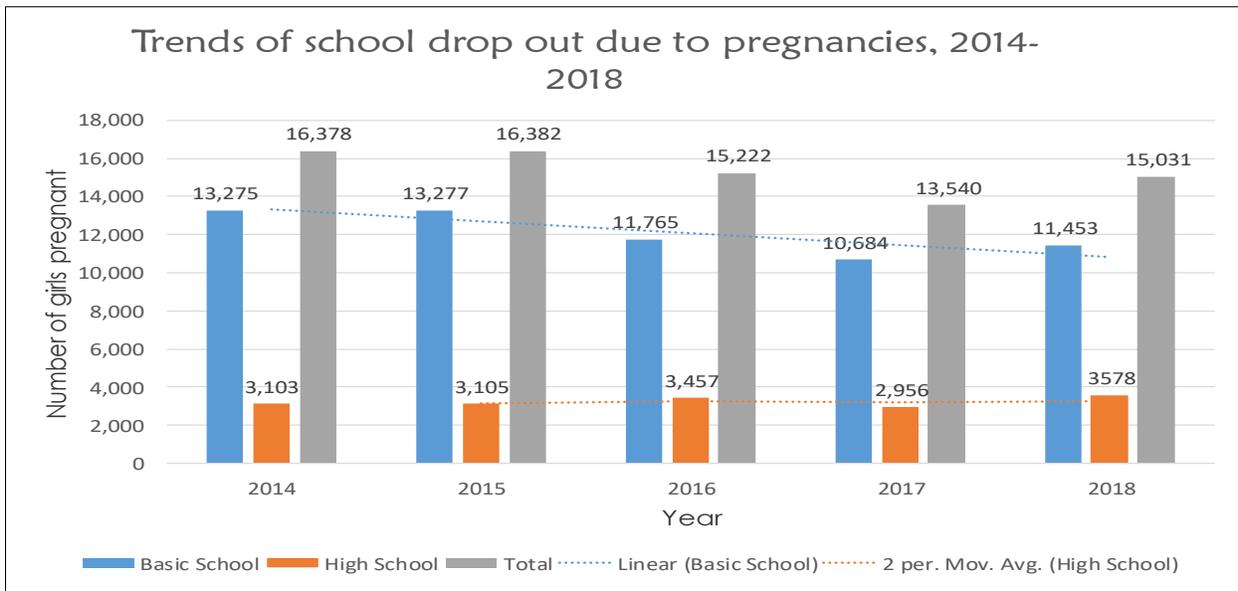
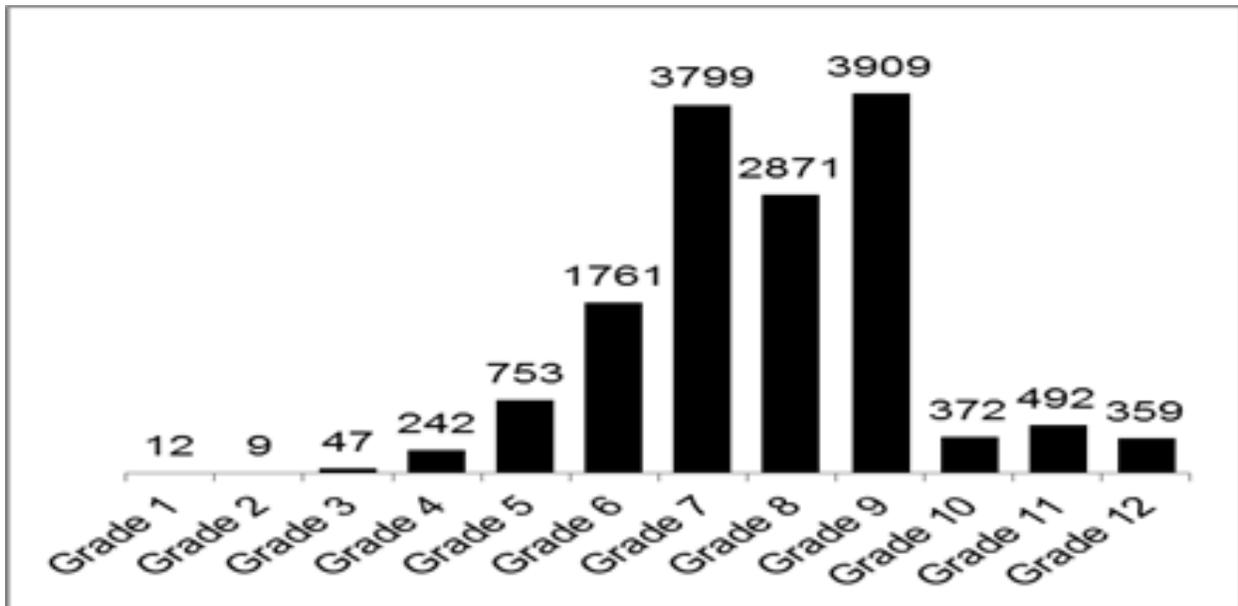
However, the big bang came in 1979 when Poland moved a motion at the United Nations for the Rights of the Child. The Convention on the Rights of the Child was adopted by the General Assembly of the UN by its resolution 44/25 of 20 November 1989. In 1995, the Convention had been ratified in Vienna (<http://www.ohchr.org/Documents/Publications/FactSheet10rev.1en.pdf>, viewed on 23/10/2021).

Despite the adoption of the Convention on the Rights of the Child by the General Assembly of the UN by its resolution 44/25

of 20 November 1989 and despite its ratification in 1995 in Vienna, yet boys and girls sometimes live in an environment that does not respect their rights. One of this axis of evil is the lack of knowledge by the children on matters of sexuality. That being the case, in 1996, a National Policy on Education called “Educating our Future” was written down in Zambia which said that “*Young people frequently experience problems arising from their developing sexuality. Many of those attending school have not been given the help they need in this area. The school has an obligation to compensate for the losses they may have experienced elsewhere by helping pupils to form an enlightened outlook on sexuality. This is all the more urgent today in view of the prevalence of HIV and AIDS. Because of this, the curriculum for each school will include an education programme in the areas of sexuality and interpersonal relationships, appropriate to the age and development of its pupils*”, (Sexuality and interpersonal Relationships, 1996: 38). So between 2000 and 2015, a number of research studies were undertaken concerning sexuality and interpersonal relationships among pupils in schools and the findings were as follows:

- Data from Educational Statistical Bulletins, indicated high rate of school dropout due to pregnancy (ZESB, 2012).
- Zambia Demographic and Health Surveys revealed high prevalence of Sexually Transmitted Diseases including HIV among the 15 to 24 age group (ZDHS, 2007, 2013/2014).
- The 2007 ZDHS revealed that 12% girls and 16% boys experience sexual intercourse before the age of 15 (ZDHS, 2007).
- 2010 curriculum scan by UNESCO revealed gaps in knowledge on sexuality education (UNESCO, 2010).
- The 2010 SACMEQ Report revealed that 60% of Grade 6 learners showed inadequate knowledge on sexuality (SACMEQ, 2010).
- 28% of adolescent girls in Zambia become pregnant before the age of 18, (ZDHS, 2013/2014).
- Adolescent birth rate in Zambia stands at 146 births per 1000 women aged 15 to 19 years, (Census of Population and Housing, 2010).

School drop-out trends due to pregnancies-2010



The research findings prompted the Ministry of General Education to start looking for ways to find a solution for this problem. After consultations with some Cooperating partners in Europe, the answer to this problem was Comprehensive Sexuality Education.

Comprehensive Sexuality Education (CSE) provides young people with opportunities to explore their values and attitudes and build skills so that they can make safe decisions; including reducing their risk of getting diseases such as HIV and AIDS, avoiding Child marriages and unintended pregnancies, Gender Based Violence, delay sexual debut and sexual abuse.

To this effect, in 2011, an Adolescent Health Strategy was put in place which started covering and providing interventions on the following Health issues for the adolescents and young people: unintended pregnancies; identity crisis, drugs and substance abuse; sexual relationships and experimentation; lack of decision

making skills and assertiveness; HIV & AIDS; lack of information and Gender Based Violence; lack of access to medical services e.g. contraception; negative cultural and religious practices; failure of parents to educate their children and lack of adherence to proper use of contraception. In order to provide these interventions, it was seen fit to introduce and infuse them in the school curriculum. In Zambia, this started in 2014 and was led by the Ministry of General Education and a consortium of other line Ministries and Civil Society Organisations according to their mandate.

International Agreements surrounding Comprehensive Sexuality Education

Governments world over understand the fact that the Educational sector has a responsibility to provide Reproductive Health Education which in essence is Comprehensive Sexuality Education. This is for the purposes of protecting and promoting the rights of adolescents to reproductive health education and that

information and care greatly reduce the number of adolescents' pregnancies." To this effect Zambia as a member of UNESCO and the United Nations whose guidelines notes Comprehensive Sexuality Education as scientifically accurate, culturally and age-appropriate, gender sensitive and life skills-based education moved forward to accept and start implementing Comprehensive Sexuality Education in schools. The Sexual and Reproductive Health and Rights Continental Policy Framework recognizes reproductive health as a flagship programme for the African Union Commission in addressing the continent's inadequate levels of knowledge about human sexuality and Reproductive Health information. Through this policy framework, governments established:

- The Continental Education Strategy for Africa: from 2016 to 2025 recognizes the responsibility of the education sector in addressing reproductive health and rights for adolescents and young people in Africa;
- East and Southern African (ESA) Commitment: Governments committed to providing Comprehensive Sexuality Education for young people in their countries;
- With 19 other countries in the ESA region, Zambia affirmed and endorsed a joint commitment to deliver Comprehensive Sexuality Education to its young people;
- The Maputo Protocol enjoins Zambia as State Party to ensure that the right to information and education on Sexual and Reproductive Health rights for women is respected and promoted – Article 14 (2);
- The Maputo Plan of Action provides for age appropriate, culturally sensitive comprehensive sexuality education so as to promote Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCAH) and operationalize the continental sexual and reproductive health and rights (SRHR) Policy framework;
- The SADC Protocol on Gender and Development obligates the Zambian State to develop policies, legislation and programmes promoting SRHR education – Art. 26 (2);

Through these international agreements, governments have recognized the fact that:

- there is need to protect and promote the right of adolescents and young people to Reproductive Health Education;
- the Reproductive health and human sexuality information is a major public concern affecting adolescents and young people;
- Comprehensive Sexuality Education should be availed to both in school and out of school adolescents.

Eastern and Southern African countries' commitment

Since Zambia was not the only country which was affected by these issues, the implementation of this Comprehensive Sexuality Education programme was not only done in Zambia, but also in other countries in Eastern and Southern African (ESA) region. Thus, Zambia is one of the signatories of the ESA Commitment and the then Minister of Education, was one of the early champions of the Young People Today (YPT) campaign. The implementation was infused in the school curriculum for a national scale up of the Comprehensive Sexuality Education.

The Ministers of Education and Health from 20 countries in Eastern and Southern Africa gathered in Cape Town, South Africa on 7 December 2013, working towards a vision of young Africans who are global citizens of the future who are educated, healthy, resilient, socially responsible, informed decision-makers and with the capacity to contribute to their community, country and region. These Ministers committed themselves to strengthening HIV prevention, treatment, care and support, and sexual and reproductive health and rights (SRHR) efforts in Eastern and Southern Africa by ensuring access to good quality, comprehensive, life skills-based HIV and sexuality education (CSE) and youth-friendly sexual and reproductive health services for all adolescents and young people, recognizing each country's socio-cultural context.

Eastern and Southern African countries' commitment targets by the end of 2015

The Ministers from these 20 countries in Eastern and Southern Africa hit the ground running with very ambitious targets which they wanted to achieve by 2015. The targets were as follows:

- A good quality CSE curriculum framework is in place and being implemented
- Pre and in-service SRH and CSE training for teachers, health and social workers
- Increase the number of schools and teacher training institutions that provide CSE to 75%.
- Eliminate child marriage
- Eliminate gender-based violence

Countries which have achieved targets

As mentioned above, these 20 countries in Eastern and Southern Africa were very ambitious. So 2 major targets were embarked upon:

- Providing Comprehensive Sexuality Education or Life Skills to at least 40% of schools
- Comprehensive Sexuality Education training programmes for teachers

To this effect a few countries have achieved both commitments while some other countries have only achieved one commitment. Below are the countries which have achieved both commitments: South Africa, Botswana, Namibia, Zambia, Zimbabwe, Mozambique, Tanzania, Malawi, Swaziland, Lesotho, Uganda, Kenya and Burundi. Then the following countries have just achieved one commitment which is the second commitment (Comprehensive Sexuality Education training programmes for teachers). These countries are: Madagascar, Angola, Democratic Republic of Congo, Ethiopia, Rwanda, South Sudan and Mauritius.

Policies and Legal Frameworks

The implementation of CSE in the Zambian schools is supported by a number of national policy and legal frameworks within and outside the ministry. In 2013, the Ministry of General Education came up with the Zambia Education Curriculum Framework, in which it reaffirmed the provision of cross cutting issues of Human rights, population and family life education (PopFLE), life skills, Reproductive Health and Sexuality and HIV and AIDS (2013: 24). In brief the framework says:

- *The school curriculum should be tailored in such a way that PopFLE is well integrated and implemented through CSE.*
- *Reproductive Health is essential in helping learners appreciate the functions of their bodies and knowing how to handle issues of sexuality.*
- *Learning institutions should incorporate HIV and AIDS education into their programmes to allow learners acquire knowledge, values and skills that they should use in their day to day lives.*

Stakeholders Engagement and Development Process

The normal process of curriculum development is highly consultative. It requires stakeholder engagement at all levels. To this effect a number of stakeholders were engaged during this process:

- 2013: Various stakeholders at Sandys Creation - CSOs, Faith Based Organisations e.g CHAZ/CCZ, Zambia Interfaith Networking Group on HIV and AIDS (ZINGO), Zambia Network of Religious living with HIV (ZANARELA), House of Chiefs, Parliamentarians, Independent Churches of Zambia (ICOZ).
- 2015/2016: Religious leaders were sensitised through ZINGO in Ndola, Lusaka and Livingstone.
- 2016: meeting with Traditional leaders under the House of Chiefs in Kabwe.
- 2018: Sensitisation of Chiefs spouses (Lusaka), Civic leaders across Zambia (Lusaka), Religious leaders indaba hosted by Ministry of Health in Lusaka (Traditional Leaders Indaba, Lusaka).
- 2019: Meeting Religious leaders in Lusaka.
- 2019: Meeting 53 Traditional Leaders from Eastern Province in Chipata.
- 2020: Faith Based Organisations at Sandy's Creation in Lusaka.

The Development and Packaging of Comprehensive Content

According to the Ministry of General Education:

- Sexuality education has always been taught in schools as part of the school curriculum.
- The 2003 school curriculum has content on Comprehensive Sexuality Education in a number of subjects.
- In 2006, the curriculum review process commenced & sexuality education was enhanced.
- In 2012, the Ministry of General Education identified and contextualised the thematic areas and topics on Comprehensive Sexuality Education into the Comprehensive Sexuality Education Framework for Zambia.
- Comprehensive Sexuality Education Framework for Zambia is said to be Responsive to the Zambian laws and policies, Responsive to Zambian cultural values (e.g. traditional values), Responsive to Zambian cultural religious values (e.g. Christian values), Age and grade level appropriate content, The Content on CSE is integrated in carrier subjects e.g Integrated Science, Biology, Religious Education, Home Economics, Social

Studies and Civic Education. Hence Comprehensive Sexuality Education is not a standalone subject. As can be observed, there are no learning areas or subject called Comprehensive Sexuality Education.

Lessons learnt from the pilot implementation

In 2020, the Ministry of General Education reported that in 2013, a pilot project of the Comprehensive Sexuality Education Curriculum received positive feedback from stakeholders for implementation. One of the positive feedbacks was the fact that learners become more assertive and increase their perception of risks. This helps them to have positive behaviour change and improve academic performance. However, there were also some negativity which included lack of understanding of CSE which created a negative perception and misconception by society. Furthermore, although it had been reported that Zambia had achieved both targets, namely; Providing Comprehensive Sexuality Education or Life Skills to at least 40% of schools and providing Comprehensive Sexuality Education training programmes for teachers, in reality government had not yet started training teachers to deliver lessons that integrate CSE content appropriately.

Statement of the problem

Comprehensive Sexuality Education is said to be a curriculum-based process of teaching and learning about the cognitive, emotional, physical and social aspects of sexuality. It aims to equip children and young people knowledge, skills, attitudes and values that will empower them to:

- Realise their health, well-being and dignity
- Develop respectful relationships
- Consider how their choices affect their own wellbeing and that of others
- Understand and ensure the protection of their rights throughout their lives.

It is important that young people know Comprehensive Sexuality Education because in some parts of the world, two out of three girls reported having no idea of what was happening to them when they began menstruating. Comprehensive Sexuality Education assists young ladies to know that pregnancy and childbirth complications are the second cause of death among 15 to 19 year olds with approximately 70,000 adolescents affected annually and hence never to rush into intimate sexual affairs, but instead wait until they are mature enough. Through Comprehensive Sexuality Education, the girl-child is made alive to the fact that early and forced marriage is a risk factor – approximately 90 per cent of births to teenage mothers in developing countries occurs within marriage. Every year, an estimated 246 million children are subject to some form of gender-based violence (GBV), including mistreatment, bullying, psychological abuse and sexual harassment, in or on the way to school. It is a fact that around 120 million girls worldwide (slightly more than 1 in 10) have experienced forced intercourse or other forced sexual acts or any other form of intimate partner violence at some point in their lives. Then at global level, only 34 per cent of young people can demonstrate accurate knowledge about HIV prevention and transmission.

These are the hard facts of life. Therefore, Comprehensive Sexuality Education comes in as part of the solution to this bitter

pill. It offers a solution by preparing young people for a safe, productive, fulfilling life in a world where GBV, gender inequality, early and unintended pregnancies, HIV and other STIs pose serious risks to their health and well-being. CSE presents this solution by approaching sexuality with a positive response, emphasizing values such as respect, acceptance, tolerance, non-discrimination, equality, empathy, responsibility and reciprocity. CSE provides age-appropriate and phased education about human rights, gender equality, relationships, reproduction, sexual behaviours, risks and prevention of ill health.

However, people are alive to the fact that it is not everything that glitters which is gold. Is it true that CSE is as good in depth as it is presented at surface level? Aren't there some grey areas which need some special concern? Is it possible that what is good for some developed European countries is also good for Africa and especially the Zambian context? Is CSE meeting the Zambian cultural and religious taste? Indeed, this is the crux of the matter for which the researchers would wish to pin this research study to their intellectual microscope.

Objective of the study

The objective of this research is to find out whether Comprehensive Sexuality Education is as good in depth as it is presented at surface level or there could be some grey areas which need some special attention before implementing, or if at all there is need to implement it in schools. In other words, the objective of this research is to critically analyse whether Comprehensive Sexuality Education has met the benchmarks needed for it to be taught to the youths in schools or elsewhere from the cultural, religious and moral point of view in the Zambian context. In order to realise the objective of the study, the researchers applied a qualitative method. In applying this method, the researchers used the Summative Content Analysis and Ethnographic Model.

Summative Content Analysis

Typically, a study using a summative approach to qualitative content analysis starts with identifying and quantifying certain words or content in text with the purpose of understanding the contextual use of the words or content. This quantification is an attempt not to infer meaning but, rather, to explore usage. Analyzing for the appearance of a particular word or content in textual material is referred to as manifest content analysis (Potter & Levine-Donnerstein, 1999). If the analysis stopped at this point, the analysis would be quantitative, focusing on counting the frequency of specific words or content (Kondracki & Wellman, 2002). A summative approach to qualitative content analysis goes beyond mere word counts to include latent content analysis. Latent content analysis refers to the process of interpretation of content (Holsti, 1969). In this analysis, the focus is on discovering underlying meanings of the words or the content (Babbie, 1992; Catanzaro, 1988; Morse & Field, 1995). Researchers report using content analysis from this approach in studies that analyse manuscript types in a particular journal or specific content in textbooks.

Ethnographic Analysis

The ethnographic model instead immerses subjects in a culture. The goal is to learn and describe the culture's

characteristics much the same way anthropologists observe the cultural challenges and motivations that drive a group. This method often immerses the researcher as a subject for extended periods of time. Ethnography is one of the most popular methods of qualitative research which involves the researcher embedding himself or herself into the daily life and routine of the subject or subjects. Either as an active participant or as an observer, the researcher experiences their customs, traditions, mannerisms, reactions to situations etc. This anthropological approach to conducting qualitative research allows the researcher to embed oneself in the natural setting of the subject he or she tries to study.

The researchers, being Zambians and Christians, tried to evaluate Comprehensive Sexuality Education from the cultural and faith point of view. The instruments used in conducting this research study was the participant observation. This method for qualitative research entails the researcher embedding oneself in a group setting and observing intently to note down nuanced descriptions of the setting under study. This could be inclusive of the larger contextual settings, descriptions of individuals, the dynamics in a group, individual opinions, and the like. Being Zambians, researchers have been born and brought up in the Zambian culture and hence they understand the world of the people. Therefore, the choice of this tool was relevant as it helped to understand Comprehensive Sexuality Education from the point of view of Zambians.

Theoretical Framework

This study applied the curriculum implementation theory developed by Rogan and Grayson in 2008. The 'Rogan theory involves the curriculum profile that stands on three concepts of implementation, capacity to support innovation and support from outside agencies. This is because the current research holds culture as a cornerstone of every curriculum. That is why Offorma (2016) is quick to note that 'Culture is important in curriculum planning and drives the content of every curriculum'. This is the essence of education to transmit the cultural heritage of a society to the younger generation of society' (Offorma C. G., 2016).

In an earlier paper, Offorma (2014) defines curriculum as the document plan, or blue print for instructional guidance which is used for teaching and learning to bring about positive and desirable learner behaviour change. She sees the learning experiences of the learner being learner oriented, goal oriented and culture oriented (Offorma G. , 2014).

Another proponent of the Rogan theory, Anwuka (2001), is of the view that curriculum gives an education focused on the acquisition of pre-specified competencies. The competencies reflect the elements of the learners' culture which when imbibed by learners make them functional members of their society (A.G. Anwuka, 2001).

Taba (1962), and Nicholls and Nicholls (1978) believe that situational analysis should be the first step in curriculum planning so as to understand the culture of the people and the available accumulated body of knowledge before embarking on selection of objectives. Even in the selection of objectives, one of the major considerations is the contemporary society which depicts the culture of the people. Therefore, any curriculum to be worthwhile, the planning must have its foundation on the culture of the society that owns the learners (Taba, 1962; Nicholls & Nicholls, 1978).

Curriculum must be a reflection of what people do, feel and believe. All these have cultural affiliation. Any society whose education is not founded on its culture is in danger of alienating the products of that system from their culture. A functional curriculum reflects the culture of the people and drives to make learners functional members of their society (Offorma C. G., 2016).

Therefore, riding on the propositions of the many researchers above, this study holds the Roganistic view on culture and the curriculum and adds that at no point should curriculum planning or curriculum change influence an education bended on producing citizens that are alien to their own culture.

Assumptions about learning, humanity and society clearly diverge from one another in different cultural contexts. Definitions, for example, what constitutes reality, goodness and logic familiar to educators in a given culture, are based upon premises unknown or unfamiliar to those grounded in other cultural heritages (LeSound, 1990). LeSound's conceptual framework called for 'cultural sensitivity' in curriculum development to be applied to facilitate the identification of culture in the curriculum development process (1990).

The relevance of contextual analysis and cultural understanding for successful curriculum development and implementation has been alluded to by several authors (Kealey et al., 2005; Rogan and Aldous, 2005; Chisolm and Leyendecker 2008; Gerverdink et al., 2013).

This research therefore upholds the views of the proponents of the Rogan theory and is in tandem with the other researchers because the education of a people should be for the advantage and benefit of that society.

II. LITERATURE REVIEW

The historical Background of Comprehensive Sexuality Education (CSE)

The International Planned Parenthood Federation (IPPF) is the world's foremost voluntary non- governmental provider of sexual and reproductive health and rights, with 151 member Associations and millions of volunteers providing information and services in over 180 countries world-wide – particularly to those who are poor, under-served or marginalised. Although IPPF is not primarily an education body, it has a number of strengths which can be applied to promoting CSE and which complement the approaches of other international agencies. These include peer education, documenting and sharing best practices, developing collaborative partnerships between health services, NGOs, governments and education providers and undertaking advocacy for CSE and young people's rights.

IPPF has created a framework for CSE that seeks to promote a model of sexuality education that considers the various inter-related power dynamics that influence sexual choices and the resulting emotional, mental, physical and social impacts on each person's development. The approach includes an emphasis on sexual expression, sexual fulfilment and pleasure. This represents a shift from methodologies that focus exclusively on the reproductive aspect of adolescent sexuality.

There is increasing evidence to show that abstinence-only programmes are ineffective, although some governments and organisations still continue to promote them. IPPF strongly

discourages sexuality education programmes that solely focus on abstinence. IPPF believes that all young people have a right to be informed about their sexuality and their sexual and reproductive health and are entitled to make their own choices. IPPF believes that sexual taboos as a result of culture and religion are not insurmountable barriers to broadening the scope of sexuality education.

IPPF's Framework for Comprehensive Sexuality Education (CSE) includes:

- the principles of good practice
- components of existing CSE programmes and guidelines
- describes the seven priority areas to cover in CSE
- focuses on the rights and needs of young people
- provides the basis of a new CSE curriculum

Sourced from IPPF, 2021.

Review of Empirical Research Studies in CSE

Studies in Botswana, Nigeria and South Africa have shown that sexuality education may contribute to overcoming the adolescents sexual related health (SRH) challenges that Zambia and other countries face (Naezer M, 2017); (Helleve A, 2011); (Mhlauli MBb, 2015). Hence, riding on this, in 2014 Zambia rolled out an ambitious framework for CSE targeting children and adolescents enrolled in grades 5-12 in schools across the country supported by UNESCO. This aimed to address the unequal access to knowledge about SRH.

This article chose to review the research undertaken in Nyimba in Eastern province of Zambia because it highlighted a number of issues that referred to the Concept of Culture and the Curriculum. This research looked at teacher discretion in the implementation of CSE curriculum in schools.

The study findings reviewed that the lack of clarity in the CSE framework, on how to integrate CSE teaching into existing subjects coupled with contextual challenges, left teachers involved in CSE with great room for discretion. In this context, extensive use of discretion resulted in arbitrary and unequal management of the SCE curriculum in the district. In this study, some features of work setting that shaped the decision-making among teachers were socio-cultural factors. These factors included incompatibility of CSE with the local culture and religious ideals (Zulu JM, 2019). The study concluded that the implementation of the CSE curriculum in this setting was largely dependent on an individual teacher's decisions on what, how and when to teach. This was related to lack of guidance, lack of legitimacy of the curriculum and lack of local ownership of the agenda. The big space left for teacher discretion in sexuality education resulted in arbitrary teaching of CSE.

According to the study, the following gaps were identified in the implementation of the CSE curriculum:

- The framework offered very little guidance to the teachers; these choices were ultimately left to individual teacher's judgement on what to teach and what to leave out.
- Teachers wondered how they would integrate CSE into science, social studies, civic education home economics and religious education in a natural and appropriate manner without diverting the learners' attention from the core subjects, and without compromising learning outcomes in the core subjects.

- Some teachers withheld a few selected pieces of the CSE Curriculum, others would only agree to teach very limited fragments of it according to what they deemed to be appropriate for the learners. Teaching methods of prevention of pregnancy was deemed as counterproductive and teachers instead decided to teach one method, abstinence. The strong message of abstinence was put across in several ways.
- Some teachers dropped topics or defined sessions in the CSE altogether. Some substituted the whole CSE topic, which they were not comfortable teaching with other topics which they believed were more appropriate for learners. Interviews with teachers showed that teaching CSE was not done on a routine basis and in a standardised manner and that the CSE curriculum was treated haphazardly in the schools, and a few teachers admitted having stopped teaching CSE altogether.
- Teacher dilemmas in CSE teaching included incompatibility with the local culture of the people, teacher-parent role dilemma, concerns about the legitimacy of the CSE concept and practical challenges related to lack of training and access to manuals. Many teachers saw the CSE agenda as something that was externally driven with little relevance to local needs.

According to Zulu, if the CSE programme was to be successfully integrated and taught, there is a fundamental need to take local culture into account in terms of the curriculum content and teaching approaches, and to secure local ownership of the curriculum (2019).

Integration of CSE in the Zambia’s School Curriculum

Prior to the formal CSE implementation, young people accessed information from nonspecific sexuality education material embedded in their education curriculum, from the internet, and from traditional and family sources. Traditional sources were at best detrimental and not up to date with contemporary teachings on sexuality, and internet sources were ungoverned and of wide-ranging quality and appropriateness. CSE would provide channels for appropriate information and would neutralise misinformation (wekesah, 2019).

According to Wekesah et al (2019), UNESCO led wide stakeholder engagement on CSE in Zambia. Advocacy meetings were held with policymakers within ministries, with parents and with young people and other stakeholders in the CSE. The Ministry of General Education (MoGE) appointed a coordinator within the Curriculum Development Center (CDC) to coordinate the CSE activities. To build the capacity of curriculum developers, an expert in sexuality education conducted an extensive training. A curriculum framework was then developed to outline content by grade level from grade 5 through grade 12. This process involved consultation meetings and local and international peer reviews. CSE content was adapted from UNESCO’s IRGSE adapted to align with Zambia’s national culture and values. During the modification, some non-aligning topic areas (e.g. on masturbation and homosexuality) were dropped or ‘silenced’ (wekesah, 2019). The integration of CSE curriculum in Zambia was officially rolled out in 2015. Considerations made when settling for integrating CSE into various subject areas and at different education levels

(e.g. social studies, biology, home economics, civic education, integrated science and religious education).

Table 1: *Integration of CSE in Carrier Subjects per school level*

PRIMARY LEVEL	JUNIOR SECONDARY LEVEL	SENIOR SECONDARY LEVEL
Integrated Science	Social Studies	Biology
Social studies	Integrated Science	Civics/ Civic Education
Home economics	Religious Education	Religious Education
	Home Economics	Home Economics

III. RESEARCH FINDINGS

- i. **Involvement of the Catholic Church in Education:** An interview was undertaken with the National Education Secretary’s Office at the Catholic Secretariat in Lusaka because the Catholic Church is a key stakeholder in the provision of education in this country and whose voice cannot be silent. The National Education Secretary’s Office at the Catholic Secretariat is responsible for all the Catholic Schools in Zambia. Data from this office shows that Zambia Conference of Catholic Bishops has over 353 schools, 20 special schools, over 20 skills centres, 5 teachers training colleges and 2 universities. According to the respondents, the Catholic Church in Zambia has been involved in education in this country for over 100 years and its role in providing excellent education speaks volumes. In providing quality education, the Catholic Church is guided by various church documents that form the foundation of the educational institutions. There are a lot of documents that guide the Catholic Church on Sexuality Education. Some of these documents include Fratteli Tutti, Catechism of the Catholic Church, Humane Vitae, Caritas Veritate etc. The Catholic Church believes that it is her inalienable right as well as her indispensable duty to watch over the entire education of her children, in all institutions, public or private, not merely with regards to the religious instruction they are given, but with regards to every other branch of learning and every regulation in so far as religion and morality are. (Fratteli Tutti 23,24).
- ii. **Non-engagement of major Stakeholders:** The Ministry of General Education and the Sponsors did not engage the Catholic Church as a major stakeholder in education at the beginning and only to engage them at an advanced level when they had already implemented the programme in some schools. It took the Education Department of the Catholic Secretariat to reach out to government after an outcry from the Catholic Schools when they

- received CSE materials that they considered inappropriate for the learners in the schools. Such a situation already created a form of mistrust. What were the Ministry and the sponsors hiding in CSE for which they were avoiding the Catholic Church to uncover if they were tagged along? From 2014, there was no material. When the material arrived in 2020, they took them straight to the schools by-passing the body in charge of schools so that government could short-cut the process and hence start teaching before the Church authority have an opportunity to examine the material closely and digest it fully thereby giving it an holistic overview. Therefore, being major stakeholders, the Catholic Church feels that it was not meaningfully engaged, and hence there is no sense of ownership of the curriculum.
- iii. **Emphasis on morals and character formation:** In the learning institutions of the Catholic Church, the emphasis is on morals and character formation. And because of that the number of unintended pregnancies is almost nil. According to CSE, the emphasis is on risk-reduction techniques as opposed to character based education that provides children with skills and tools that help avoid risks altogether. For example, one of the topics says, “Avoiding unintended pregnancy: Using condoms and Using other forms of contraceptives” Infact due to emphasis on risk reduction, it appears like there is no possibility of a child to stop sexual activity and control oneself through self- discipline. Is the assumption that when a child begins engaging into sexual activities they cannot stop? The issue of secondary virginity is missing.
- iv. **Resistance of CSE from the community and the teachers:** The CSE had limited legitimacy in the community and has been met with resistance from teachers. Hence the parent-teacher role dilemma must be taken into consideration. The message from Zulu’s research is loud and clear: the teacher discretion is quite high when it comes to teaching CSE. Some teach the components they are comfortable with others leave it out completely.
- v. **The Title needs to be addressed:** Comprehensive means ‘nothing is left out’. Culturally, people know what sexual material to off load to the children at which stage. For example, they know what material to teach them before puberty and what material to off load to them at puberty stage and finally when they are getting married. So comprehensive teaching of sexuality without leaving out anything might be scandalous and might even bring sexual materials which are inimical to the Zambian culture such as gay and lesbianism. CSE does not provide to care for the mental and immature levels of some of the learners. Our learners are ‘traumatized’ by some of the information given. The issue of ‘sexuality rights’ – the books say as long as the child gives ‘consent’. At what age should this child give consent?
- vi. **Exaggeration of the positive results scored by CSE:** According to their findings, they claim that SCE is significantly reducing the number of Unwanted Pregnancies and school dropouts. What about in the Catholic Schools? Is it SCE which has brought about zero or very minimum close to negligible results in terms of school girls not being pregnant? They cannot claim such successes within this short period of time. There could be other factors.
- vii. **Emphasis on sexuality than on Life Skills:** There is too much emphasis on Sexuality which dilutes the good content on Life skills.
- viii. **Marketing Language:** The language used is marketing language instead of important ‘evidence based’ and ‘scientific’. And the terminologies need clarity. Some books have no glossary terms at the back of the book to ensure clear understanding. Only the grade 10 learners’ books has it. Under the references, the teacher is allowed to refer to the internet. As everybody knows, the internet search has no limited scope for covering this topic. It is an endless sea over this issue. Thus what stops the teacher from bringing in matters found on the internet which refers to a different culture?
- ix. **Statistics provided only from one Province:** The evidence that has been provided are from Eastern Province alone. There are ten provinces in Zambia. What kind of research can claim to be representative enough which is one tenth? This falls far below par.
- x. **Contraceptives side effects:** The long-term effects of contraceptives are not highlighted. Everything presented about contraceptives is painted white as if there may not be any side effects.
- xi. **Diminishing Parental Role:** The role of the parent is not explicitly emphasised thereby taking away the parental influence and allowing children to be secretive.
- xii. **Reference to the Zambian Laws:** The learner’s books do not relate to the Zambian Laws sufficiently throughout the books especially in incorporating sexual behaviour.
- xiii. **Feedback from children:** The feedback from the children is missing. In whole of this exercise, the children are the most important and special stakeholders and yet their feedback is nowhere to be seen.

IV. RECOMMENDATIONS

1. Teachers be trained and get comfortable in delivering Course content
2. Stakeholders must be engaged throughout the process and not a one off thing
3. Terminologies which contradict with the Zambian cultural and religious set up be removed and replaced with more mild ones.

4. Guidance given by the UN bodies recommends that international and national laws must be taken into consideration
5. Can teaching on sexuality recognize the role of parents as the primary educators
6. Consider providing detailed information on the long term effects of contraceptives.
7. Is there a possibility of having comparisons from other provinces. E.g. what is the picture in the North-western province where boys go for initiation ceremonies
8. Provide statistics on both sides, not just CSE but on Abstinence as well. The public and the learners need to understand that there is a difference between sex education and sexuality education
9. The Scope and caveats must recognize the parameters which are being referred to. Remove the part that allows teachers to consult the internet.
10. Is there a possibility of watering down the emphasis on sexuality because it encourages risk reduction as opposed to character formation
11. All books must have a glossary list of terms to ensure that the same understanding is carried
12. There is need to take a multi sectoral approach to tackling these issues.
13. This paragraph should have been written with a lot of emphasis. Rather than with a sense of apology! Keeping their virginity as young people should not be as a desire but as a **set goal!**
14. Emphasis that the right place for sex is Marriage. Only those in marriage are free to indulge into sex. Contraceptives are methods of family planning in marriages. This could be the right place for abstinence and its emphasis.
15. Emphasis to be placed on values, abstinence as a sure way to avoid pregnancy. There is no alternative to abstinence! This is a corrective measure even for those who are sexually active.
16. The issue of rights needs to be handled properly and carefully
17. According to the findings, there are 12% of children that have had sex by the age of 15. So how can the 88% who have not engaged in sex and will not see condom use or contraception as a safeguard measure to start indulging in illicit sex be safeguarded? Therefore, there is a need to deliver the CSE in such a way that it enhances good morals and character and not just emphasizing on risk reduction.
18. Curriculum development requires experts to ensure that it is age appropriate, with appropriate wisdom, direction and guidance from parents and legal guardians.
19. What are the number of hours the children are spending in schools, what is pre occupying their time? Should some education policies change? Social and economic factors need to be addressed e.g. the issues of poverty, child headed homes, orphans and today there is Covid-19. All these issues were not taken into consideration when integrating CSE in the Zambian Curriculum. Instead the cultural aspects were ignored or considered as retrogressive and irrelevant to the current curriculum.

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Effect Of Emotional Intelligence On Employee Performance In Banking Sector In Bangalore

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Abstract- Banking industry is a fast growing sector in which technology adoption is at a high pace. The role of employees is shrunk to value added services and customer care. This paper analyses the effect of emotional intelligence on their performance. The study was conducted among bank employees from NBFC , Scheduled banks, Nationalized banks and private banks. Descriptive analysis is used in this research and used raking method based on weighted mean to understand the effective emotional intelligence factors that affects performance. Self awareness, self regulation, self motivation, empathy and social skills are tested using a tool based on emotional intelligence of Daniel Goldman. The results shows that the employees have long service and happy in continuing in Banking sector. The employees are interested in delivering customer based value services though personal interest is low in tasks, but deliver for completing tasks.

Index Terms- Emotion intelligence, banking industry, employee performance, Technology adaptability

I. INTRODUCTION

Emotional Intelligence is a significant factor that modulates the thoughts, actions and interactions with environment. Daniel Goldman identified five basic attributes: self-awareness, managing emotions, motivating oneself, empathy and social skill. These are the driving forces in helping the employees to perform in an organization. (Dacre Pool & Sewell) explained the practical model of employability in which five components, career developing learning, experience (work & life), knowledge (subject knowledge, understanding), generic skills and emotional intelligence cause a component called, 'reflection and evaluation'. Emotional Intelligence is a component of employability as well '

Emotional Intelligence

Emotional Intelligence of an individual is also a behavioural pattern in critical situations in which one's feelings challenged or aroused. Self-awareness, motivations, empathy , self-regulations, , and social skills are the components of Emotional Intelligence. Self-awareness is the awareness of an individual on own skills, strengths, and weakness. It moulds own self confidence as strength increases. The self-regulation comprises of self-control, trustworthiness, consciousness, adaptability and innovativeness. Self-motivation includes achievement drive, commitment, initiative and optimism. Self-awareness includes empathy, service orientation, developing others, leveraging diversity, and political awareness. Social skills contains influence, communication, leadership, change catalyst, conflict management, building bonds, collaboration and cooperation, and team capabilities.

(Cherniss & Goleman, 2001) explained the emotional intelligence as a drive to adapt with the environment and the situation which is hostile. Boyatzis and Goleman have stated that "emotional intelligence is observed when a person demonstrates the competencies that constitute self-awareness, self-management, social awareness, and social skills at appropriate times and ways in sufficient frequency to be effective in the situation". The Emotional Competency Inventory (ECI) comprise of many scales, integrated together . It integrated Innovation behaviour into the Initiative scale. The Optimism scale was integrated into Achievement Orientation scale, because the Optimism scale and the Achievement Drive scale were highly correlated. The Leveraging Diversity items were correlated with the Understanding Others scales and , hence, they formed Empathy scale. The strongly related Commitment items and Leadership scale were integrated together.. The Collaboration items were highly correlated with the Team Capabilities scale and so they were integrated into the newly named Teamwork and Collaboration scale. Finally, two other minor name changes were made. Political Awareness was changed to Organizational Awareness and Emotional Awareness was altered to Emotional Self-Awareness.

II. RESEARCH GAP

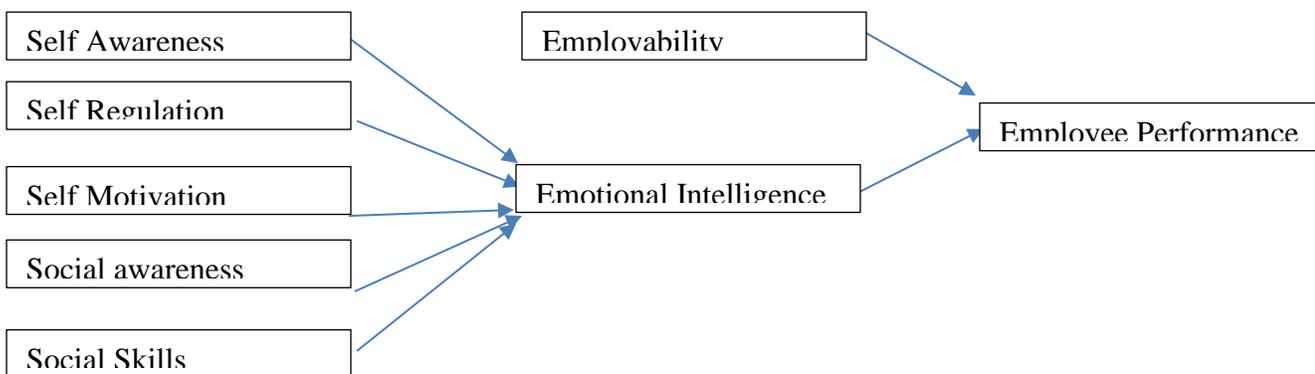
The banking industry has changed over years from labour oriented to digitalized, mechanized and automated service industry that the role of employees has been transformed to generate revenue through customer interaction and wealth maximization. The employee performance in this context depends on their affective, cognitive and emotional intelligences. Based on the findings from the literature analysis, the following research gaps identified. They are,

- changes in employee perception on role employees in digitalised work environment
- role of emotional intelligence in managing performance and to meet dead lines
- assess personal competence and emotional intelligence on employee performance

III. PROPOSED MODEL OF STUDY

The employee performance is an outcome of employee engagement and employability. The employee involvement depends on one person's capabilities, environment and interests.

The proposed model has integrated three components, personality traits, employability and emotional intelligence to form employee involvement while three demand factors of job market, opportunity, talent demand and socio-economic factors to frame job description. Integrating employee involvement and job description under organizational environment form employee engagement.



IV. NEED OF STUDY

Performance of an employee depends on his emotional intelligence. In Banking sector, the employees have a higher work stress and also interact with a many customers per day. Hence, the emotional intelligence is very crucial factor in performance with confidence as they are engaged to, awareness development, operations, customer care etc. This multi tasking demands a higher degree of Emotional Intelligence

V. SCOPE OF STUDY

Scope of this research is the bank employees in Bangalore and include national, scheduled and private banks. The population is stratified based on type of bank and sampling will be made accordingly to ensure adequate representation to compare the models.

VI. STATEMENT OF PROBLEM

Performance of any employee is influenced by job environment, targets to be achieved or tasks to be completed in a specific period and employee attitude. Job environment and tasks to be completed are dynamic in nature and the attitude enables the employees to respond to the changes in environment and volume of tasks creatively. In banking industry, the tasks can be in three segments: customer service, documentation and, analysis and decision making. Though a part of the manual tasks are replaced with mechanization and automation like ATMs, CDMs as well as the mobile application of the banks for payments and fund transfers, the increase in value added services like Cards (Debit and Credit Cards), different types of loans, Direct Benefit Transfer programs, increased the target oriented responsibilities of employees to maximise revenues. This study analyses how bank employees of different cadres in hierarchy manage their performance and how their emotional intelligence helps them to manage work stress, performance and work life as the complexity in banking service changes continuously though the type of change is partially influenced by technical adaptability.

VII. REVIEW OF LITERATURE

Relationship between psychological well being and exercise

(Butt, Rashid, Mahanoor1, & Saeed, 2016) explained the effect of psychological wellbeing as the Mental which improves the quality of life when an individual is free of depression, anxiety, excessive stress, troubles, addictions, and other psychological problems which

enable are more capable to live his/her life the fullest extent. Wellbeing is defined as a constructive mental, physical and social condition. We can understand wellbeing as people's feelings and how they do in their daily routine work we judge them on both personal and social level, their way of thinking, and evaluation on their whole life. It is based on individual level, life level and community level. Carol Ryff's six categories of well-being are: **Self-Acceptance, Personal Growth, Purpose in Life, Positive Relations with Others, Environmental Mastery and Autonomy.**

Emotional Intelligence as an Ability: Theory, Challenges, and New Directions

(Fiori & Vesely-Maillefer, 2018) explained tripartite model suggests three levels of EI includes awareness on emotions, applying in real environment, and traits to manage emotions. The four-branch model identifies EI as being comprised of a number of mental abilities that allow for the assessment, communication, and directive of emotion, as well the integration of these emotion processes with cognitive processes used to promote growth and achievement. The model is comprised of four hierarchically linked ability areas, or branches: recognising emotions, smoothing thought using emotions, accepting motions, and dealing emotions. This occurs through the analysis of, attendance to, or reflection on emotional information, which in turn assists higher-order cognitive activities such as reasoning, problem-solving, decision-making, and consideration of the perspectives of others

Understanding and Developing Emotional Intelligence

(Serrat, 2017) In this paper, the components of EI and their sub components are explained that it is useful in developing the model. The model has identified the components as, self-awareness, self-regulation, self-motivation, social awareness, and social skills. The model helps to get the full classification of sub-variables in each of the components

(Muda, Rafik, & Harahap, 2014) explained three components of employee performance and they are, job stress, motivation and communication. Occupational stress may be an outcome of occupational demand and personal competencies to meet the demand. This cause discontinues of job or health issues. Motivation is a positive factor that enhances performance. Vertical and horizontal communication is important in performance as it reduces miscommunication leading to errors and mistakes.

(Saeed, Mussawar, Lodhi, & Iqbal, 2013) explained five factors that influence employee performance are, organization culture, personal problems, manager attitude, job content and financial rewards. The organization culture may be friendly or rigid. The psychological barriers and inability to match with job demands limits employee performance. Regular and good payment of remuneration is a motivation.

(Imandin, Bisschoff, & Botha, 2014) explained five factors that influence employee performance are, organization culture, personal problems, manager attitude, job content and financial rewards. The organization culture may be friendly or rigid. The psychological barriers and inability to match with job demands limits employee performance. Regular and good payment of remuneration is a motivation.

(Dorsey & Mueller-Hanson, 2019) explained 'trust' as the cohesive force in developing an organizational climate and the behaviours that develop trust are, Dependability (following through on promises), Trustworthiness (telling the truth and admitting mistakes), Courage (confronting difficult issues even in the face of resistance); aptitude (demonstrating the knowledge and skills necessary to carry out important tasks), meaning (making decisions in the best interest of the organization; putting the welfare of others before individual interests), Compassion: being sensitive to others' needs and giving them the benefit of the doubt.

The ideal elements of a performance management are, simplified systems, flexible goal setting, emphasis on performance measurement, major emphasis on coaching and feedback, different criteria for performance index and measurement.

The accountability of the performance management are can be a means of holding employees accountable for results, though managers often complain that it fails to do so. Accountability stems from making initial expectations clear, monitoring progress, providing feedback, and following through on consequences, both positive and negative. While these elements together increase accountability, the follow-through on consequences is the most important but also the least likely to happen. Without follow-through, accountability cannot improve, even if the other elements of performance management are sound.

Employee performance management

The employee performance management was evolved from MBO (management by objectives) of Peter Ducker. Four normative concerns of performance management and they are, performance improvement, employee's development, organizational development and communication and involvement.

(Koopmans, Bernaards, Hildebrandt, & Henrica C.W. de Vet, 2013) explained three components in individual work performance and they are, presenteeism, performance, or productivity. The four dimensions of Individual Work Performance are, task performance, contextual performance and counter productive work behaviour. The first dimension is the employability and competency of the employees with which an individual performs his task, while contextual performance refers to employee behaviours that support the organizational, social, and psychological environment in which the central job tasks are performed. The adaptive performance and counterproductive work behaviour refer to employee's proficiency in adapting to changes in work roles or environment and o behaviour that is harmful to the well-being of the organization.

The indicators for the task performance are, work quality, planning and organizing work, being result-oriented, prioritizing, and working efficiently. Result oriented performance seemed to be important for managers in marketing and Human Resource Management. The contextual performance has two domains: interpersonal and organizational level.

Six relevant adaptive performance indicators were identified: showing resiliency (coping with stress, difficult situations and adversities; , coming up with creative solutions to novel, difficult problems , keeping job knowledge up-to-date , keeping job skills up-to-date , dealing with uncertain and unpredictable work situations , and adjusting work goals when necessary

VIII. OBJECTIVES OF THE STUDY

- To examine the effect of components of Emotional Intelligence in Banking job
- To analyse the effect of Emotional Intelligence on employee performance

IX. HYPOTHESIS DEVELOPMENT

(Mayer, Caruso, R., & Salovey, 2004) explained five EI domains and they are, knowing one’s emotions, managing emotions, motivating oneself, recognizing emotions in others, and handling relationships. (Goleman, 1998) also created five EI domains, which include self-awareness, self-regulation, motivation, social skills, and empathy.. In Banking Industry, the emotional intelligence plays an important. Twelve competencies are grouped into four domains and is

SELF-AWARENESS	SELF-MANAGEMENT	SOCIAL AWARENESS	RELATIONSHIP MANAGEMENT
Emotional self-awareness	Emotional self-control	Empathy	Influence
	Adaptability		Coach and mentor
	Achievement orientation	Organizational awareness	Conflict management
	Positive outlook		Teamwork
			Inspirational leadership

This shows the effect of personal competencies on job of an employee. The creativity and innovativeness are outcomes of emotional intelligence in work

Hence

H_0 : There is no significant effect of emotional intelligence on Job

H_1 : There is a significant effect of emotional intelligence on Job

Service quality and Job –performance

The service quality is the important aspect in retailing the customers and it depends on the employee of the industry in understanding the need of the customer and deliver it. (JAIN, JAIN, & DAS, 2018) identified emotional intelligence variables that helps the employees to meet the service quality gaps in Banking industry. This depends on the employee performance

Hence,

H_0 : There is no significant effect of emotional intelligence on Employee performance

H_1 : There is a significant effect of emotional intelligence on Employee performance

Effect of Demographic variables on emotional intelligence

(Gautam & Khurana, 2019) identified the effect of demographic variables on emotional intelligence. The different strata in demographic variables shows as identifiable difference in behaviour

H_0 : There is no significant effect of emotional intelligence on Employee performance

H_1 : There is a significant effect of emotional intelligence on Employee performance

X. RESEARCH DESIGN

The respondents of this research are employees of different sectors, and domains. The respondents are selected based their readiness to share their information. The proposed geographical area is Bengaluru city of Karnataka State.

Selection of respondents

The criteria of selection of respondent are to ensure adequate samples for analysis and hence the stratified sampling is used. Since, the population is large, non-probabilistic sampling used here. Demographic variables are used for stratification. Additional strata are, type of industry, classification of employment and occupation.

Data Collection:

The data collection comprises of three stages: Analysis of theoretical background, Literature Review and developing tool for data collection.

The analysis of theoretical background focus on identifying the variables from the existing theories. The variables of existing theoretical models in employee intelligence, personality traits and employability. An empirical model to effect of personality traits, employability and emotional intelligence on employee engagement and employee performance.

The recent literatures on effect of personality traits, employability and emotional intelligence on employee engagement and employee performance are also analysed.

Based on empirical model, variables identified from theoretical background, the tool for data collection is developed. The data collection tool is questionnaire

Reliability of questionnaire

Pilot study is to be done among the employees in different sectors. The pilot study is used to analyse three things, understanding of the questions, clarity in responses, consistency in responses. The responses are used to check the consistency.

Reliability of the tools is improved through test and retest. Cronbach alpha and kappa are used to analyse the reliability and consistency. The average Crombach alpha of the variables is 0.789.

Sampling size

The population size is not defined in this research as it is high. Hence the Cochran’s sample size formula.

$$n_0 = \frac{Z^2pq}{e^2}$$

P is the taken as 50% and 95% confidence level and hence, Z is taken as 1.96. ‘e’ is the error level and percentage of error is taken as 5%.

Scale of measurement

The questions are ‘subjective’ and hence a qualitative scale is used. To get more precision, 11 point scale is used (0-10 scale)

Statistical tools

The analysis of data can be taken in three stages. The cross tab is used to analyse the influence of one control variable over another. This is verified using Pearson Chi square. If the Pearson Chi square is statistically significant, the two control variables influence each other.

Analysis & Inference

Table 1

Demographic variables	Mean	Std. Deviation	Response distribution				
			Top M	Mid M	Others	Executive	Clerical
Job position	2.28	1.06	6.3	14.3	18.3	23.0	38.1
Service length In years	2.93	1.39	20 <	15-20	10-15	5-10	<5
			9.5	13.5	42.9	27.8	6.3
Opinion on bank job	2.6	1.24		Happy & satisfied	Balanced	Difficulty in Timing	Difficulty in stress
				21.4	33.3	31.0	14.3
Willingness to change job	1.71	0.59			Not decided	No	Yes
					4.0	63.5	32.5

Attractiveness to banking industry	2.16	1.04	others	Retirement benefits	Perks& Benefits	Industry performance	salary
			3.2	7.1	16.7	49.2	23.8
Types of bank in which the respondent work	2.2	0.93		NBFC	Private	Scheduled	National
				7.1	16.7	48.4	23.8
Area of job	2.12	1.2	Deposits	cards	Investment	loan	Customer care
			4.0	6.3	15.1	47.6	27.0
Location of branch	1.78	1.1			urban	Semi-urban	rural
					25.4	27.8	46.8
Size of branch	1.96	0.96			large	medium	small
			6.3	5.6	16.7	19.8	51.6

From the above table, it is observed that the bank employees have a prolonged service and they have a long service of more than 10 years (65.9%) while they are happy (21.4%) or balanced (33.3%). A 63.5% of the respondents do not willing to change job. Industry performance (49.2%), salary (23.8%) , perks & benefits (16.7%) or retirement benefits (7.1%) are the attractiveness for employees. A 48.4% of the employee respondents work in scheduled banks while 23.8% of the employees work in national banks. A 16.7% of the employees work in Private Banks while 7.1% of the respondents in NBFC. Areas of job of the respondents are loan (47.6%), customer care (27%), investment (15.1%) , cards (6.3%) and deposits (4%). The area of working of the respondents are rural (46.8%) , semi-urban (27.8%) and urban (25.4%). The size of the branch of the respondents are, small (51.6%) , medium (19.8%) or large (16.7%). The response shows that the employees have long service and there is a service consistency. Employees are happy or balanced and they don't want to change the job.

Self awareness

RANK	Variable	mean	Standard deviation
I.	I interact with my colleagues even when they were in problems or fail to complete jobs	2.87	1.152
II.	Comprehend when the temper is lost	2.84	1.252
III.	Reframing 'bad situations' is easy for me	2.72	0.801
IV.	I will not lose my temper even if the things are not happening as planned	2.72	0.811
V.	I express my happiness and support when my colleagues do things successfully in time	2.72	0.821
VI.	Self-motive in difficult situation and tasks	2.7	0.801
VII.	I am able to accept other' view points	2.68	0.869
VIII.	I never feel anxiety or stress during evaluations	2.68	0.859
IX.	I am a good listener	2.66	0.852
X.	I am confident that I can fulfill commitments in my job on time , effectively	2.66	0.832
XI.	It is my responsibility to motivate my team members to fulfil commitments on time	2.63	0.749
XII.	I am aware of my strength and weakness	2.61	0.749
XIII.	I can take comments and criticism positively without getting mood out	2.38	1.359

XIV.	I react to my customers very cool even when they charge angrily and aggressively	2.37	1.171
XV.	It is difficult for others to understand my mood	2.37	1.159

The results shows that the emotional awareness of employees is influenced when the colleagues to fulfil their responsibilities, managing hostile environment, managing criticisms and viewpoints, But reaction to comments, reaction to emotionally excited customers and managing mood have low ranking.

Self-regulation

Rank	Variable	mean	Standard deviation
I.	I accept my mistake and try to correct them that they are not repeated	2.84	1.252
II.	I find time to learn new things	2.84	1.252
III.	I interact with others with respect and listen to them carefully	2.73	0.801
IV.	I never blame or accuse others for unnecessary things in a way that it may hurt them	2.72	0.811
V.	I point out the problem of others confidentially with empathy	2.7	0.801
VI.	I never interrupt other people' conversation	2.7	0.801
VII.	I feel stress and it will be a positive one to make me to do things perfect and total	2.68	0.869
VIII.	I feel it is not fair to miss deadlines	2.66	0.852
IX.	I will not leave workplace unless I complete my job	2.61	0.749
X.	I prepare myself to do new tasks or to manage a new situation	2.38	1.359
XI.	Self-learning is the cutting edge for professional growth	2.37	1.165
XII.	I use a priority list for planning my work	2.27	1.145

The ranking shows that self-correction and self-improvement have top ranks while problem solving, missing deadlines, and promptness in work have mean more than 2.5 while the interest to explore new things or to prioritise the tasks have low mean. This shows a behaviour pattern of 'common attribute' that the involvement in work to complete task is given more importance than tendency to explore ideas.

Self-motivation

Rank	Variable	mean	Standard deviation
I.	Maintaining consistency and solving the maximum queries of customers is the first objective in Banking Industry	2.84	1.212
II.	I interact with others with respect and listen to them carefully	2.73	0.801
III.	I never blame or accuse others for unnecessary things in a way that it may hurt them	2.72	0.811
IV.	It is a must to adapt to new technologies that the industry adopt to enhance both efficiency and customer satisfaction	2.7	0.801
V.	Doing the things on time at right pace is the key factor in customer focused activities	2.7	0.801
VI.	It is my responsibility to meet set targets by the organizations and it is my part to achieve them	2.65	0.842

VII.	Every task I involve is an opportunity to learn and a step forward in my career growth	2.62	0.719
VIII.	I am the only person responsible for the jobs assigned to me	2.58	0.869
IX.	Vertical growth in banking Industry is a good opportunity if one is competent.	2.37	1.115
X.	There is something to learn from every case and missing opportunities may affect my efficiency	2.29	1.359

Self motivation in doing job well, technological adaptability, learning and task completion have mean more than 2.5 while ambition on career growth and learning from job are less.

Empathy

Rank	Variable	mean	Standard deviation
I.	Sharing any information that I know with my peers to help them in their work is my responsibility also	2.84	1.252
II.	The satisfaction and relief appear on faces of customers after solving their problems is a motivation to help more	2.66	0.852
III.	When new queries or problems are brought to me, I take interest	2.62	0.849
IV.	I feel involved in understanding the queries of customers and to solve them	2.58	0.869
V.	Every customer care process is an awareness development	2.37	1.319
VI.	Personal interest, knowledge and readiness to listen are important in customer care	2.36	1.135

Every opportunity to solve the customer issues is a motivation and give satisfaction to customers. But these opportunities are utilised for job purpose only ,not for personal development.

Social skills

Variable	mean	Standard deviation
Customer confidence and loyalty depends on employee interaction with customers	2.7	0.801
Expressions, interest to listen and attitude towards the customers motivate them to do more business with the Branch	2.7	0.801
Ensuring replies to the queries is important	2.68	0.852
A smile, eye contact and ever courtesy queries make customers happy and motivate to visit more	2.65	0.869
It is not right to mix personal issues with professional life that both will be affected if there is any disturbances	2.61	0.749
I always maintain professional confidentiality while in social network	2.38	1.359
I take initiative to develop awareness among on new changes and use of banking related technologies	2.37	1.175
Use of social media among investors, depositors and borrowers is a good platform in awareness and business developments	2.23	1.16

Team effectiveness and peer support are essential in developing a successful career in Banking sector. I get it from peers and give we well	2.15	1.25
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Social networking to develop personal network , maintaining confidentiality and maintaining team effectiveness have low mean, less than 2.5.

XI. CONCLUSION

The banking job is a repetitive task of interacting with customers and solving similar issues for employees, but every query is new to customer. The emotional intelligence is essential to to listen peacefully, understand their problems and learn from the opportunities are the core point in banking job. The interesting phenomenon identified the common behaviour patter in their job and lower interest in self-development. But, it will be a critical issue when banking sector is adapting technology fast. The work pressure to complete in time maintain a punctuality in work though personal involvement is less.

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The Performance of Biometric Attendance System (BAS): CTU-Tuburan Campus as case study

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Abstract- This study aimed to evaluate the performance of the Biometric Attendance System (BAS) of Cebu Technological University-Tuburan Campus during the calendar year 2018 as basis for a proposed system improvement. This study used the quantitative research employing descriptive method that assessed the performance of the Biometric Attendance System as to timeliness, accuracy, graphical user-interface and system maintenance. The study was conducted at Cebu Technological University-Tuburan Campus, Tuburan, Cebu. There were 96 teaching staff and 48 non-teaching personnel who were chosen randomly to evaluate the performance of the Biometric Attendance System. Weighted mean was used to analyze and interpret the data. This study revealed the following findings: the BAS has six (6) features which are touch-screen user interface (TUI), system setup, administrators, finger registration, clock configuration and DTR pint menu. The overall performance of the biometric system was very satisfactory in terms of timeliness, accuracy, and graphical-user interface. Hence, biometric system has always ensured employees' timeliness, provided accurate employee attendance record, and accommodated well the employees in their daily use of the biometric. Thus, it utilized a corrective form of maintenance only for emergency cases or is done after the problem occurred such as system reboot for downtime related issues and database backup. Lastly, "employees forget to log in/out" is found out to be the number one (1) problem in the daily use of biometric system. Formulation of a proposed system improvement on the lapses of the performance of the current biometric attendance system is the output of this study.

Index Terms- Performance, Biometric Attendance System, Timeliness, Graphical User- interface, System Maintenance

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I. INTRODUCTION

In people's lives today, computers are getting more intelligent as they take in more about human thinking process. This procedure has advanced the speed of doing office works and furthermore helped in basic leadership of organizations. Moreover, these personal computers keep on making individuals think more intelligent. They likewise reform workplaces and school methods in smooth and quick task. Truth be told that personal computers are more helpful when they are utilized not simply in an activity. Truth be told that personal computer are more valuable when they are utilized not simply to perform calculations, but likewise to store an expansive amount or tremendous measure of data or date in a drawn-out stretch of time. In other words, they have the capacity to impact human choices, changing the way people work into a superior one and enhance individuals' capacity to convey (Whitney, 2017).

From generation to generation, numerous kinds of frameworks and even advances are being produced and broadly utilized. Using new advancements and frameworks, manual exercises have been changed to work quicker, make errand less demanding and deliver more dependable yields. Nowadays, huge associations or organizations and school exchanges need to actualize attendance monitoring. Monitoring of

attendance is perceived as an essential component in supporting both employees' security and performance (Thakkar, 2015).

In recent years, due to globalization and industrialization of our nation there is a rise of employment opportunities which can be available to every prospect applicant. These employments are present in every establishment that utilizes manpower and human interactions. This innovation is the utilization of science to social event, recording, handling and conveying of business data by methods for electronic media. Most regular apparatus for application is the PC and it includes all the exchange handling framework, administration data framework, different business emotionally supportive network and so forth. The PC is a focal power in the headway of different associations. Some notable examples are hospitals, hotels, department stores, airport, security agencies and specially universities (Ware, 2015).

Validation is the way toward deciding if a person is who he or she claims to be. This procedure can happen in one of two ways. Confirmation asks "Is this the individual who he or she claims?" and comprises of a solitary correlation. Distinguishing proof makes a one-to-N examination and tries to decide whether the individual is one of the N individuals. A few variables, for example, what you know, what you have, or what you are can be utilized for validation, with each of the three alternatives having qualities and shortcomings. For enhanced security, it is prudent to utilize in excess of one factor, if conceivable. Biometric verification is a "what you are" factor and depends on one of the forms of individual qualities. Two varieties of biometric properties are useful for verification. Physical biometrics comprise of DNA, fingerprints, facial acknowledgment, and eye exams (iris, retina). Conduct biometrics comprise voice acknowledgment and written by hand marks (Mustafa Erden, 2017).

The biometric approval process involves a couple of stages: estimation, flag preparing, outline organizing, and fundamental leadership. Estimation incorporates identifying biometric properties and is imperative both for the making of the reference show and for each approval preliminary. For instance, when voice check is used, this stage includes recording one's voice through a receiver. At that point the computerized information is numerically displayed. At the point when the client needs to be confirmed, the gadget thinks about the information to the client model and settles on a choice for the most part in view of a pre-figured edge (RihaZ. , 2002). Biometric validation frameworks are not a hundred percent precise. There are two sorts of error in a run of the mill biometric framework. A false reject (FR) mistake is the dismissal of a permitted personality endeavoring to get to the framework. A false acknowledge (FA) mistake is the acknowledgment of an individual who isn't in actuality who claims to be (Dass, S.C., et. al., 2006). These two kinds of mistakes are conversely relative and when all is said and in done can be controlled by a certainty edge. To build the security of the framework, the edge can be expanded, which diminishes FA mistakes and builds FR blunders. Points of interest of biometric frameworks include (1) Enhanced security, (2) Enhanced client encounter, (3) Can't be overlooked or lost, and (4) Decreased operational expenses. On the other hand, the disservices of biometric frameworks are (1) Environment and use can influence estimations, (2) Frameworks are not 100% exact, (3) Requiring mix as well as extra equipment, and (4) Cannot be reset once traded off (Sahoo et. al., 2012).

Computerized biometric employee clocking system is an automated process that verifies workers identity and captures employee traits with high speed (in one second or less) with high levels of accuracy. Computerized biometric employee clocking systems that are well managed are crucial in the overall performance of any organization. An effective computerized biometric system should address attendance timing, employee

identification, and payroll computation. An effectively implemented computerized employee clocking system should lead to more accurate employee attendance records, eliminate the practice where employee clocks in and out for their colleagues 'buddy punching', more authentic identification of workers, and more accurate payroll computation for workers, which leads to happier and productive employees (Shehu & Dika, 2011).

When working time is managed well, employees conscientiously perceive their work. Employees who do not attend to their duties are identified among the workers in the workplace and are encouraged to improve. Improved job satisfaction may be realized through effective computation of overtime, management of extra workload, and recognition of hard work. The employer can also be able to identify areas of high employee absenteeism in the workplace which can be used to re-organize work.

The history of the time clock dates back to the late 1800s when the first-time clock was invented. The time clocks were used to record the time workers reported to work and left work. The time check mechanically indicated the day and time on the card. This provided the factory owner the actual time worked by the employee. Employers paid for actual hours worked by employees. The system of keeping track of hours labored has always been a problematic task. Among the most famous of these standards on the clock punch in structures are the time card, the punch clock, and time sheets. Each of these picks has their very own disadvantages. During the past several decades, companies have slowly begun integrating software and contemporary clocking terminals to greater precisely tune employee attendance. Through the years, various options have been created for monitoring employee attendance and the time clocks have evolved to give rise to the current computerized biometric employee clocking systems (Mitrefinch, *Advance Systems*, 2016).

In the 20th century, the need to accurately track employee hours has emerged as an essential part of running a business. Laws were put in place to protect employees and make certain they had been precise compensated. Businesses began the usage of a range of strategies of monitoring worker time. While these techniques allowed businesses to report employee time, they also possessed flaws. The foremost negative aspects of these common systems are: (1) potential for human error, (2) employees can commit time theft, (3) manual tracking is time consuming, and (4) inefficient and outdated. While the advantages of upgrading to an automated time tracking solution are: (1) prevent payroll error, (2) prevent time theft, (3) improve efficiency and (4) increase productivity.

Software for commercialization of time clocks appeared for the first time in the 1990s. Prior to commercialization of time clocks, electrical time clocks that were in use were prone to failure, expensive to maintain and repair. The use of clock software has enabled employers to minimize payroll processing costs and expenses. This by extension has made payroll processing much faster and efficient. Computers have continuously become more complex which have also led to evolution more versatile attendance timing systems. The range

of application for current time and attendance software includes absence management, management of vacation, sick days and holidays, automatic tracking of attendance, management of overtime, real-time data and online payroll.

The operational performance of a firm according to Brown, (2008) can be evaluated on prescribed indicators that may include efficiency and effectiveness. Operations transform inputs that produce services or products that translate to value for stakeholders. Business operations should be coordinated well to realize the targets that are set in workplace. In the workplace, business operations involve storage of materials, transportation, processing and inspection of activities. Business operations according to Brown (2008) deal with human resource, location where activities are done, the equipment that are used and the processes that are undertaken. These elements of operations should be combined well to enhance operational performance of an organization. Russel and Taylor, (2011) proposed that every employee should be provided with knowledge and skills that they can utilize to attend to customers promptly for efficiency in operations.

According to Battersse, (2005) the operational performance of an organization can be enhanced through the streamlining of main activities and processes that an organization engages. Organizations are expected to continuously position themselves and be dynamic in the context of the ever-changing market forces. Organizations should strive to attain high levels of operational performance. Organizations should continuously reduce wastages of time and resources while making optimum use of employees and utilizing appropriate technology to manage operations. Firms are said to be effective if they formulate appropriate strategic goals, and efficient if they achieve the goals with minimal resources. Battersse (2005) proposed consequences for increasing operational efficiency, which include lowering costs, enhancing client satisfaction, and staying beforehand of the competition. This helps in imparting employees with invulnerable and constant access to information.

The life span of the biometric is especially engaging in the verification procedure and the way that a biometric can't be changed. Today, one can undoubtedly change secret key, PIN or even keys, yet with the biometrics it is an incredible inverse. In the meantime, as it is difficult to manufacture a biometric include (it is difficult to put a false unique mark or influence the retina to appear as though someone else's) it is very simple to produce once the reference format has been duplicated or stolen, as we can send in photographs of those, we assert we are or examine their marks and utilize them over and over. The primary issue is that once it is stolen, it is stolen forever. A person has recently that numerous fingers, irises and just a single face.

Henceforth, one of the greatest open feelings of dread is the potential abuse of the individual biometric information. Despite the fact that the standard on which the biometric innovation is based is not the slightest bit new, the advancement and the spread of the innovation in the ongoing years has been continuing in an extremely quick pace. While the innovation is extremely engaging from the security outlook, and the most solid and exact type of distinguishing proof and check, there are not kidding contemplations and worries that this innovation raises. No biometric innovation is hundred percent precise and it experiences biometric-particular dangers. It represents a danger to protection, raises worries about its utilization in following and observation and conceivable abuse of the halfway put away data on people. In the same class as the biometric innovation is, we do realize that no framework is foolproof.

Biometrics is considered as a promising arrangement among conventional techniques in view of "what we possess, (for example, a key) or "what we

know, (for example, secret key). It in light of "what we are" and "how we carry on". Biometric verification frameworks have numerous applications (Jain et. al., 2004): fringe control, web business, colleges, and so on. The fundamental advantages of this innovation are to supply the most advantageous security and to inspire the validation method for a client. Likewise, it is usually difficult to duplicate the biometric attributes of an individual than the higher section of the other validation techniques, for example, passwords. The fingerprint is the most popular way to biometric authentication. The pattern of the ridges and furrows of the fingers are unique for each individual. Therefore, based on the pattern of the ridges, furrows and minutiae points a person is identified or verified (Hasan et. al., 2013). The advantage of fingerprint biometric system is that it is socially acceptable, easy to collect the fingerprint and even the fingerprint of each finger on the same hand are different from each other. The limitation of the fingerprint is that, the factors like a person's age, occupation or any kind of accident might make it difficult for the sensors to capture the fingerprint (Goudeliset.al., 2008).

While the biometric system is considered to be a secure way of authentication, the impostors also created new ways to bypass the security of the biometric system. The main problem with the biometric based authentication is that biometric trails are not secret. Intruders can easily get access to the fingerprints, face image, etc. According to the study of Kamaldeep (2011), there are eight possible attacks against biometric systems. It indicates the different assaults on the one-of-a-kind points on the biometric system for verification, and these are: (1) attack on the sensor, (2) replay attack, (3) overriding the feature extractor, (4) attack with the aid of synthesized function vector, (5) overriding the matcher, (6) assault on the database, (7) assault on the channel between the matcher and database, and (8) overriding closing decision.

The Biometric Attendance Monitoring System of Cebu Technological University-Tuburan Campus is a fingerprint-based mechanized observing framework that will encourage a quicker and simpler checking of the attendance of employees both teaching and non-teaching. This framework will spare time, lessen the measure of work the chairman needs to do and will supplant the stationary material with electronic mechanical assembly.

The increasing population in Cebu Technological University (CTU) -Tuburan Campus is due to higher numbers of enrollee and expanding growth of teaching personnel. In the administrative area, a timely, effective and efficient way is required in recording Daily Time Record (DTR) of every personnel. A smoother process is needed to maximize time management. Avoid crowding a specified area that would cause delay and create additional problems.

The current system is utilizing Biometric Fingerprint Scan in DTR logging. Biometric Fingertip Scan has the current advantages of improved security, electronically recorded, better management compared to traditional time-sheets. Regardless of these advantages with its implementation there are still a number of disadvantages present that didn't get address with the current system. One problem that was

experienced in the Tuburan Campus, the current system causes crowding and delay since it is accessible only in one point and a large number of users is simultaneously using it. Accuracy, timeliness and efficiency are compromised in its operation. Environment and usage can affect measurements which may lead to false readings and time delay. The system cannot be reset once compromised and can take time for repair. It requires integration and/or additional hardware which is costly. User factor can also cause errors to the system which decreases its functionality. Lack of real-time tracking of every personnel is observed. All these flaws need to be resolved to have a more effective system accessible to everyone with added benefits and reliability.

In a certain way, one thing that is still in manual process is the recording of attendance of their employees in utilizing logbook in their every day time record or in short it is paper-based. Others may exploit by punching co-workers' card in the Bundy Clock. Thus, it can't generally screen employees who are getting as often as possible absent or late. Furthermore, they need to react to the call of mechanical headway so the school will have the capacity to serve the entire employees with most extreme administrations. Along these lines, the researcher embraces this study to enhance/improve the current Attendance Monitoring System utilizing Biometric of Cebu Technological University- Tuburan Campus due to its apparent significance in order to monitor the attendance of the employees easily, accurately, efficiently and effectively.

The main purpose of this study is to evaluate the performance of Biometric Attendance System of Cebu Technological University-Tuburan Campus during calendar year 2018 as basis for a proposed system improvement.

II. MATERIALS AND METHODS

The study is quantitative research employing descriptive technique to determine respondents' level of delight to the overall performance of the current Biometric Attendance System. This kind of research work needs extra specification on statistics gathering. The research method normally used has significance in the research methodology due to the data imperative for this completion of this work is all concise and the capacity to discuss it with the survey.

Formulation of a proposed system improvement on the lapses of the performance of the current biometric attendance system is the output of the study.

Environment

This study took place in Cebu Technological University- Tuburan Campus, one of the campuses of the CTU system located at Brgy. 8, Tuburan, Cebu, Philippines. The town nestled in the northern part of Cebu Province. Tuburan is the second-class municipality in the province of Cebu.

Sampling Method

Samples were determined by random sampling in each site using Likert scale survey questionnaire.

System Features

The features of the current biometric system in CTU-Tuburan which utilizes the DTR system Setup version 1.9.1.0 running on a Windows 7

Operating platform that provide the information menus, screens, interactive and administrator and/or user defined setup configuration such as:

A. Touch-screen User Interface

The Touch Screen Interface or TUI is a special kind of GUI using a touch-pad or a touch-screen display as a combined input and output device. In TUI, the display screen is pressure sensitive where the user interacts with the machine by tapping the screen surface using fingers or stylus. On tapping, the system compares the actions stored in the database and executes appropriate commands.



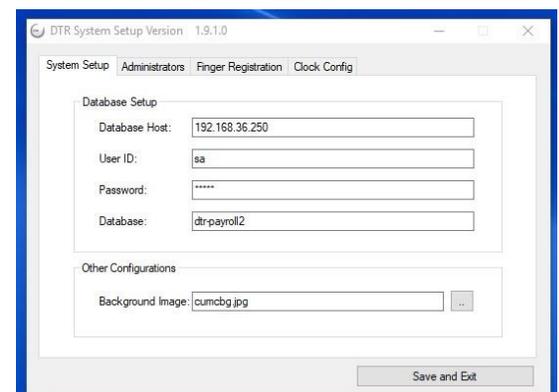
Figure 1. Touch-screen User Interface (TUI) used in the study.

B. System Setup Menu

The System Setup Menu describes the database setup which is connected to the database host computer defined with its static IP (Internet Protocol) address:

192.168.36.250, where user ID and password are setup. Thus, in this menu Other Configurations like Background Image can also be setup or changed. This feature also sets rules for network setup and the like.

Figure 2. System Setup Menu



C. Administrators Menu

A top-level *menu* displays as section in the *administrator's menu* and contains sub-level *menu* items. A sub-level *menu* means the *menu* item is a member of an existing *menu* where another authorized administrator ID (Identification) can be added and can be deleted from the database host computer with the permission from the MIS (Management Information System) In-Charge.

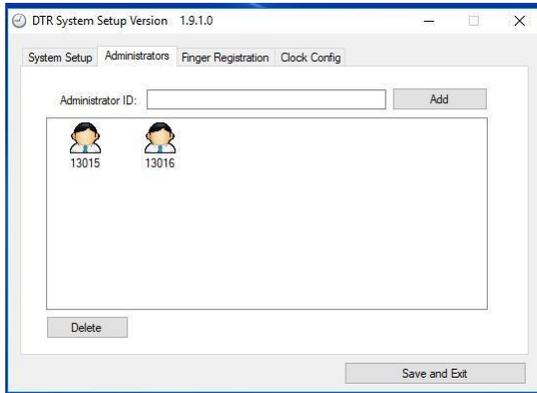


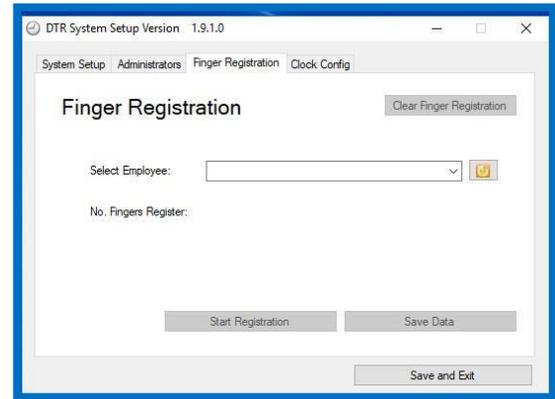
Figure 3. Administrators Menu

D. Finger-based Registration Setup

The Finger Registration menu allows the administrator to register each employee through fingerprints as the biometric data which is intrinsically connected to an individual employee and provides a detailed audit trail of employee

attendance. This section also allows the administrator and/or the MIS In-Charge to remove employee from the list and clear fingerprint registration in case of retirement, resignation, reassignment, AWOL and the like. It likewise allows to save data after the registration process. This feature is anchored in the daily time record (DTR) print menu.

Figure 4. Finger-based Registration Setup



E. Clock Configuration Setup

The purpose of this menu/feature is to help the administrator *configure* themicrocontroller *clocks*, taking into consideration product parameters such as power supply. This section also describes the system clock schemes which are the hour hand, minute hand, second hand, ticks, and digits color. This menu is an added feature to the graphical-user interface (GUI) of the system.

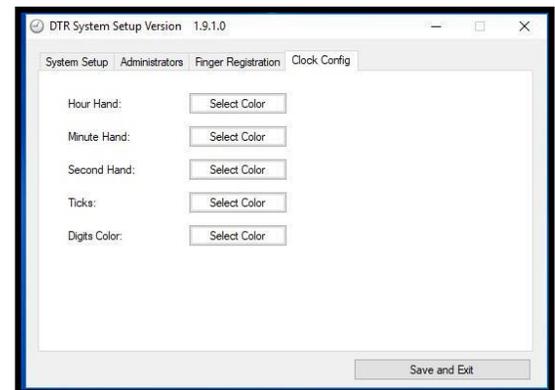


Figure 5. Clock Configuration Setup

F. DTR Print Menu

This feature allows the system administrator or an authorized user for the process of printing out of the Daily Time Record (DTR) for each employee. This feature also shows the list of employees by department and by groups or all employees, employee leaves and availment, employee DTR Card, attendance sheet, summary of employees' tardiness and undertime. It also shows the reports on individual employee's tardiness and undertime, name of employee filed leave and monthly reports of absences and undertime which are all connected to the database host PC.

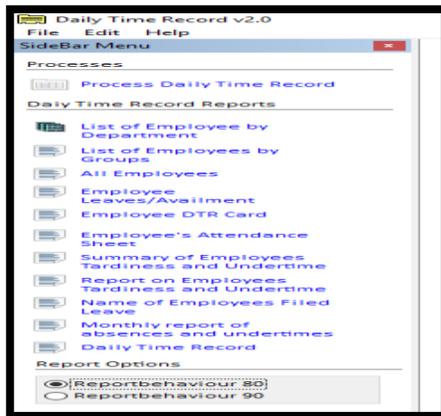


Figure 6.DTR Print Menu

System Maintenance

Regular system maintenance is necessary for the proper function of the biometric machine over a period of time. However, there was no log or any record for regular or preventive system maintenance on file. As per statement from the experts, namely the Network Administrator and the MIS-In-Charge, the current Biometric Attendance System in Cebu Technological University–Tuburan Campus only utilized a corrective form of maintenance for emergency cases or is done after the problem occurred such as system reboot for downtime related issues and database backup. Thus, timely maintenance is a practice many users get accustomed to as to preventive maintenance.

III. RESULTS AND DISCUSSION

The result (See Table 1) contains the data pertaining to timeliness of the operational performance of the current biometric attendance system. As reflected on the table, the overall weighted mean is 4.25 or verbally described as Strongly Agree.

has an overall weighted mean of 4.06 or verbally described as Agree.

The data showed that the performance of the current biometric is very satisfactory in terms of its graphical-user interface as perceived and experienced by the respondents.

This implies that the current biometric attendance system is generally user friendly because it is easy to use and it requires less force in keying employee ID. Likewise, employee verification is generally fast and its reading characters on the screen of the Biometric Attendance System are readable and performing tasks is straightforward. Ultimately, it is generally

The data showed that the current biometric attendance system is outstanding in terms of its timeliness as experienced by the respondents in their daily use of the biometric system in logging in and out. The researcher conducted a simulation of at least ten (10) trials as to the timeliness of the biometric machine and the results showed an average of 1.82 seconds just to capture employee data in real-time. In fact, all of the indicators of timeliness were rated SA or strongly agree by the respondents.

This implies that the current biometric system always ensures that employees are attended to their works on time since attendance data can easily be captured and it takes lesser time for recording employee attendance and authenticates employee identity in real-time. With this, it avoids queuing of employees causing them to be late in their respective works.

It presents the data (See Table 2) on the accuracy of the current biometric attendance system according to the respondents' responses. The table revealed that accuracy has an overall weighted mean of 4.19 or verbally described as Agree.

The data showed that the performance of the current biometric system as perceived and experienced by the respondents is very satisfactory in terms of its accuracy.

Though, there were only an average of 2 employees per month or 1.39 % of the total population have experienced that the official printed DTR did not show any log as to the actual time rendered. However, this implies still that the current biometric attendance system is mostly effective in capturing employee working hours as it provides a detailed audit trail of employee attendance to ensure data integrity. Moreover, it has an intrinsic connection to an individual employee and provides accurate data for payroll to determine reliably employees' pay. Thus, it enhances employee punctuality and eliminates incidents of wage theft.

Furthermore, the data (See Table 3) on Graphical- User Interface of the current biometric attendance system according to the respondents' responses. The table revealed that graphical-user interface

user friendly because its organization of information and sequence of screens such as the hand hour, time, date and keypad are clear and the position of messages on screen such as notifications on successful login/out, error messages is clear and consistent.

It revealed that the overall performance of the biometric system is 4.17 or verbally described as Agree (See Table 4). The data showed that the overall performance of the biometric system in Cebu Technological University (CTU) – Tuburan Campus is

very satisfactory in terms of timeliness, accuracy, and graphical-user interface.

This implies that the biometric system has always ensured employees' timeliness, has provided accurate employee attendance record, and has accommodated well the employees in their daily use of the biometric.

IV. CONCLUSION

Biometric systems are an increasing number of used in our everyday life to control the access of quite a few resources. Several biometric applied sciences exist towards this goal, going from physiological-based features (such as fingerprint) to behavioral-based facets (such as keystroke dynamics). However, a key issue to be considered is the evaluation of such systems. This is generally vital to make sure efficient and effective biometric system that appreciates the privacy of an individual, and to allow a good usability (El-Abed, et.al., 2012).

Based on the findings, it can be concluded that the performance of the current Biometric Attendance System in Cebu Technological University (CTU) –Tuburan Campus was very satisfactory with its six (6) features; however, the system still incurs inevitable problems.

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Table 1: Performance of the Current Biometric Attendance System in CTU-Tuburan Campus as to Timeliness

Timeliness	Weighted Mean	Verbal Description
Fingerprints input takes lesser time for recording employee attendance.	4.29	Strongly Agree
Attendance data can easily be captured through computerized biometric employee clocking system.	4.32	Strongly Agree
The biometric attendance system ensures that employees are attended to timely.	4.40	Strongly Agree
The Biometric Attendance System authenticates employee identity in real-time.	4.00	Agree
Overall Weighted Mean	4.25	Strongly Agree

Legend: Strongly Agree (4.21-5.0) Agree (3.41-4.2) Average (2.61-3.4) Disagree (1.81-2.6) Strongly disagree (1.0-1.8)

Table 2: Performance of the Current Biometric Attendance System in CTU-Tuburan Campus as to Accuracy

Accuracy	Weighted Mean	Verbal Description
The biometric attendance system is effective in capturing employee working hours.	4.27	Strongly Agree
The biometric attendance system provides detailed audit trail of employee attendance.	4.21	Strongly Agree
The biometric attendance system ensures data integrity.	4.08	Agree
The biometric attendance system is intrinsically connected to an individual employee	4.25	Strongly Agree
The biometric attendance system is a reliable way to determine employee fair pay.	4.27	Strongly Agree
The biometric attendance system provides accurate data for payroll.	4.16	Agree
The biometric attendance system enhances employee punctuality	4.08	Agree
The biometric attendance system eliminates incidents of wage theft.	4.16	Agree
Overall Weighted Mean	4.19	Agree

Legend: Strongly Agree (4.21-5.0) Agree (3.41-4.2) Average (2.61-3.4) Disagree (1.81-2.6) Strongly disagree (1.0-1.8)

Table 3: Performance of the Current Biometric Attendance System in CTU-Tuburan Campus as to Graphical User Interface

Graphical User Interface	Weighted Mean	Verbal Description
The biometric attendance system is easy to use.	4.13	Agree
The Biometric Attendance System's keypad requires less force in keying employee ID.	3.58	Agree
Employee verification of the biometric attendance system is fast.	4.19	Agree
Reading characters on the screen of the Biometric Attendance System is readable.	4.12	Agree
Organization of information and sequence of screens such as the hand hour, time, date and keypad are clear.	4.11	Agree
Position of messages on screen such as notifications on successful login/out is clear and consistent.	4.10	Agree
Error messages of the Biometric Attendance System are helpful.	4.12	Agree
Performing tasks of the Biometric Attendance System is straightforward.	4.15	Agree
Overall Weighted Mean	4.06	Agree

Legend: Strongly Agree (4.21-5.0) Agree (3.41-4.2) Average (2.61-3.4) Disagree (1.81-2.6) Strongly disagree (1.0-1.8)

Summary of Biometric Performance

Table 4: Summary of Data on the Performance of the Current Biometric Attendance System in CTU-Tuburan Campus

Aspects	Weighted Mean	Verbal Description
Timeliness	4.25	Strongly Agree
Accuracy	4.19	Agree
Graphical-User Interface	4.06	Agree
Overall Weighted Mean	4.17	Agree

Legend: Strongly Agree (4.21-5.0) Agree (3.41-4.2) Average (2.61-3.4) Disagree (1.81-2.6) Strongly disagree (1.0-1.8)

Summary of Corrective System Maintenance

Table 5: Summary of Data on the Corrective System Maintenance of the Current Biometric Attendance System in CTU-Tuburan Campus

Month	Issues/Concerns	Number of Occurrence in a Month	Corrective Action/s
January	Power Interruption	3	System Reboot
February	System freezes/Unresponsive	3	System Reboot
March	Database backup	2	Scheduled System backup/System Reboot
April	System freezes/Unresponsive	1	System Reboot
May	System freezes/Unresponsive	1	System Reboot
June	Power Interruption	2	Scheduled System backup/System Reboot
July	Power Interruption	3	System Reboot
August	System freezes/Unresponsive	4	System Reboot
September	Database backup	1	Scheduled System backup/System Reboot
	System freezes/Unresponsive	2	
October	Power Interruption	1	System Reboot
November	Power Interruption	3	System Reboot
	System freezes/Unresponsive	1	

Polytechnic Library Personnel Competency Framework In Ict Environment: A Study Of Some Selected Polytechnic Libraries In The North West.

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Abstract- Information and communication technology (ICT) has changed the world of library such that activities being carried out manually before are now being automated. The works of library staff are now being characterized by information and communication technologies. Academic libraries were observed to be more equipped with information infrastructures more than any other type of libraries, but no library no matter how well equipped that doesn't require the service of a workforce that is highly competent in the use of ICT tools, as such information infrastructure will remain unused or under-utilized. It is in connection to this, that this study examined the background and underlined the need for an ICT competency framework that explains the duties and responsibilities of the library professionals engaged. The study also highlighted several aspects of ICT competency implementation and the impacts of ICT on the development of library personnel competencies in general. A descriptive survey design of quantitative research method was used, with a sample size of one hundred and thirty-two (132) drawn from population of one hundred and fifty-two (152). Questionnaire served as instrument for data collection, with two hundred and fifty-five participants (which constitute 85.49% return rate) fully completed and returned the instrument. Result of findings demonstrated a high level of ICT competency on the part of library professionals staff in selected polytechnics libraries (Federal Polytechnic, Kaura Namoda, Nuhu Bamalli Polytechnic, Zaria and Federal Polytechnic, Kaduna), most especially on skills that were considered basic and intermediate ICT skill. Identified challenges militating against effective utilization of ICT tools in the library for dynamic information service delivery include; lack of adequate information infrastructure, absent of provision for staff training and development, inappropriate library and information science curriculum and epileptic power supply. Sequential to the above identified challenges the study recommends that library management should make available adequate information infrastructure, make provision for staff development and training, make appropriate ICT driven LIS curriculum and steady power supply.

Index Terms- Polytechnic, Competency, ICT, Framework

I. INTRODUCTION

Information management has grown increasingly crucial in everyday life, especially in libraries. This is due to advancements in electronic resources and library applications of information and communication technology (ICT). Library staff plays a critical part in transitioning the library from its traditional functions to a more sophisticated role in digital information dissemination. As a result, identifying the competency of library and information science (LIS) workers in an ICT setting becomes even more difficult. All aspects of library management are affected in some way or another by ICT applications. Computers, printers, modems, RFID, V-SAT, and other communication equipment have completely revolutionized the functions and services in libraries. Kaur, Rajinder, Gaur, and Rupesh (2017) stated that to cope with this situation, LIS professionals should be ICT competent for achieving effective utilization of resources, user satisfaction, and staff motivation.

Information and Communication Technology (ICT) is one of the greatest inventions of mankind which played unprecedented roles in changing the landscape of human and organization activities around the globe from which libraries are not exempted. In corroboration to that Dhanavandan, Esmail, Mohammed, and Nagarajan (2012) postulated Libraries are currently extensively engaged in digitization of practically all library resources to provide rapid, interactive, and dynamic information services to users, as ICT has significantly impacted every part of human pursuits, including libraries. As a result of advancements in technology, knowledge has been spread quickly over the world. In the present era of technological developments, it has been observed that market demands for library professionals are changing in terms of qualification, experience, professional and technical skills. Several researchers have raised concerns on the technical competence of librarians in coping with multifaceted challenges of the introduction of ICT in libraries. According to Akhilesh and Prerana (2016), LIS graduates are not only expected to have core library skills but also the ability to implement ICT knowledge efficiently and effectively.

ICT is generic terms that refers to the technologies that are used to collect, store, edit and communicate information in various

format (Raji, 2018). According to Janakiraman and Subramaniam (2015) the world now experiences a digital scenario in which ICT has changed the possibilities of the library job promotions and has brought changes to expected library performances. Since libraries are at the Centre of information business, it will not remain unchanged when these technologies are changing. Hence, possession of ICT skills has become an important recruitment variable for libraries while the introduction of ICTs in education had also brought about computerization of traditional materials such as books, journals newspaper and other information resources in the library (Madu, Aboyade & Aboyade, 2016). This has also led to the existence of virtual library. Educational researchers, through the use of ICT can access current literature materials with ease. ICTs also encourage collaboration among researchers irrespective of their locations. Instead, ICT skills are about the ability to use their knowledge about ICT to find, develop and present information; whether it is text, image or number, or all of this integrated task” (Quadri, 2017). It is thus clear that LIS professionals must learn and adjust to a rapidly changing environment and acquire competencies and skills to become a knowledgeable asset to the library. Library professionals then teach these skills to users and other supporting staffs to enable them search, navigate and find the right knowledge from a world of information. Libraries have been transformed into information centres, formal tools and techniques have been replaced by the modern technologies. ICT has become an integral part of the modern libraries (Emiri, 2015). Chisita and Shoko (2015) defined ICT in a library context to mean the application of various technologies such as computers, retro-graphics, audio-visuals, and other electronic devices for storage, reproduction, and dissemination of information in a library environment. In a similar vein, Vijayakumar and Vijayan (2018) defined ICT as the application of computers and technologies for the acquisition, organization, storage, retrieval, and dissemination of information. Malanga (2015) explained the definition further to mean a revolution that provides the platform and technical means of handling information and communication. With all these definitions, ICT can rightly be said to be a catalyst for generating, processing, storing, and disseminating information. Various studies have mentioned the necessity of ICT skills for librarians. Hallam and Ellard (2015) studied show that “digital literacy represents a fundamental Foundation skill needed by library staff”. Libraries in Nigeria, like libraries in other areas of the world, are confronting issues as a result of the media through which information is generated, communicated, disseminated, and archived, as electronic formats become more prevalent. One of the numerous obstacles is storing and providing information in many formats (pdf, jpg, Html, etc.) that may be accessed by various people in various ways from different parts of the world through different media (phone, email, social networking sites, etc.) simultaneously, managing online learning communities and working in virtual environments, etc. In a contextually networked global village, it could be perceived that polytechnic libraries, without ICT competent professionals, may run the risk of being out-dated.

Competency on the other hand is the ability to do something successfully and efficiently. It is the skills, quality, the ability needed to perform a task. It also tends to describe the level of proficiency of an individual in executing a particular task or job.

Competency is the ability, skills, attributes, proficiency of an individual to perform or do something efficiently. Oyewunmi, Akanbi and Laaro (2018) stressed that competency is a set of predefined skills that provide a structured yardstick against which proficiency of an individual performance in carrying out a given task is measured and evaluated. Ojiegbe (2020) view competency as a way of demonstrating the knowledge, skills, experience, and attribute of an individual to carry out a defined function successfully. Competency is a set of predefined skills that provide a structured guide against which proficiency of an individual performance in executing a task is being measured and evaluated. Competency could be seen as a combination of practical and theoretical knowledge, skills, behavior, and value needed to improve on a performance. It could also be seen as a state or quality of being adequately equipped and qualified to perform a given task. Library professionals need technical know-how and need to acquire ICT competencies that may not fall within the traditional library for several practical reasons. The future roadmap for the ICT competency framework for LIS professionals is varied and multi-faceted. All the library services should be made available to users’ on-demand, at places as per convenient location, and be enabled in any part of the world. The availability of workflow processes, use of ICT, networked computers, peripherals viz., printers, scanners, modems, etc., are much required under these circumstances. The empowerment of users is achieved by employing employees who are technically and intellectually competent and qualified. These employees are the users' first point of contact; thus, they must demonstrate adequate skills for the job. As a result, putting a strong emphasis on developing ICT skills is crucial in dealing with the situation. ICT revolutionized many traditional library practices which in turn posed a new challenge, opportunities, and competition for LIS professionals (Narasappa & Kumar, 2016).

Problem Statement

It is past time to recognize the importance of training library workers in the education sector and to invest appropriately in developing professionals working in the learning delivery system, namely libraries. Developing a competency framework for library personnel is the need of the hour in any polytechnic library that wants to be dynamic and growth-oriented or to succeed in a fast-changing environment. Libraries can become dynamic and grow only through the efforts and competencies of their human resources. Personnel policies can help to maintain people's morale and motivation strong, but they are insufficient to make the company dynamic and move it in new directions. This research aims to investigate the entire range of people situations in polytechnic libraries by eliciting staff perspectives on ICT applications that the libraries of the federal polytechnic, Kaura Namoda, Nuhu Bamalli polytechnic, Zaria and Kaduna polytechnic, Kaduna are selected as the main focal point of study. This study would help in accomplishing common goals of the polytechnic libraries and would focus on the following aspects:

- ICT-based competencies of library personnel (working in the 03 selected polytechnic libraries in the North-Western part of Nigeria).
- The ICT course content of the LIS curriculum (of some selected LIS departments of the institutions).

The Aim and Objectives Of The Research Are:

The main aim of the research is to explore the ICT competencies of LIS professionals working in polytechnic libraries for efficient, goal-oriented, and smooth functioning of the library so that they will be systematically and scientifically developed concerning the ICT environment. Some of the other objectives of the study are as follows:

- To identify the current levels of ICT competencies possessed by LIS professionals working in polytechnic libraries.
- To identify the ICT competencies needed by LIS professionals in the future.
- To formulate an ICT competency framework for polytechnic library personnel.

Research Questions

The following questions will be addressed to answer the aims and objectives of the research such as:

- What is the current situation regarding ICT-related competencies possessed by the LIS professionals?
- What are the ICT competencies that library users expect from LIS professionals?
- What are the training needs of LIS professionals for acquiring expected ICT competencies?

Hypothesis

H₀: There is no ICT competency among the LIS professionals in the three selected Polytechnics

H₁: There is ICT competency among the LIS professionals in the three selected Polytechnics

Scope of the Study

The current research, titled "Polytechnic Library Personnel Competency Framework in ICT Environment: A Study of Some Selected Polytechnic Libraries in the North West", focuses on the LIS personnel who work in the libraries of three polytechnics in Nigeria's north western region. ICT has been used in all of these polytechnic libraries for library activities and services. They are delivering digital information services to their users/subscribers, but they need to improve. These polytechnic libraries have been identified with the help of three indicators viz., existing ICT infrastructure, ICT competency levels of professionals working there, and ICT-based library functions and services provided by the libraries. The working practices of professionals and the ICT applications formed the domain of this study. The present study covers the permanent professionals working in the libraries. Additionally, various applied ICT competencies and their impact are confined to the geographical area of the North West wherein the consideration is restricted to three polytechnics viz., federal polytechnic, Kaura Namoda, Nuhu Bamalli Polytechnic, Zaria and Kaduna Polytechnic, Kaduna.

Limitations of the Study

The study is limited to permanent LIS experts working in three polytechnics in Nigeria's northwestern region to collect data efficiently. Contract professionals would not be included in the study because they were only engaged for a brief length of time and so could not be trusted for dependability and validity. The limitation also concerns the time dimension of its coverage as it is difficult to study all the polytechnics in a limited time. Financial

constraints are a big stumbling block to traveling to different locations for data collection for the study as well as security.

II. REVIEW OF RELATED WORKS

A literature review typically holds the promise of disseminating the findings of various surveys and highlights the published information of a particular subject area within a specified period. It can be just a summary of the sources or an elaborate exposition of the subject area. Generally speaking, the main purpose of the literature review is to analyse critically a segment of a published body of knowledge through summary, classification, comparison of prior research studies, and theoretical articles after the threadbare examination. An evaluation of the literature logically leads to the research questions. It also provides the researchers with a handy portable guide on a particular topic. If the researchers have a paucity of time to conduct research, the Literature review can provide a mirror or overview of prior research or act as a stepping stone to initiate research. Literature reviews include books, journal articles, web-based resources, newspapers, magazines, theses, dissertations, conference proceedings, reports, reviews, course contents, and documentaries. Reviews of related and existing literature constitute an essential part of the research study. It enables the researcher to get an understanding and clear insight into a specific field of study. Additionally, it also provides an opportunity to gain in-depth knowledge about time-tested methods and procedures adopted and ensure laying a path for possible interpretations in such similar studies.

On perusal of literature, it is observed that there is varied and diverse literature available towards various applications of ICT in different libraries and ICT competencies of LIS professionals. Bibliographic research revealed a narrow spectrum of research studies made on ICT competencies of LIS professionals in polytechnic library systems but a wide spectrum in academic libraries. Adebisi (2020) recognized some of the benefits of ICT to library operation to include speed and ease of access to information, remote access, that is, unlimited access which combats the constraint of closing hours that restricted access to a particular time and hours.

Odunewu and Haliso (2019) opined that successful completion of tasks within designated period and effective delivery of services by librarians are among the indicators of good job performance which in turn predicts the overall success of the library. Job performance refers to how people perform their tasks as set against particular standards. Librarians' job performance can in this context be described as an act of carrying out functions, tasks or schedules relating to librarianship in a particular time and manner expected of a trained librarian. Librarians in public university libraries are expected to render quality services to library users, which in turn predict the quality of its workforce (Igbinoia and Popoola, 2016).

A good way to think about ICT is to consider all the uses of digital technology that already exist that is being used in helping individuals, businesses and organizations to manage information. ICT covers any product that is capable of storing, retrieving, manipulating, transmitting or receiving information electronically in a digital form. The term ICT is also used to refer to the convergence of audio-visual and telephone networks with

computer networks through a single cabling or link system. Rouse (2017) on the other hand opines that ICT is the information infrastructure and component that enable modern computing. She further stressed that ICT is a term that encompasses all information technology, networking components and application software that allow interaction in a digital world.

In this ICT-oriented environment, library professionals must become ICT literate in order to survive. A recent study by Cherinet (2018) has also mentioned that since skills are essential for the success of individuals and libraries, the universities should include emerging skills in curricula to meet the needs of the 21st-century librarians and expectation of potential employer. LIS professional must update and upgrade their ICT skills to perform better in the digital environment. Heavy reliance on technology suggests that LIS professionals must be able to adapt and learn new technologies, advanced skills, and tools such as Web 2.0, for academic success.

Another article by same author (Cherinet, 2018) shows that “perpetual skill, communication skill as one of the required skills unanimously in all job ads. The findings also reveal that knowledge and skills about content management and sharing tools are frequently required by employers.” ICT skills deal with the application of ICT to a specific purpose. It is not just about using a software package or using operating systems, neither is it concerned with keyboarding skills and students’ ability to copy type or follow instructions. Instead, ICT skills are about the ability to use their knowledge about ICT to find, develop and present information; whether it is text, image or number, or this entire integrated task”. It is thus clear that LIS professionals must learn and adjust to a rapidly changing environment and acquire competencies and skills to become a knowledgeable asset to the library. Library professionals then teach these skills to users and other supporting staffs to enable them to search navigate and find the right knowledge from a world of information.

Bansode and Viswe (2017) in their study indicate “that the ICT literacy level of the library professionals working in university libraries in Maharashtra is satisfactory. Majority of library professionals has acquired the basic ICT literacy skills which are required to handle day to day library operations, but still few library professionals need to enhance their literacy level in the area of open-source library automation software, digital library software, and institutional repository software, etc.”

Raju (2017) in his study discusses “IT knowledge and skills needed by academic librarians in the digital library environment. Result reveal that 70 to 75 per cent of job advertisements in the academic library sector emphasis on advanced IT skills (Integrated library system, advanced computer skills, digitization process, web design and development, IR, and technical skills which are repositories, digitization, and curation of research data and other digital content etc.) which librarian should possess. Librarians require IT knowledge and skills to a significant extent in the academic library environment. As research on institutional repository management grow and become complex, the literature addressing different areas of prerequisite skills and competencies for scholarly communication keeps growing too.

Nemati-Anaraki and Tavassoli-Farahi (2018) proposed a conceptual model for scholarly communication through institutional repositories to facilitate and simplify the creation and management of the repository by experts and librarians. Equally,

Oguche (2018) identified insufficient skills and competencies for management of the repository among the challenges of the practice of institutional repositories in Nigeria. Similarly, Adam and Kiran (2019) and Hussain et al, (2017b) showed that there is inadequate knowledge and skills in developing standard interface and providing effective user information needs for achieving the best practice of institutional repository in Nigeria.

Jain and Jain (2017) carried out a study on advancement in Information and communication technologies (ICTs) which has revolutionized the scenario of LIS education and practice everywhere to a significant extent. Khan, Khan, Bhatti, and Bhatti (2017) explored the essential digital competencies for designing, developing and skillful managing of digital libraries. De-Sarkar (2017) described how libraries are incorporating photo-sharing applications into the collection development and service provision to encourage improved user participation around digital inclusion. Aung, Erdt and Theng (2017) have discussed about evaluating research output which has tremendously been changed, and the pattern of dissemination of information in the contemporary electronic age has become very easier and convenient through online mode even in many cases in open access platforms. Similarly, Kumar (2017) observed that information technology can also be used in the library for email, voice mail, telephone and fax communications; videoconferencing, social media, library security including short circuit television (CCTV). According to Adebayo, Ahmed and Adeniran (2018) the challenges facing libraries use of ICT are enormous, prominent among which include inadequate funding; high cost of ICT software and/or operation; poor maintenance culture of ICT equipment in libraries; unstable power supply; dearth of ICT policies; lack of technical ICT skills and competencies among library personnel; technophobia; insufficient bandwidth and copyright and intellectual property management problems.

Kayal, Bandapadnyry and Banerjee (2015) observed that despite acquiring formal and academic qualifications there remain some gaps in acquiring ICT skills amongst LIS professionals as the latest technological developments are not included in the LIS curriculum. To fill the gap, on-the-job training of personnel is very much required. In hindsight, this does not suffice to describe an ideal set of behavioural traits needed for roles. Neither have they guaranteed that LIS professionals would perform to the standards and levels lay down by organizations. The challenge to LIS professionals is mainly centred on the ability to visualize and put forth into practice, the various steps required in enabling the effective performance of respective duties. This in turn could further enable the polytechnic library to open a window wherein innovation could result in the incorporation of the ICT framework by taking into consideration a similar collection of combined competency information. Such steps could result in the creation of an environment wherein LIS professionals could learn and imbibe various ICT competencies whilst on the job. This in turn could ensure that the organization help in the creation of a standardized approach of having LIS professionals updated vis-à-vis ICT competencies. It would also ensure the professionals regarding technological advancements in LIS areas and thus increasing the accessibility of its services to all users in the library. The ICT competency framework so defined could have its outlines transparent regarding the specific job descriptions of every LIS professional. The framework so designed is indeed an effective

method of assessing, maintenance and monitoring of competencies of various personnel in the organization.

polytechnics in the North-Western part of Nigeria, namely the Federal Polytechnic Kaura Namoda, Nuhu Bamalli Polytechnic, and Federal Polytechnic Kaduna.

III. METHODOLOGY OF THE STUDY

The research design for this study is a descriptive survey which is appropriate when studying a phenomenon that tends to seek the opinion of the respondents without the researcher attaching his value (Palmquist, 2017). The population for the study comprises of LIS professionals working in the three selected

Sample Population of the Study

The main targeted populations that serve to achieve the aim of this research were LIS professionals of the three polytechnics in the North western part of Nigeria. The brief description regarding professionals working in the polytechnics are mentioned in table 3.1

Table 3.1 Sample Population

S/N	Name of Polytechnic	Number of LIS Professionals		Library Users/Members (Faculty/ Students/Visitors)
		Libraries (Library Professionals)	LIS Department (Faculty)	
1	FEDERAL POLYTECHNIC, KAURA NAMODA	08	-	100-150 (as per availability)
2	NUHU BAMALLI POLYTECHNIC, ZARIA	08	-	
3	KADUNA POLYTECHNIC, KADUNA	16	01	
Sub-Total		32	01	
Total		From 132 to 152 (as per availability)		

The professionals in the polytechnic libraries are considerably small in number and many of the professionals possess basic ICT Competencies. The sample size of the population ranges from 132 to 152 depending on the availability of the professionals and library users. The other objective of the study is to analyze the curricula of ICT course contents (graduates) in the LIS programmes spread across the different polytechnics. The course content of the select polytechnics and institutions were collected and gathered from their respective polytechnic websites.

IV. THE TOOL USED

Data collected through interviews and questionnaires were collected and fed into the computer for the purpose of consolidation and analyzed to find the results by using Microsoft Excel Statistical package. Questionnaire replies would be based on 'prima facie' study, various points in support of the research questions were sought and finally data in the form of tables obtained for analysis. Descriptive analyses were aimed to be written form based on the findings of analysis. In testing the dependency between the attributes, the chi-square test and P-value for independence of attributes were used.

V. RESULTS AND ANALYSIS

The population for the study consists of LIS professionals working in the three selected polytechnic of the North western part of Nigeria. The total number of permanent professionals in LIS departments and libraries of the three polytechnics under study are 182 (table 5.1). The calculated P-value is 0.325; also the calculated Chi² is 0.971 while the tabulated Chi² is 0.103. The decision is to reject H₀ (Null Hypothesis) if calculated Chi² > tabulated Chi² or If the P-value for the calculated Chi² test to be greater than 0.05 (i.e., P > 0.05), it means the H₀ is to be rejected and accept the alternative value. If the P-value for the calculated Chi² is less than 0.05 (i.e., P < 0.05), then accept the H₀ and reject the alternative value. The conclusion can be drawn that since the calculated Chi² is equal to 0.971 > the tabulated Chi² 0.103. This research work reject null hypothesis (H₀) and accept alternative hypothesis (H₁), that there is ICT competency among the LIS professionals in the three selected polytechnics. The responses collected through the questionnaires were discussed in details in this chapter.

Table 5.1 LIS professionals in three polytechnics

S/N	Name of Polytechnic	Number of LIS Professionals		P/Chi ² - value
		Libraries (Library Professionals)	LIS Department (Faculty)	
1	FEDERAL POLYTECHNIC, KAURA NAMODA	08	-	< 0.325/0.971
2	NUHU BAMALLI POLYTECHNIC, ZARIA	08	-	
3	KADUNA POLYTECHNIC, KADUNA	16	01	
Sub-Total		32	01	
Total		33		

For the purpose of study and having detailed comparative view of the ICT competencies, the population under study has been categorized into the following two groups G-1, and G-2

Response Profile

As discussed in research methodology, 255 questionnaires were distributed to gather the required information from the LIS faculty and professionals in select polytechnics. □ Researcher visited the professionals working in libraries for interview and handed-over the questionnaires personally to them. Lack of time with professionals to fill up the questionnaire and non-availability of some of the professionals at the time of visit was a handicap in getting the filled-in responses. In spite of repeated visits researcher could collect 218 (85.49%) responses out of 255 questionnaires distributed to all the professionals. Polytechnic-wise response from the libraries shows the responses received from the libraries can be considered as reasonably high.

Data Analysis of Group-G1

The data gathered through questionnaire-A regarding the opinions of LIS faculty and experts was also supplemented through face-to-face semi-structured interviews where-ever felt needed to collect quantitative as well as qualitative data. Open ended questions were asked to explore the point of views and opinions of the respondents on major issues in the use of ICT, ICT competencies, adequacy of ICT course contents, availability of basic ICT infrastructure in the LIS departments, etc.

Response Profile of Group-G1

The data gathered through questionnaire-A was received from total of 12 department members (03 Doctors, 03 Chief Lecturers and 06 Principal Lecturers).

Table 5.2 Response profile for group-G1

Questionnaire Number	Group No. / LIS Professionals Of the Group	Designation	Questionnaire distributed	Questionnaire received	Response %
A	G1/ Faculty	Doctors	03	03	100.00
		Chief Lecturers	03	03	100.00
		Principal Lecturers	07	06	85.71
TOTAL			13	12	92.30

Table 5.2 represents the percentage of responses. There was a near perfection in receipt of responses from the respondents. The distribution of the figures clearly show the healthy involvement and sincere attitude of the respondents in showing active interest

and concern with the important issues raised in the questionnaire. The response percentage shows the commitment and cooperation received. The responses were divided into the following eight sub-sections below.

Major ICT Issues

It is observed that ICT and its applications has fulfilled its promise in academic libraries as there is high percentage in the use of ICT based library functions and services. Use of ICT and its applications has also led to the exponential speed of library operational services such as cataloguing, classification, acquisition, processing storage, retrieval and dissemination of information. It is obvious that library personnel will face across various challenges, constraints, conflicts, barriers in use of ICT. Therefore respondents were asked open ended question to give their opinion on these above mentioned issues. The following are the observations:

- It was inferred that about 25% respondents mentioned that there is a lack of confidence to adopt new things, lack of interest to learn ICT and language (technological terms) barrier among the LIS professionals.
- Nearly 83% respondents vehemently advocated that the professionals must be trained in using ICT through various online services. This invariably force the LIS professionals in keeping themselves updated constantly which is not possible for everyone because of time constraints, lack of infrastructure, willingness of the authorities, lack of appropriate training and availability of financial and human resources.
- 42% respondents stated that it is imperative that constant improvement should be on a continual basis towards maintaining efficiency and effectiveness in ICT applications. This is a challenge to LIS professionals for suitable recognition of role as an information specialist.
- 17% respondents stated that training of teachers regarding latest skills and techniques on a regular basis is a serious challenge being faced by all. This is essential as the teachers have to acquire and learn before they could impart to students. Due to various factors (such as information revolution, technological advancement etc.) knowing where to find information and how to use it strategically is a big challenge.
- 33% respondents stated that complementing technology skills with an understanding of the role of ICT should be incorporated in LIS curricula. It is rather difficult to decipher towards LIS courses in relation to ICT-related and non ICT-related subjects. The degree of difficulty arises due to the fact that most of the LIS courses include ICT elements.
- 67% respondents informed that one of the greatest challenges facing educationists is ensuring that the contents of LIS courses are regularly evaluated, revised and updated so as to respond effectively in a rapidly evolving world of LIS profession. This is required as we live and work towards the betterment of LIS profession. LIS courses need to inculcate newer and comprehensive skills in areas of information literacy, information management, information searching, and communication skills along with essential ICT competencies.

ICT Competencies

As competency is a relative term and one cannot say that fulfilling of selected competencies will make one competent otherwise incompetent. The information professionals and LIS

educators need to prepare themselves to possess and be equipped with a range of ICT based competencies to provide the highest quality information services. Therefore, polytechnic libraries in this era will be assessed more on their ability to satisfy their current user needs for information and their ability to link their users to electronic databases scattered worldwide and not necessarily on their ability to buy or subscribe to information materials on paper formats. The information gathered in this question provides important guidance as to the skills sets that LIS professionals are likely to find most useful and sought after. Respondents were asked to give their opinion on ICT based competencies required by the information professionals in the polytechnic libraries. The following are the opinion of respondents regarding this question:

- 17% respondents opined that aptitude to learn and use ICT in library operations is essential. LIS professionals should not aspire to become ICT experts rather they should try to learn the application of ICT for acquisition, storage and retrieval of information.
- 42% respondents expressed that the aspects of hardware, software and networking skills, web based service skills, online database search engines, database creation, digitization, desktop publication skills be dedicatedly pursued by LIS professionals and students. Technical professional skills like information resource management, e-serial management, metadata standards e.g. Dublin core, MARC, TEI2, XML3 etc., system development, knowledge management and traditional skills are to be managed in a regulated and efficient manner.
- 75% respondents named the following attributes necessary for the effective achievement of competencies. They are namely; computer knowledge; knowledge of various relevant databases; key term searching; use of Boolean operators; handling online and offline resources; knowledge of open source software and resources; expertise to manage internet and intranet; information curation; digital preservation; mobile environment; collaboration; social media; coaching and effective facilitation to the users.
- 33% respondents opined that ICT competencies vary for different functions and jobs and therefore understanding of whether and what ICT is essential and useful for particular function with library is almost necessary for the professionals working in the libraries. LIS professionals must be competent with information retrieval and management skills; word processing and desktop publishing skills; webpage design and maintenance skills to work efficiently and effectively in the libraries. In addition, they should possess awareness about communication technologies; production and design technologies; virtual-modeling technologies; file-sharing technologies and social networking technologies so as to provide effective LIS services.
- 67% respondents opined that the LIS professionals should be well versed with ICT competencies such as webpage construction, database design, internet use and evaluation, information use and retrieval. Also they should be well conversant with emergent Web 2.0

technologies such as blogs, podcasts, wikis, Really Simple Syndication (RSS) feeds and social networks. The professionals are expected to be well versed with the areas like ICT competencies; information literacy skills; knowledge management skills which includes using e-mail, internet, databases, e-cataloguing, circulation, planning for library automation and managing automated systems along with time management and public relation skills.

- 70% respondents opined that the present day professionals are entrusted with the knowledge in areas of management competencies; resource development competencies; technical services competencies; reference and information services competencies; general competencies like storage and retrieval technologies; network technologies; communications and library automation; etc. Accordingly, they should efficiently discharge the knowledge to provide service for the betterment of LIS profession and maintenance of its standards.

Evaluation Methodology

The question regarding different approaches to evaluate ICT based competencies of students and professionals by the faculty of LIS departments was asked to know and explore about the level of ICT literacy among students and professionals. Respondents were asked to give their opinion on the evaluation methodology to be adopted for the assessment of ICT competencies. The opinion of respondents on approaches and methods of measuring ICT competencies and the analysis is as follow:

- 83% respondents felt that for professionals working in polytechnic libraries, time to time user surveys with regard to library services should be conducted. The feedback from the user's community will help in further improving the services etc. in the library. Yearly assessment of the work done by the staff should be done and some incentives should be provided to the staff.
- 25% respondents opined that evaluation are done on the basis of theoretical examination for understanding policies and also by practical examination for judging ICT based competencies. Teaching courses involving ICT content largely depends on individual faculty member's knowledge and effective applications of ICT in teaching. Since assessments depend upon classroom observations and individual student's performances, an objective evaluation is required regarding the curriculum which includes assessment of students' achievements and their subsequent accomplishments obtained as a result of teaching aptitude in classroom. The respondents felt that the most common qualitative approach for assessing the ICT competencies of LIS students is by observation of learning in the classrooms in addition to evaluation of examinations in theory and practical. Furthermore, there should be periodic assessment, task oriented exercise and working with ICT gadgets.
- 33% respondents felt that regular feedback of imparted ICT competencies is obtained by means of assignments, projects and seminars. In addition to regular

examinations etc., students are to be encouraged to give impromptu seminars.

ICT Course Content

Respondents were asked to give their opinion on the adequacy of ICT course contents imparted by LIS curriculum in polytechnic departments. The purpose of asking this question is to develop the understanding that have helped to deal with staff and students problems in positive way, helped in improving teaching methods, students learning and the development of the curriculum. The opinions of respondents regarding adequacy of ICT course contents is as follow:

- 25% faculty mentioned that they could provide feedback about various department courses rather than ICT requirements. In their opinion, ICT component at the various levels (i.e., certificate, diploma, graduate, postgraduate, research course work, etc.) is sufficient for a novice to work in a library set up. LIS Faculty should constantly revise the curriculum of its own programmes. Furthermore, they also opined that certain weightage in relation to be given with the fundamentals of librarianship and functional knowledge.
- 67% respondents mentioned that some updates are required on web based services, virtual learning, use of social media in teaching and learning, content development etc. Emphasis must be more on imparting service skills.
- 17% respondents opined that the ICT course contents are too broad and it is impossible towards deciphering about the applicability for all LIS schools. The existing course structure is rigid and inflexible to accommodate emerging needs of the information society and distant learning education. However, joint and combined degrees of other related departments, joint research and development projects could help to maintain adequate ICT course contents.
- 42% faculty mentioned that ICT based examination be compulsorily included in every semester. It is necessary that 1/3rd of courses be ICT-oriented and integration of expertise of teaching staff be done from related disciplines also. In the LIS course, it is imperative that relevant and recommended practical ICT training be incorporated in programme besides in other courses as well. It is also recommended that the programme be restructured offering in its curricula, the ICT related activities. ICT in isolation, has very little to offer but forms an important basic constituent in library education programmes.
- 58% respondents mentioned that it is urgently required to change the admissions criteria and syllabi on a frequent basis and to maintain continuity in this aspect. LIS programmes are made dynamic so as to offer online courses that could make use of ICT. Presently the courses offered are too heavily theory based and dominantly discipline-oriented. The modern library skills are not being adequately included and covered in the present courses offered.
- 19% respondents confirmed that LIS graduates were well trained in ICT competencies while imparting course and all students were trained on different library procedures

by applying all the required practical training of the ICT courses but the work place developed fast enough in terms of technology.

ICT Infrastructure

Respondents were asked to give their opinion on the availability of basic ICT infrastructure in the LIS departments and libraries. The purpose of asking this question is to find out the ways to know about the present status of ICT infrastructural facilities available in polytechnic departments and libraries in relations to the requirements for the library services delivery in this electronic age. LIS educators cannot work in isolation. The LIS profession as a whole must work together collaboratively to ensure it has a bright and relevant future. Collaboration could be made between LIS departments and polytechnic libraries, locally and internationally in areas of availability of basic ICT infrastructure, if not in order. The opinion of respondents on the availability of basic ICT infrastructure in the LIS departments and libraries is as follow:

- 8% respondents stated that they could not provide a complete picture of all the LIS departments but in some departments, for academic purposes they have proper infrastructure and are satisfactory at present.
- 17% respondents informed that departments should have at least well equipped computer lab with required software's. Library should have access center with high speed network connectivity but generally observed that the situation is better and improving.
- 67% faculty opined that most of the students neither use ICT for research nor for online activities due to scarcity of infrastructure besides the hardware and software becomes obsolete after few years from purchase. There is no such system in place for automatic upgrade of hardware and software, resulting in poor ICT based competencies. Internet access was readily available, but majority of possible usage encountered downtime repeatedly. Computers are placed in separate laboratories instead of being in the classrooms wherein learning and teaching are imparted. Students and teachers had access to ICT applications during ICT courses only and not for other courses. It is recommended for having computers in the classrooms and has its usage in different course domains.
- 58% faculty stated that LIS education is largely dependent on computer hardware and software, internet connectivity, ICT competent staff and well equipped laboratories. Unfortunately, necessary funding does not cover these essentials. Departments are deficient and hamstrung in having the technological resources (including high speed PCs, local area networks, printing and scanning facilities, and also audio-visual materials). Most of these deficiencies are in use of hardware, software and other technological resources deemed essential for course instruction of LIS. Sometimes in-house maintenance and technical support are infrequently available. Procedures are very complex to procure necessary hardware and software due to lack of adequate financial support from the department which in turn are grossly inadequate for laboratories to meet the demands

of students. The operation of ICT laboratories is inadequate in terms of usage by student and there were limited access to databases, majority being commercially subscribed.

- 25% respondents felt that the basic minimum requirements are present in department but providing adequate ICT hardware and software needs continuous support and development so that it could meet the standards of the programme and its learners. A substantial number of students are admitted to the programme each semester but they do not get adequate support regarding ICT infrastructure.

ICT Provisions for Continuing Professional Development

LIS professionals including faculty members and experts deliver the lectures to impart training to professionals and students in CEP, SDP, refresher and orientation courses, etc. The purpose of asking this question is to find out whether the current system and methodology of imparting training is appropriate or not and if there is scope for improvement, then to find out the ways to do so. Therefore respondents were asked to give their opinion on the current provisions in ICT for staff development activities in different categories. The opinions are given as follow:

- 17% responses candidly refuse to comment.
- 25% responses reveal that many institutes and training centers are arranging CEP and SDP. They are relevant to every category of professionals. Regular trainings and development activities must be organized to help professionals to grow and which will further enhance the satisfaction level of their users.
- 33% respondents stated that they witnessed that many a times the librarians or immediate seniors do not allow their juniors to go for such events. They also admitted that since the libraries are understaffed and sending juniors for training means the library work will suffer. So some type of provisions must be there to solve this problem.
- 58% respondents informed that refresher courses and other programmes including seminars conferences are quite frequently held but this depends on the teaching staff and the training areas. Teachers of ICT courses possess different levels of ICT competencies, which translate into teachings skills in classrooms. Subsequently it depends wherein the student took the course of concerned teacher. Moreover, in some organizations, students learn very good skills while in others there is no technology involved. They also admitted that they could not train them all in the same place because they were forced to send only a limited number of students to these organizations.
- Approximately about 75% responses reveal that due to evolving (new) technologies, faculty needs to be made aware of these by enabling them to attend refresher courses and seminars as frequently as possible to have the upgraded skills in classrooms. The existing format and forum of imparting ICT education (related to LIS) by means of SDP and CEP are adequate enough for providing students and professionals, all the required competencies. But the department needs a complete

changeover with regard to ICT facilities and training being given to faculty members with special emphasis on ICT course content. Current syllabi and courses should be thoroughly revisited and revised keeping in view the current situational position of LIS courses. Department should have a regular process of having intake of visiting faculty from organizations and others in the area of ICT competencies towards interaction with faculty and students.

ICT Topics

Just as new emerging ICT application is to be added as and when arrived in the curriculum and training programs, likewise old and obsolete study materials are to be deleted so that the time saved will be utilized in learning updated knowledge and skills. Respondents were asked to give their opinion on the inclusion and/or deletion of topics related to ICT in the curriculum and training programmes for the LIS professionals of polytechnic libraries. Following analysis represents the opinion of respondent against this question:

- The responses of 33% respondents revealed that online library, database creation, mobile environment, on-line databases search, digitization, web based services, information resource management, e-serial management and social media should be included in the curriculum and training programmes.
- 8% respondents stated that all courses have the relevant features. However, due to the fact that ICT is evolving and what is new today becomes obsolete very fast, requirement and application of constant up-gradation of ICT tools in library, CEP and SDP are the need of an hour. The bare minimum skills are needed to run hybrid libraries but at the same time continuous training is also required.
- 67% respondents have given the feedback that since library is a service oriented organization therefore any relevant skills that are required for providing efficient service must be the main focus of the programme. New ICT topics useful for LIS should be included. Topics like information audit; web search strategies; online information marketing; content development; metadata and metadata extraction; multimedia applications; web-2.0 tools; digital archives; cataloging of e-resources; digital library software; IT oriented project work and apprentice be added in LIS courses.
- 42% response shows agreement for the promotion of concepts of internship of three to six month or training ranging from six to twelve weeks in reputed and well established libraries. This training or internship is made part of the course. Specific areas like ICT oriented project work and ICT oriented apprentice should be introduced. In addition to existing ICT course contents in LIS syllabus, the topics on library blog designing, digital archives, web-2.0 tools and information audit can be included for a more comprehensive coverage of syllabus.

- 33% respondents advocated regular round table conference be arranged with outside experts in field, organizations and other libraries alongside the department so that brain storming of fresh ideas, existing syllabi and course curriculum be revisited and revised accordingly as per the existing environment of LIS courses.

Other ICT Issues

As the list of questions is by no means exhaustive, therefore respondents were asked to give their opinion on any other ICT related issues regarding LIS professionals so that they can provide comments much liberally which they feel necessary to communicate and are relevant in current scenario. Following are the opinion of respondent against this question:

- 8% respondents had stated that they could not add to more than already provided.
- 17% respondents informed that librarianship is a noble profession and every professional should perform their duties ethically. Therefore, adequate knowledge of ICT and its application in libraries with a positive attitude can make the real difference between the real and desired situation.
- 33% responses reveal that managing and working, both in a modern academic library has become a highly specialized job, which requires proactive attitude towards change and continuous reinvention of the competence among professionals. Library is a service oriented organization therefore any skills that are required for providing efficient services must be the main focus of the curriculum design. Formal education has not helped in getting expertise and skill in topics and neither helped in evaluating information resources in electronic format, handling multimedia systems.
- 17% of respondents stated that the students are not given enough practical training during their LIS studies, 70-75% of courses are theoretical with only 25-30% left for practical training, which is grossly inadequate for obtaining the requisite skills.
- 17% respondents stated that the LIS studies should have at least 50% practicals. If the students wish to acquire the necessary ICT competencies, therefore it is deemed essential for ICT to be included in all daily applications.
- 8% respondents had stated that the department offers selective ICT courses as electives, these results in students not getting an opportunity to learn all the required skills.
- 25% respondents stated that teaching staff should update their own ICT competencies on a regular and continuous basis and should display their ICT competencies for encouragement of the students towards its use to improve their skills. Some of LIS teaching staff lack the requisite ICT competencies themselves but are not readily admitted. This result in improper and limited impart of courses to students which in turn results in largely ignorant and remain oblivious to positive aspects of ICT tools and technologies. The shortcomings consolidate into improper trained students.

Data Analysis of Group-G2

The data gathered through questionnaire-B was received from total of 45 supervisory professionals. Tables from 5.3a to 5.3b represent designation, and gender-wise responses respectively.

Table 5.3a Designation-wise response profile for group G2

Questionnaire Number	Group No./ Professionals of the Group	Designation	Questionnaire distributed	Questionnaire received	Response %
B	G2/ Supervisory Professionals	Librarian	05	04	80.00
		Deputy Librarian	15	14	93.33
		Assistant Librarian / Media Librarian / Information Scientist	29	27	93.10
		TOTAL	49	45	91.83

There was a healthy to near perfection in receipt of responses from the respondents. The distribution of the figures clearly show the healthy involvement and sincere attitude of the respondents in showing active interest and concern to the important issues raised in the questionnaire. The response percentage shows the commitment and cooperation received from the respondents. It is observed that there is an overwhelming

dominance of male gender as compared with female gender. The rather unequal dominant feature could be due to various reasons, chiefly due to non-availability of female gender professionals in LIS field. Other reasons could be varied amongst of which the qualifications, work experience etc., could be a limiting factor.

Table 5.3b Gender-wise response profile for group-G2

S. No.	Designation of Respondents	Frequency	Gender	
			Male	Female
1	Librarian	04 (8.88%)	04 (100.00%)	-
2	Deputy Librarian	14 (31.11%)	09 (64.29%)	05 (35.71%)
3	Assistant Librarian /	27 (60.00%)	24 (88.89%)	03 (11.11%)
TOTAL		45	37 (82.23%)	08 (17.78%)

For the post of librarian, there is total absence of female gender in all the polytechnics while the in case of other designations i.e., DL and AL, there are a large pre-dominance of male gender. This displays the unequal distribution of employment of female professionals not being selected or appointed for various reasons.

professionals working in the libraries. Sub-sections 5.4 represents the opinion of supervisory professionals regarding efficiency in handling of ICT based library functions and services by the professionals, whom they supervise, trained at various degree levels i.e., graduate, postgraduate, (with emphasis on Bachelor’s degree as the highest professional qualification) on the following competency levels.

ICT Competencies of Library Professionals’

User expectation from any information providing system is to make available directly or remotely and in real time the needed information, format notwithstanding. In the polytechnic environment, the library supports teaching, learning and research with information materials of various types. The ICT facilities applied in the library in general and also in particular sections are based on the functions performed therein. Supervisory professionals of all the polytechnic libraries were asked about their opinion regarding handling efficiency of ICT based library functions and services of the professionals whom they supervise. This question ascertains the efficiency of the library professionals in ICT environment. The result of this survey will help to know about the strength and weakness of ICT based competencies on the basis of the professional qualifications i.e., degree levels of the

- Level – I: Basic ICT Competencies
 - Level Ia: Basic Awareness of ICT
 - Level Ib: Basic Windows Functionality
 - Level Ic: Internet and Websites Handling
- Level – II: ICT Competencies by Function (Library Services)
 - Level IIa: Working Knowledge with ICT tools
 - Level IIb: Workstation Skills

- Level IIc: Analytical and Problem Solving Skills
- Level – III: ICT Expertise
 - Level IIIa: Planning and Management of ICT services
 - Level IIIb: Learning Skills
 - Level IIIc: Conceptual Thinking Skills

aptitudes regarding ICT competencies possessed by LIS professionals. In competency level Ia ‘Basic Awareness’, 2% professionals had manageable skills of ICT based library functions and services. 11% professionals had enhanced moderation skills. Contrary to these professionals, 36% professionals could manage it satisfactorily. About 50% could manage the level completely. In case of level Ib ‘Basic Windows Functionality’, there are about 5% professionals that could manage considerably, 41% could manage moderately while 27% could manage it satisfactorily. About 27% could manage the level completely. In level Ic regarding ‘Internet and Websites Handling’, about 6.81% could not manage, about 59% could manage considerably and 30% could manage it moderately. About 5% of professionals could manage it satisfactorily. Accordingly, these findings reveal that LIS professionals are completely aware and have a basic understanding of fundamental ICT competencies.

ICT Competencies of Professionals’ Having Bachelor’s Degree

Table 5.4 represents the opinion of supervisory professionals regarding ICT competencies shown by the professionals, whom they supervise having bachelor’s degree as highest professional qualification. The data revealed a diverse display of varying

Table 5.4 ICT competencies of professionals’ having Bachelor’s degree

CL	Cannot Manage	Somewhat Manage	Moderately Manage	Satisfactory Manage	Completely Manage
Ia	-	1 (2.27%)	5 (11.36%)	16 (36.36%)	22 (50.00%)
Ib	-	2 (4.55%)	18 (40.91%)	12 (27.27%)	12 (27.27%)
Ic	3 (6.81%)	26(59.09%)	13 (29.55%)	2 (4.55%)	-
IIa	38 (86.36%)	5 (11.36%)	1 (2.27%)	-	-
IIb	43 (97.73%)	1 (2.27%)	-	-	-
IIc	44 (100.00%)	-	-	-	-
IIIa	44 (100.00%)	-	-	-	-
IIIb	44 (100.00%)	-	-	-	-
IIIc	44 (100.00%)	-	-	-	-

The competencies regarding ‘Working Knowledge’ i.e., level IIa, about 86% of professionals could not manage ICT based library functions and services. About 11% could manage considerably, 2% professionals managed it moderately. In level IIb regarding ‘Workstation Skills’, about 98% could not manage the competency level. Only about 2% of professionals could manage ICT services considerably. Overall, there is a mixed bag of understandings among the LIS professionals having bachelor’s degree in LIS. Professionals were not in a position to manage the competency levels either in IIa, IIb, IIc, IIIa, IIIb or IIIc. Although it is noted that there is a significant relationship between the frequency (professionals with bachelor’s degree) and the levels of competency but the fact remains that four levels viz., IIc, IIIa, IIIb and IIIc, shows a 100% apparent incompetence. This is a major concern in respect of abilities and capabilities of the LIS professionals with bachelor’s degree.

Supervisory professionals were asked about their opinion regarding minimum number of years (time period) required to learn the ICT related work by newly appointed professionals having LIS degrees at graduate levels. Table 5.5 represents the analysis of respondents’ opinion regarding number of years required to learn the ICT related work and discharges the duties independently by newly appointed library professionals having bachelor’s degrees as their highest qualifications. From the data it is obvious that the graduates required 1 to 4 years to learn the ICT related work which includes 53% professionals take less than 1 year, 42 % of professionals take up to 2 years, 2.22% of professionals up to 3 and 4 years each. This clearly shows that ICT work experience should be included mandatory in the curriculum and more specifically at this level. This proves that degree level has a distinct relation to the number of years required to learn the ICT related work by the library professionals.

Time Period Required To Learn ICT

Table 5.5 Time period required to learn the ICT related work

Competency/ → Degree Level ↓	Opinion of supervisory professionals regarding number of years required to learn the ICT related work by the library professionals whom they supervise.				
	>5 Years	4 Years	3 Years	2 Years	<1 Year
Bachelor's	-	01(2.22%)	01 (2.22%)	19 (42.22%)	24 (53.33%)

Although it is encouraging to note that there is a significant relationship between the frequency and the level of competency levels with special reference to the requisite years being less than one year, however, requirement of more than one year towards acquiring ICT related competencies give an impression that there could be having some understanding difficulties.

Supervisory professionals were asked about in-house training programmes, CEP/ SDP etc., conducted by the polytechnics libraries for library professionals. Table 5.6 represents the analysis of respondent's opinion regarding various types of training programmes/CEP/SDP conducted by the polytechnics libraries.

Training Programmes

Table 5.6 Training programmes conducted by polytechnics

S. No.	Training Programmes/ CEP/ SDP	In-house Training programmes/ CEP/ SDP conducted by the polytechnics libraries		
		KNDP	NBMP	KADP
1	Short-Term Course	No	Yes	Yes
2	Workshops	Yes	Yes	Yes
3	Individual Training by Colleague	Yes	Yes	Yes
4	Training via Online	No	No	No
5	Refresher Course	No	Yes	No
6	Orientation Course	No	Yes	No
7	Lectures/ Seminars	Yes	Yes	No
8	Conference	Yes	Yes	Yes

*KNDP= kaura namoda polytechnic, *NBMP= nuhu bamalli polytechnic, *KADP= kaduna polytechnic

From the responses, it reveals that only NBMP and KADP conduct 'short term courses' while KNDP could not do so. The aspects of 'workshops' and 'individual training by colleagues' were conducted by all the polytechnics. In 'training via online', none of the school conducts the 'training via online'. The 'refresher courses' were conducted by NBMP only while KNDP and KADP did not conduct this type of course. The 'orientation courses' were conducted by NBMP only. The aspects of lectures and seminars were conducted by KNDP and NBMP while KADP did not conduct any. The last aspects of 'conferences' were conducted by all polytechnics. The analysis shows that the LIS departments/ libraries have a positive attitude towards

participation of staff in the various CEP/ SDP conducted by each polytechnic.

Practical Orientation and Training

Respondents were asked about their opinion regarding need of practical orientation and training before graduates and postgraduates are put on the job. It is observed from table 5.7 that maximum number of supervisory professionals (49%) agreed for the need of practical orientation and training of LIS professionals at graduate level. 29% of the supervisory professionals partly agreed, 13.33% strongly agreed and only 9% dis-agree for the need of practical orientation and training of LIS professionals at graduate level.

Table 5.7 Practical orientation and training

Degree Level	Opinion of supervisory professionals regarding need of practical orientation and training to the library professionals' whom they supervise				
	Strongly Agree	Agree	Partly Agree	Dis-Agree	Strongly Dis-Agree
Graduates	06 (13.33%)	22 (48.89%)	13 (28.89%)	04 (8.89%)	-

ICT Course Content Offered By LIS Schools

Respondents were asked about their opinion regarding thoroughness of ICT component in the core, electives and optional papers offered in LIS schools. It is observed from table 5.8 that

56% of supervisory professionals partly agreed and while 33.33% dis-agreed on the opinion that ICT component is thoroughly included in core and elective papers offered in LIS schools at graduate level.

Table 5.8 Thoroughness of ICT course

Courses	Opinion of supervisory professionals regarding thoroughness of ICT component in the core/ electives / optional papers Offered in LIS schools at graduate levels.				
	Strongly Agree	Agree	Partly Agree	Dis-Agree	Strongly Dis-Agree
Core	-	05 (11.11%)	25 (55.55%)	15 (33.33%)	-
Electives	03 (6.67%)	03 (6.67%)	21 (46.66%)	18 (40.00%)	-

In case of elective papers 03 (7%) of professionals strongly agreed, equal number of professionals i.e., 03 (7%) agreed. Further 21 (47%) partly agreed and 18 (40.00%) of professionals dis-agreed on the opinion for thoroughness of ICT component at levels. No one opined for optional papers.

Major Problems In Implementation Of ICT Applications

Respondents were asked about their opinion regarding prominent problems they generally faced during implementation and in applying ICT based services in the library to the optimum level of satisfaction. From the opinions of the respondents (table 5.9), it is inferred that lack of knowledge on part of library staff is one of the major problem mentioned by maximum number of professionals (96%). Other related issues expressed by professionals are namely: inadequate staff strength (91%), inadequate training in ICT applications (87%) and inadequate funding (82%).

Table 5.9 Problems in implementation of ICT based library services

S.No.	PROBLEMS	FREQUENCY(#N)	% OF CASES
1	Lack of knowledge on part of library staff	43	95.56
2	Inadequate staff strength	41	91.11
3	Inadequate training in ICT Application	39	86.67

4	Inadequate funding	37	82.22
5	Lack of support from authorities	33	73.33
6	Negligible demands from users to ICT	27	60.00
7	Lack of infrastructure	19	42.22
8	Lack of co-ordination among library staff	14	31.11
9	Lack of support from polytechnic administration and management	13	28.89
10	Ever increasing cost of ICT infrastructure and resources	11	24.44
11	Inadequate support and initiative from professional associations in conducting specialized training programmes	07	15.55
12	Mental block of Fear of learning	06	13.33

13	Insufficient facilities	03	6.67
14	Inadequate promotional avenues in careers	01	2.22
15	Insufficient back up facilities	01	2.22

#N = 45 (multiple response)

Others issues e.g. negligible support from authorities were indicated by some professionals (73%) and negligible demands from users to ICT (60%). Only few professionals had opinion that lack of infrastructure (42%) and lack of co-ordination among library staff (31%) caused problems in effective use of ICT. Lack of support from polytechnic administration and management was cited as an issue by very few professionals (29%) followed by ever increasing cost of ICT infrastructure and resources (24%), inadequate support and initiative from professional associations in conducting specialized training programmes (15.55%), Mental block of fear of learning (13%). 7% of professionals opined that insufficient ICT hardware and software hindered implementation of ICT based library services.

Few library professionals (2%) also cited inadequate promotional avenues in careers as a problem for ineffective implementation of ICT application. From the survey, it was clear that all the polytechnics have proper ICT infrastructure but were not properly utilized in the absence of annual maintenance contract (AMC). Many times computer systems and soft wares were found to be not in working conditions, even though they incurred heavy cost for AMC's. Separate funds are not allocated for ICT infrastructure and ICT based Library services. Lack of maintenance support; incompetency's in ICT, absence of LIS professionals; vacant positions in libraries, etc., are cited as reasons for not implementing the ICT based functions services in the polytechnic libraries.

VI. ICT COMPETENCY FRAMEWORK FOR LIS PROFESSIONALS IN NIGERIA: A PROPOSED MODEL AND DESIGN

Competencies within this framework would be defined as the application of professionals' ICT skills and capability to effectively achieve results in enabling library users and students to become creative learners and responsible persons. The survey findings would result in creating a model of LIS competency framework that would be strongly valued by both polytechnic departments and libraries.

The ICT competency framework for LIS professionals (ICT-CF-LIS) will be arranged and developed in three successive levels of competencies as follows:

- **Level I: Basic ICT Competencies**
- **Level II: ICT Competencies By Function**
- **Level III: ICT Expertise and**

Each of these competencies could be defined in three successive sub-levels as follows:

- **Sub-Levels Of Basic ICT Competencies (Level-I)** would include Basic/General Awareness, Basic Windows Functionality and Internet and Websites Handling
- **Sub-Levels Of ICT Competencies By Function (Level-II)** would include Working knowledge, Workstation Skills and Analytical and Problem Solving Skills
- **Sub-Levels Of ICT Expertise (Level-III)** would include Planning and Management, Conceptual Thinking Skills and Learning Skills to reflect the context within which the competencies are going to be used and in accordance with the profession levels, designation, professional qualifications and work-profile of the LIS professionals.

All these levels are incorporated for the arrangement and development of the ICT-CF-LIS professionals in Nigeria. The use of pervasive tools which cover by and large all the areas of LIS and encompassing the entire working of the department is to be well thought out by the LIS professionals. In order to achieve this aspect, the integrative approach would have to be considered involving different areas. Similarly the constant flux of the learning, motivation and formation of guidelines need to be well thought out prior to imparting of the learning skills amongst LIS professionals. The conceptual thinking skills of self-management attributes; initiative being taken at one's own level; able to deal with new and innovative ideas and how to implement these in the ICT areas constitute an important tool for exercising due diligence when introducing fresh and newer ideas in LIS areas. Finally the outlook of the LIS professionals in maintaining an objective, flexible and practical approach and desist from negative, subjective and rigid outlook in resolving various ICT problems would go a long way in solving many intricate problems in ICT. Figure 1 represents the description of ICT-CF-LIS. The three competency levels being included in the framework are proposed to be disseminated and dispersed amongst all the levels of the LIS professionals inclusive of all designations and responsibilities. These include entry, mid, senior and finally executive levels comprising of leadership professionals. Together all the factors would ultimately result in enabling of ICT competencies amongst LIS professionals.

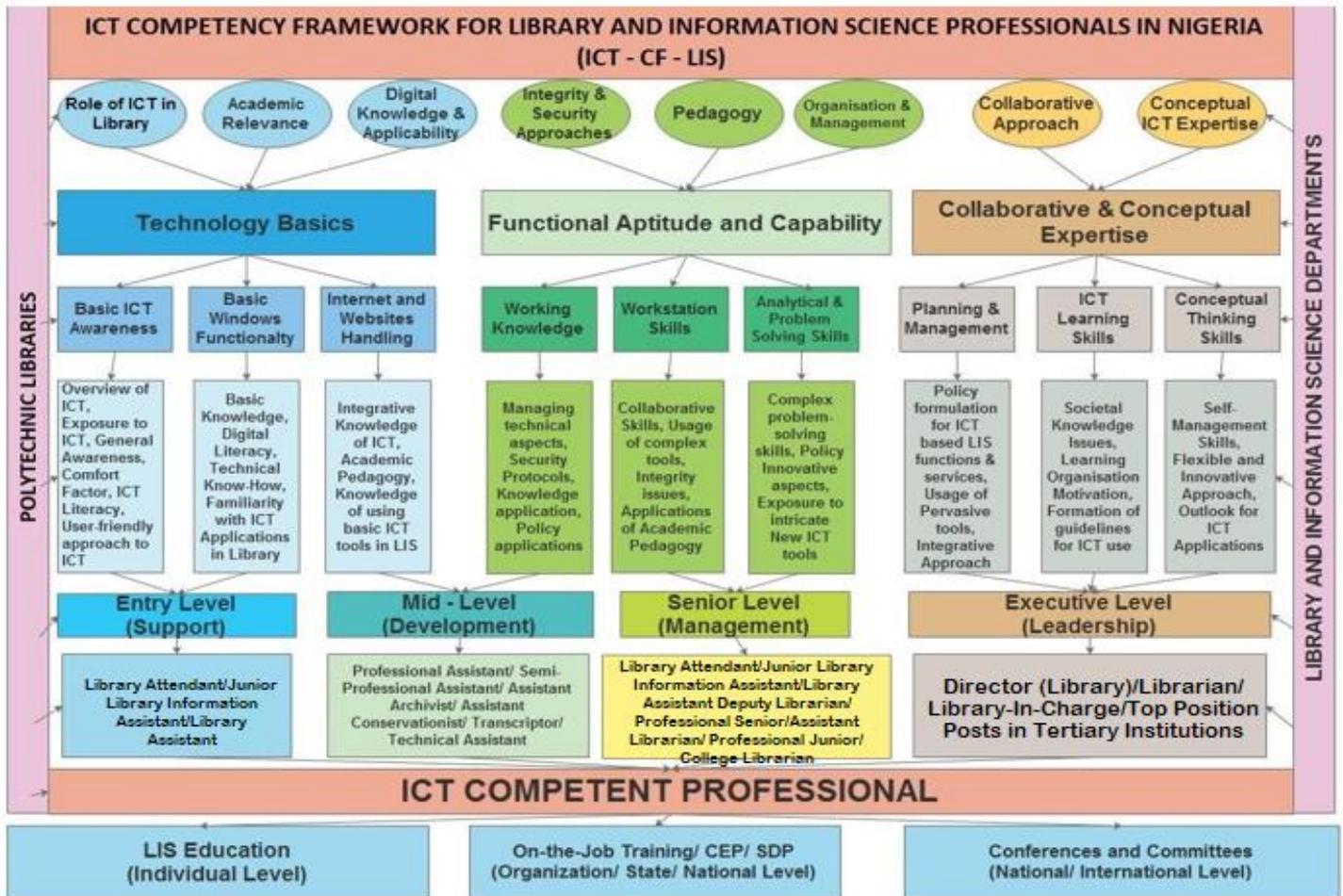


Figure1 ICT-CF-LIS.

VII. CONCLUSION

LIS professionals working for polytechnic libraries are proactively seeking to improve their ICT competencies throughout their career for providing efficient library services. The on-going development of ICT competencies of LIS professionals is a high priority. The technological learning skills and means to acquire sufficient knowledge in specific and appropriate areas are vital for LIS professionals to tackle problem areas, keep abreast of emerging developments and be effective in performing several job tasks. The ICT-CF-LIS results in creating model strongly valued by both polytechnic departments and libraries. Competency framework is planned for continuing education of librarians as a tool to adapt LIS curricula in continued flux of evolving aspirations. Also in context of rising expectations of LIS professionals and users; to support analytical assessment according to the professional development plan; to foster career-long education; lifelong learning among librarians and to check over quality control of polytechnic personnel in terms of ICT competencies.

The proposed model of ICT-CF-LIS is essentially a knowledge based information dissemination system in which co-ordination among different LIS communities is at top priority. The main pivot of a successful competency framework is the

understanding of fundamentals of ICT and its applicability in various streams of resource generated information. This could possibly lead to better information dissemination in the age of technological era wherein newer forms of ICT are being developed as we speak and are relatively unknown to us. Only a continued persistent effort on a regular basis could one hope to master the ICT competencies within the shortest delay at the earliest through constant feedback and interaction amongst the LIS professionals. The ICTs competency framework is designed in such manner which could entail in providing proper guidance and follow up of all LIS professionals in their future endeavours in applicability of ICT in LIS areas.

It helps in achieving the following objectives:

- ❖ To ensure nationwide standardization information on ICT based competencies.
- ❖ To initiate a regular academic related meeting to thrash out various problems associated with understanding issues of framework and work out solutions.
- ❖ To help LIS professionals working in polytechnic libraries in planning of ICT infrastructure and procurement of ICT based information resources.
- ❖ To provide uniform workforce in academic or polytechnic libraries.

- ❖ To support LIS scholars and professionals in continued professional development.
- ❖ To collect important information for learning and updating ICT competencies required for providing efficient and up-to-date library services.
- ❖ To collect feedback from LIS professionals and library users for better planning and improvement of ICT based library functions and services in future.

The framework establishes a common bond throughout the LIS community so that everyone is working together, and it is an integral part of all other strategy systems, processes and tools. It will help the professionals to imbibe the following qualities required and deemed essential towards a rewarding self-actualization career:

- ❖ Introduction to technology literacy, in-depth knowledge resulting in creation of knowledge.
- ❖ Understand what it takes to be technically (independently) successful.
- ❖ Take more control over their ICT competencies.
- ❖ Know expected ICT performance measures
- ❖ Use of basic, complex and pervasive tools of ICT
- ❖ Assist in achieving development goals in ICT based functions and services
- ❖ Creating a common bond throughout the LIS community
- ❖ Ties into other ICT plans, strategies and tools
- ❖ Emerging as a change catalyst resulting from continuous creation of engaging and effective change process in development of ICT; understanding and communicating the need for ICT applications and its necessity in today's LIS syllabus in order to preserve its identity among other subject areas.
- ❖ It also builds and helps the LIS professionals in need for engage and consult with each other towards a better understanding of future LIS curriculum
- ❖ It would result in focusing more effectively on service delivery, academia and other key performance indicators and how ICT relates to LIS profession in order to positively impact the standard of academics.

The intention of the competency framework being designed is not merely to add extra burden to existing overburdened professionals in the present environment of a busy schedule but rather it seeks to enhance their abilities and strive for excellence in the areas due to ever changing scenario of introduction of newer technologies. This in turn would help the ICT competencies to become a part of their professional lives of day-to-day activities, career planning and development. It would also enable productive and effective professional career. The main aim is to guide LIS professionals so that they become more skilled and competent in handling ICT based library services and resources and also identifying gaps in ICT competencies between different levels. The ICTs competency framework is designed in such manner which could entail providing proper guidance and follow up of all LIS professionals in their future endeavours in applicability of ICT in LIS areas.

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Understanding the Effect of University Service Quality on Student Loyalty to Online Learning Adoption in the Light of COVID-19 Pandemic

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Abstract. The COVID-19 Pandemic has caused significant disruption to a wide range of human activities, with academic commitment at universities being one of the most important. By the end of COVID-19, everyone will recognise that universities cannot be held responsible for the adoption of online studies. However, in the context of the COVID-19 Pandemic, it is critical to investigate the relationship between "University Service Quality" and "Student Loyalty" in order to better comprehend the impact of online learning adoption. Studying the Influence of university service quality on student loyalty to online learning adoption in the context of the COVID-19 Pandemic, on the other hand, will lead to greater understanding of how students' commitment to online learning is linked to how satisfied they are with their university's services in the wake of the COVID-19 outbreak. As a result, a focus group experiment was conducted with university students to determine their level of loyalty towards their universities based on their online studies instead of face-to-face. According to the findings, students believe they should be compensated in some way because they paid for face-to-face instruction while receiving online instruction. The universities should not charge the same amount for online learning as it does for face-to-face study. Consequently, they lost a lot of faith in the university, and their loyalty to the university dropped drastically.

Keywords: student loyalty, service quality, COVID-19 pandemic.

1 Introduction

Many human activities have been disrupted as a result of the COVID-19 Pandemic, including university academics' commitments (Watermeyer et al., 2021). Because of COVID-19, colleges will no longer be held liable for the adoption of online courses by their students. In light of the COVID-19 Pandemic, research into the relationship between "University Service Quality" and "Student Loyalty" toward online learning is critical (Putri et al., 2020). In the wake of the COVID-19 pandemic, students' propensity to use online learning may be investigated in terms of how service quality affects their commitment to it. Student progress toward face-to-face learning has been hampered by the COVID-19 problem, which has forced universities to close their campuses and leave them without a plan for restarting face-to-face learning because COVID-19 spreads swiftly. On the 18th of March 2020, universities and practically all academic institutions in Malaysia close as part of the first lockdown for movement control under the "Movement Control Order (MCO)" (Azan et al., 2020). When school was closed for the first time, the first alternative considered was to begin all academic activities online without any prior pilot planning or preparation. The majority of universities were operating under the assumption that, in a few weeks, everything would be back to normal and academic activities would resume as usual.

The increased spread of the COVID-19 makes it difficult to predict when the university will be able to resume normal operations. Unfortunately, the likelihood of the virus spreading can only be predicted or extrapolated in some cases (Case et al., 2021). In practical, all universities around the world uses the option of online learning which has replaced traditional classroom instruction as the primary mode of doing all academic activities (Zalat et al., 2021). As the spread of COVID-19 proceeds, universities are being compelled to implement re-opening measures despite the virus's presence on their campuses (Saikat et al., 2021). The initiatives, on the other hand, place a strong emphasis on the well-being of students and the support provided to those from socioeconomically disadvantaged homes. It is equally crucial that all students participate in the establishment of a comprehensive set of safety measures in order to ensure that students feel comfortable and that they may participate in online learning when away from the university campus. COVID-19 may cause students to be gone from usual academic activities for an extended period of time. If this is the case, it is critical that students consider what academic activities they will be able to participate in during this period of prolonged absence. Furthermore, it is necessary to address general student performance and safety concerns while conducting online

learning activities. Specifically, addressing the requirements of the most vulnerable groups of students and their individual vulnerabilities. The lack of computing resources is one of the most important concerns for these groups, as a lack of such resources may result in a higher risk of school dropout and exacerbated disparities, which are frequently the result of unequal access to alternate learning techniques. These are among the major research problems this current study is willing to solve.

As a result of the COVID-19 pandemic, one of the primary objectives of this current study is to investigate students' participation in an online study in order to analyse the influence of "University Service Quality" on "Student Loyalty" to online learning adoption. Additionally, it is necessary to determine which factors may also have an impact and whether special consideration should be given to students from low-income families, students with disabilities, and other vulnerable students when participating in online studies as a result of COVID-19. Finally, it is necessary to examine whether special needs and vulnerable students are more interested in participating in online studies than the general population.

With the exception of this section, the remaining sections of the paper are organised as follows: The literature review for the study was presented in Section 2, the research methodology was presented in Section 3, the results and discussion of the research were presented in Section 4, and the implications of the research were presented in Section 5. Finally, Section 6 is the conclusion which summarises the findings of the research research.

2 Literature Review

The lack of access to technology or resources necessary for an online study during COVID-19 may cause some students to experience problems (Baticulon et al., 2021). However, even if they have access to the equipment and resources necessary for an online study during COVID-19, other students may experience difficulties in creating a conducive learning environment (García-Morales et al., 2021). Therefore, these children are more likely to suffer from the most severe academic difficulties as well as psychological harm over the course of their education. Typically, university services are not included in the implementation of the tools and resources that students will need to work from home (Sari & Nayır, 2020). There have been a number of past studies that have looked into the nature of student loyalty across the university service quality on pushing students to participate in online learning in the wake of the COVID-19 epidemic.

In the context of university education, the academic and administrative service provided by students results in the university gaining a certain level of loyalty from those who have received that service (Sabo & Yahaya, 2019). To put it another way, when students receive the highest quality academic and administrative services, they become more loyal to the university. Consequently, in terms of university students, service quality is considered to be student-based rather than resource-based, as opposed to other types of students (Awang et al., 2018). Moreover, according to Nguyen (2018), "university staff members are more empowered than employees in other service industries, such as financial institutions, owing to the greater autonomy that they have in communicating with students." As a result, it is expected that human interaction with students in universities will play an important role in defining and assessing service quality in educational settings. In their 2018 paper, Roy, Shekhar, Lassar, and Chen defined perceived service quality as a global judgement, or attitude, about how superior a service is.

Due to the COVID-19 pandemic period, during which students are required to stay away from their university campuses and complete all of their academic activities online, student loyalty will now be a key strategic theme in higher education institutions. To put it another way, universities must strike a balance between their educational offerings, financial systems, and student performance in order to gain a competitive advantage. In terms of what it takes to win a student's loyalty, during COVID-19, attitudinal loyalty expressed through positive words of mouth and recommending specific words of encouragement to students" were discussed (Dumrongsuntithum, & Wongleedee, 2019).

According to previous research, behavioural loyalty is expressed by the frequency with which something is repeated and the consistency with which it is done in relation to the subject under consideration (Pham, Lai, and Vuong, 2019). If a student pays for an on-campus face-to-face mode of study but is then forced to switch to an online mode of study, they may have a problem maintaining their loyalty if they do not receive some sort of discount. That is, students will be aware of their expenses and the value of their purchases, and they will demonstrate cognitive loyalty to a particular institution after critically examining all available alternatives and making a logical decision about their future. As a result, according to Wiklund and Jansson (2019), loyalty includes both readiness to act and resistance to the available alternatives. They argue that loyalty is defined as a customer's intention or predisposition to buy while retention is defined as the behaviour itself. The unique aspect of student loyalty has to do with the amount of time students spend on campus, which allows for systematic relationship building and the development of emotional attachments among them. Iranmanesh and colleagues (2022) discover that the quality of information, trust in members, and social usefulness all play important roles in determining students' satisfaction and loyalty. In other words, student loyalty is critical to any institution of higher learning because it assists in the management and promotion of the institution's academic and non-academic affairs, as well as the establishment, development, and maintenance of successful long-term relationships with current and former students (Annamdevula and Bellamkonda, 2016).

Mostafa and Hamieh (2022) conduct an investigation into the influence of Corporate Social Responsibility activities on attitudinal loyalty and behavioural loyalty using a sample of 203 Lebanese students as a research subject. The findings revealed that ethical, legal, and philanthropic social responsibility have a significant impact on both attitudinal and behavioural loyalty in a company. However, the effect of economic responsibility on attitudinal and behavioural loyalty was found to be insignificant in this study. In

turn, this indicates that student loyalty, similar to customer loyalty, should, at least in the long run, be positively related to student satisfaction and the performance of an educational institution (business unit).

3 Research Methodology

This current study adopts a focus group research methodology, specifically, a teleconference focus group discussion strategy, in order to better understand the relationship between student loyalty to online learning adoption and the university service quality in the context of the COVID-19 Pandemic. All ethical norms were adhered to throughout the process. When the COVID-19 pandemic outbreak occurred, students who were in the midst of their academic careers were eligible to participate in the study. Those who took part in the study were chosen from a pool of answers to invitations to take part in the study. Following that, a consensus was achieved on the group's online meeting schedule, with the goal of performing the teleconference focus group discussion via Microsoft Teams Meeting as the primary method of communication.

At the outset of the teleconference focus group discussion, it was made clear to the participants (students) in the online group discussion that the purpose of the research was to examine the relationship between "University Service Quality" and "Student Loyalty" to online learning adoption in the context of the COVID-19 pandemic. Furthermore, the research aims to measure the extent of student loyalty towards their universities based on their online studies rather than face-to-face interactions with faculty.

Also emphasised to the students was that in order to attain the goal of this study, they would need to participate in a conversation in small groups with one another. The researcher engaged in a discussion with the student and took notes on their points of view. There were approximately six separate group discussions that took place, involving a total of 47 students, with the minimum number of students in a group being six and the maximum number of students in a group being thirteen. In addition, four sessions were held with seven students each, bringing the total number of students in a group to 47. In each of the groups. It took little more than an hour of discussion to get to a conclusion. Within the context of the COVID-19 epidemic, the subject of the discussion focuses on "University Service Quality" as it relates to student loyalty to the university and the use of online learning opportunities. The data was gathered and evaluated in order to produce qualitative outcomes.

4 Analysis and Presentation of the Results

Immediately following the conclusion of each group's discussion, the data analysis and presentation of the results were carried out in the following order: When putting together the material on the group conversation, the transcripts of Microsoft Teams Meetings were used as a resource. As an illustration, this is a fantastic alternative to transcribed text. It has led to substantial breakthroughs in the field of focus group research as a result of these efforts. It has an impact on qualitative research, which is influenced by grouping data into a few subjects ranging from five to seven themes, according to the results of data analysis (Creswell & Creswell, 2017). In order for the information acquired for this study to be properly organised and prepared for analysis, it was necessary to classify and organise it into discrete themes in order for the study's analysis and interpretation to be successful.

Evaluations of Extracted Results

The extraction assessments are also known as data coding, and it is the act of collecting and aggregating information in a novel way in order to develop facts from the information (Miles et al., 2018). As a result of this process, this research was able to extract the most relevant concepts from students' responses of the focus group discussion that was provided by the researchers, and are able to organise them into categories as well. The data gathered from the extracted text, according to the objective of this study, and was organised into concepts and themes. Following extensive deliberation, the summary of ideas and topics was split into categories, which are depicted in the accompanying Table 1. Three experts evaluated the quality of the extracted themes in order to verify that the themes were easily understandable by the readers after they were removed. This ensured that the primary ideas and conceptual elements accurately represented the real facts behind the objectives of what the research is willing test.

Table 1. The Summary of the Extraction Procedures for University Service Quality

Focus issue	Extracted themes
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<p>University Service Quality in the light of COVID-19 pandemic</p>	<ul style="list-style-type: none"> i. ..., as a result of the COVID-19 outbreak, the university sends videos as lectures... ii. ..., because to the COVID-19 epidemic, even the student portal frequently crashes... iii. ..., several internet queries were delayed or inaccessible due to the COVID-19 outbreak, ... iv. ..., given the COVID-19 outbreak, university services have improved. Because of COVID-19's numerous flaws, various public opinions of its good, ... v. ..., due to the entire suspension of most academic activity, the quality of university services cannot be measured, ... vi. ..., the COVID-19 pandemic has questioned university service quality. This occurred due to a broken Internet connection, ... vii. ..., the lockout demotivated me academically, and the university's response to the COVID-19 outbreak was inadequate, ... viii. ..., In light of the COVID-19 epidemic, the quality of university services has deteriorated, ... ix. ..., students have trouble coupling, and if you're studying during lockdown, the quality of university services suffers, ... x. ..., Internet learning is difficult and has hampered university services due to the COVID-19 epidemic, ... xi. ..., although I feel COVID-19 has no impact on my research, the process is cumbersome and has lowered the quality of university services, ... xii. ..., In light of the COVID-19 pandemic, the quality of university services has impacted many families, including mine, ... xiii. ..., the COVID-19 epidemic has prompted worries about university service quality due to frequent Internet connection failures during online classes, ... xiv. ..., COVID-19 has raised the bar for university service quality, ... xv. ..., several times during the lecture, we lost Internet connectivity, ... xvi. ..., the study went well overall, but there were a few Internet issues here and there. Time constraints also hampered research, affecting the quality of university services during the COVID-19 Pandemic, ... vii. ..., In light of the COVID-19 pandemic, I was unable to get what I need quickly, ... viii. ..., slow Internet during lectures makes it difficult to focus on the topic, it has been a concern since the COVID-19 outbreak...
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The extracted themes, dwell on the central issues with the COVID-19 and how it boosted the value of service quality at universities. The extraction indicated a communalities on most online lectures plagued by problems with Internet access, that according to students this is mostly associated to the instructors Internet service. Furthermore, because of the COVID-19 pandemic, some universities are focusing on videos as lectures instead of synchronouns lectures. The extraction of themes indicate that University service quality is tarnished by a COVID-19 pandemic. This is due to many failures associated to student portals frequent crashed. Numerous Internet requests were slowed or halted as a result of the COVID-19 outbreak. Furthermore, concerning student loyalty, the extraction of the finding from the focus grou discussion is presented in Table 2.

Table 1. The Summary of the Extraction Procedures for Student's Loyalty

Focus issue	Extracted themes
<p>Student loyalty towards their universities online learning adoption in the light of COVID-19 pandemic</p>	<ul style="list-style-type: none"> i. ..., although I would prefer to be on campus, I don't want to squander time because we paid for face-to-face education but received online tuition. We should be reimbursed, my loyalty to the university drops... ii. ..., because the university decision is poor, university should have some arrangement in some way because loyalty lies with payment, we paid for face-to-face on campus studiesbut giving online lectures, ... iii. ..., universities are busy and online learning has many issues, but university focus on money most, no discount, no need of loyalty

	<ul style="list-style-type: none">iv. ..., university should repay for the money we spent on in-person instruction and now receive via the Internet, ...v. ..., It is only reasonable that we be rewarded for paying for in-person training while obtaining online training, this is where the loyalty lies, ...vi. ..., online learning is difficult due to lack of involvement, my loyalty remains, but we should be compensated for paying for in-person training while receiving online training, ...vii. ..., COVID-19 has no effect on my university performance, however it will be good if university will give discount, ...viii. ..., the university is still maintaining its good image, because it gives academic leave for people affected by COVID-19, ...ix. ..., there is no interaction with the university, which is problematic. I have problem with the way they handle issue, ...x. ..., the university does not provide enough time for online education, they can do better...xi. ..., despite the university's best efforts, the payment issue remains unresolved, and the degree or quality of my loyalty remains untouched, ...xii. ... The university does everything it can to be faithful to us, but that is not enough....
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In terms of student loyalty, there is a mix-reaction, some students indicate that their loyalty remains intact, whereas the majority are dissapoinmer especially to payment. The extracted themes show that the relationship between students and the university can be better understood and improved by looking at the characteristics of different student groups in various locations. The extracted themes also show that it is possible to create personalised online learning environments that cater to the needs of diverse students and promote their loyalty. Furthermore, the extracted theme als indicatre that it is feasible to develop online learning environments that can tailored to the specific needs of individual students, thus fostering equity in online education. This can help improve student university relationships. It is possible to enhance the quality of the relationships by improving an online learning platforms features.

5 Discussion

Considering the study's findings, it was discovered that the COVID-19 conference has increased the importance of service quality at universities. The fact that students have revealed that they have encountered several instances of Internet connectivity troubles throughout the majority of online courses is critical in proving this point. Associated with this are worries regarding the quality of university services, particularly in the wake of the COVID-19 pandemic, where it has been suggested that, in some circumstances, universities have resorted to providing films as lectures, which has been mentioned as an example. In light of the COVID-19 epidemic, this has a detrimental impact on the perception of the university's service quality. Furthermore, the COVID-19 infection has had an influence on the quality of university services, with even the student portal experiencing frequent crashes as a result of the outbreak. Several online requests were delayed or were not accessible as a result of the COVID-19 epidemic, which had a negative influence on the university's service quality. As a result of the COVID-19 epidemic, the university's service quality has significantly increased. Some people's impressions of its effectiveness have evolved as a result of the numerous loopholes that the public has judged untrustworthy.

As a result of the COVID-19 epidemic, it is impossible to assess the overall quality of university services because the vast majority of academic activities have been discontinued completely. The COVID-19 pandemic has prompted concerns about the quality of university services, which have been highlighted in recent weeks. Because of a technical difficulty with the Internet connection, the synchronous lecture did not run smoothly during the session. Students have been demotivated academically as a result of the lockout, and the university's response to the COVID-19 pandemic has been woefully inadequate. Due to an insufficient service provision, the quality of university services has become a topic of worry following the COVID-19 outbreak in the aftermath. Students are having difficulties coupling, which makes it impossible to maintain the quality of university services in the midst of the COVID-19 pandemic. Studying during lockdown is considerably more difficult. Learning on the Internet is extremely challenging, and this has had an impact on the quality of university services in the wake of the COVID-19 pandemic, as the institution's Internet service has been impacted by the virus. Despite the fact that I believe COVID-19 has had no impact on my research, the procedure has been wasteful and has had an impact on the quality of university services in the wake of the COVID-19 epidemic.

The COVID-19 pandemic has had an influence on the quality of university services, which has in turn had an impact on the institution's ability to function well academically. The COVID-19 epidemic has prompted concerns about service quality at universities, which have been raised in the wake of multiple incidents of Internet connection failure occurring during an online class. In general, the study went smoothly, but there were a few technical glitches with the Internet here and there. Additional time restrictions impeded the investigation, resulting in a reduction in the overall quality of university services during the COVID-19 Pandemic. In the wake of the COVID-19 outbreak, there have been instances when students required a response immediately but were unable to obtain one, resulting in a decrease in the overall quality of university services. Contribution to the university While Internet speed during lectures makes it more difficult to concentrate on the topic, it has also emerged as a source of concern in the wake of the COVID-19 epidemic.

The finding also indicate that it is not the fault of the university that student should not be on campus rather than online, but it was revealed that students do not want to waste their time at home waiting for the returning to campus, despite paying for face-to-face education but receiving online service, it is quite difficult that the university can offer some compensation, while student also expect to receive some form of compensation. As a result of the university's shaky decision, studies should be placed on pause until it can return to campus. Student emphasized that they should be compensated in some way because they paid for face-to-face education while receiving online instruction. They also dwell on not having enough time to devote to a wide range of activities, and online learning has a number of drawbacks. Students' accessibility is a concern, and there is no interaction with other students, that is another fact that drawbacks the loyalty students have for the university. In some certain situation, COVID-19 has had no effect on the academic performance of some students, in their perspective. Some of the opinion of the students lies with the academic leave that the university consider to offer to students for those who have family members who have been affected by COVID-19,

6 Conclusions

The study's conclusions have shown that there is a need for the universities to improve its service quality. Online students report substantial Internet connectivity concerns. This is vital to the case. Concerns have been raised concerning the quality of video lectures sent as lectures following the COVID-19 outbreak. This impacts service quality at the university due to the COVID-19 outbreak. The COVID-19 outbreak is generating frequent crashes in student portals. COVID-19 epidemic caused delays and inaccessibility of online requests, affecting university service. After the COVID-19 epidemic, the institution's service level might improve. The student's perception of universities has changed due to its multiple shortcomings. Because of the COVID-19 pandemic, most academic activities have been halted. Since the COVID-19 outbreak, university services have been questioned. An Internet connection problem halted the synchronised classes. Demoralised by the university's response to the COVID-19 pandemic mode of operations, students have been worries about the quality of university services. With the COVID-19 outbreak, students have problems coupling, and learning is difficult during lockdown. COVID-19 has impacted university services due to disruptions in Internet service. The COVID-19 outbreak had no impact on research activities, because the process become inefficient and lowered university service quality. In light of the COVID-19 pandemic, students sometimes needed immediate action but couldn't obtain it. Finally, the findings show that students believe they should be recompensated because they paid for face-to-face teaching while obtaining online study. Universities shouldn't levy the same fees for online study as they do for in-person study. As a result, they had their trust in the university shaken, as well as their commitment to it.

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Factors Affecting The Performance Of The Java-Bali Province Government In The 2016-2018 Period

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Abstract- Local government performance is a description of the level of achievement of the implementation of an activity/program/policy in realizing the goals, objectives, mission and vision of the organization contained in the strategic planning of an organization. This study aims to determine the effect of the Internal Control System (SPI), the ability to maintain WTP Opinions, and Local Government Organizations (OPD) on the Performance of Local Governments in the province of Java-Bali in 2016-2018. The analytical method used in this research is multiple linear regression. The results showed that the Local Government Organization (OPD) variable had a significant effect on local government performance. While the variables of the Internal Control System (SPI) and the ability to maintain the opinion of the WTP have no significant effect on the performance of local governments.

Index Terms- Local Government Performance, Internal Control System (SPI), WTP Opinions, Local Government Organization (OPD).

I. INTRODUCTION

Regional autonomy is the right, authority, and obligation of an autonomous region to regulate and manage its own government affairs and the interests of the local community in accordance with statutory regulations (Law No. 23 of 2014). With regional autonomy, people's aspirations will be more easily channeled and considered by policy makers into a policy that favors the interests of the community. This statement implies that in the management of local government there is an agency relationship (agency theory) between the community as the principal and the local government as the agent.

The government is required to carry out accountability and transparency in the use of local government budgets. Local government as a public sector organization should present transparent and accountable financial reports. After the enactment of Laws No. 22 and No. 25 of 1999 which stated that the system of government of the Unitary State of the Republic of Indonesia according to the 1945 Constitution gave each region the freedom to carry out regional autonomy. So it can be concluded that Indonesia has implemented regional autonomy, namely since 2000. Autonomous regions

themselves include provinces, districts and cities where the government is the provincial government, district government, and city government. The government is inseparable from the financial aspect which is managed by the local government. Financial reports that are presented transparently are a form of government accountability (Andini & Yusrawati, 2015).

The implementation of research that focuses on the performance of local government in Java-Bali is very rarely found in the available literature. Most of the available literature uses the independent variables of audit opinion and organizational commitment. With these limitations, the researcher wants to add insight by conducting empirical research on the factors that affect the performance of local governments. Researchers will use independent variables consisting of SPI, the ability to maintain the opinion of the WTP, and OPD. Research on WTP and OPD as determinants of local government performance is still rarely done.

Based on the above background, researchers are interested in conducting research on Factors Influencing Government Performance in Java-Bali Province. This research was conducted by analyzing related data in each Regency/City on the Island of Java-Bali in 2016-2018. With this research, it is hoped that it can provide useful information so that it can be used as well as possible.

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Literature Review

a. Local Government Performance

Local government performance is a description of the level of achievement of the implementation of an activity/program/policy in realizing the goals, objectives, mission and vision of the organization contained in the strategic planning of an organization. Performance can also be said as a result (output) of a certain process carried out by all components of the organization against certain sources used (input). The government is said to have good performance if the government is able to manage the government so that it can provide welfare to the community as a whole (Edowati et al., 2021). One of the performance measurements that can describe the performance of local governments is the measurement of financial performance.

Financial performance is an analysis carried out to see the extent to which an entity has carried out the objectives of the entity by using financial implementation rules properly and correctly.

b. Internal Control System (SPI)

According to Government Regulation Number 60 of 2008, the Regional Government Internal Control System (SPIP) is an integral process of actions and activities carried out continuously by the leadership and all employees to provide adequate confidence in the achievement of organizational goals through effective and efficient activities, reliability in financial reports, safeguarding state assets, and compliance with laws and regulations. The function of the internal control system is to prevent fraud that may occur and ensure the implementation of the rules and laws that apply (Indrayani & Widiastuti, 2020).

c. Unqualified Opinion (WTP)

Unqualified Opinion (WTP) is an opinion which states that the audited entity's financial statements present fairly in all material respects and are in accordance with generally accepted accounting principles in Indonesia. According to Mahmudi (2007) the best opinion is an unqualified opinion. An unqualified opinion is given because the auditor believes that the financial statements are free from material errors or omissions. The auditor's belief is based on the audit evidence collected (Nurabiah, 2018).

d. Regional Apparatus Organizations (OPD)

Regional Apparatus Organization (OPD) is a government agency that organizes regional government. In carrying out the government, of course, OPD has standards that must be met for the welfare of the community. To obtain the welfare of the community, OPD has a performance measure for its organization. The level of performance possessed by OPD is very important for the community. The performance in question is managerial performance. Where, managerial performance is how far the achievements of the organization are related to the organization's vision and mission (Nanik Ermawati & Arumsari, 2020).

2.2 Hypothesis Development

a. Influence of Internal Control System on Local Government Performance

According to Mattoasi et al (2021), the implementation of an internal control system can help to achieve the targeted level of performance and prevent resource loss. The internal control system is expected to provide adequate assurance on the achievement of organizational goals through effective and efficient activities. The components in the internal control system, such as a good control environment, will make a good contribution in creating a work atmosphere so that it can encourage employees to improve their performance.

H0: SPI has no effect on Local Government Performance

Ha: SPI has an effect on Local Government Performance

b. The Influence of Ability to Maintain Unqualified Opinion on Local Government Performance

The effect of the ability to maintain WTP opinions on the performance of local governments will be unrelated when the

opinion given by the BPK in the form of the results of the examination of financial statements is more emphasized on the fairness of the presentation of local government financial statements and not focusing on performance (Kusuma & Kurniasih, 2017).

H0: The ability to maintain the opinion of the WTP does not affect the performance of the local government

Ha: The ability to maintain the opinion of the WTP affects the performance of the local government

c. The Influence of Local Government Organizations on Local Government Performance

According to Kristen et al (2018), the higher organizational commitment to local governments will improve the performance of local governments. Therefore, if there is a good relationship and local government employees have loyalty and loyalty to the organization where they work, it will result in the performance of the local government getting better.

H0: OPD has no effect on Local Government Performance

Ha: OPD has an effect on Local Government Performance

III. METHODOLOGY

3.1 Research Design

This research is a quantitative research. According to Sugiyono (2017), quantitative research is a research method based on the philosophy of positivism, used to examine certain populations or samples, data collection using research instruments, quantitative or statistical data analysis, with the aim of testing predetermined hypotheses. The purpose of the quantitative method is to develop a mathematical model, which does not only use theories taken from literature or theory studies, but also to build hypotheses that are related to the natural phenomena to be studied.

2.3 Population and Research Sample

The population is a generalization area consisting of objects The population is a generalization area consisting of objects or subjects that have certain qualities and characteristics determined by researchers to be studied and then drawn conclusions (Sugiyono, 2017). The population of this study is the Regency/City Inspection Report (LHP) data on the island of Java-Bali obtained from the BPK from 2016 to 2018.

According to Sugiyono (2017), the sample is part of the number and characteristics contained in the study. In this study, the samples taken were several regions that included complete information in the Regency/City Inspection Results Reports located on the island of Java-Bali during 2016 to 2018.

The sampling technique in this study used a purposive sampling technique. According to Sugiyono (2016: 85), "purposive sampling is a sampling technique for data sources with certain considerations". The sampling criteria are data or information that is listed in full from the District/City Inspection Results Reports located on the Java-Bali Island during 2016 to 2018.

2.4 Data and Data Sources

This study uses secondary data. According to Indriantoro & Supomo (1999), secondary data is a source of data obtained indirectly through intermediary media (obtained and recorded by other parties). Secondary data are generally in the form of evidence, historical records or reports that have been compiled in published and unpublished archives.

This study uses secondary data sources. Secondary data sources are data sources that do not provide information directly to data collectors. This secondary data source can be the result of further processing of primary data presented in other forms or from other people (Sugiyono, 2017).

The data used is data sourced from the 2016-2018 Audit Results Report (LHP) obtained from the Indonesian Financial Audit Agency (BPK RI).

2.5 Variable Operational Definition

a. Dependent Variable

The dependent variable is the variable that is influenced or that becomes the result, because of the independent variable. The dependent variable in this study is Local Government Performance (KPD). In this study, to calculate the performance of local governments, the Regional Fiscal Capacity Index for each Regency/City on the island of Java-Bali was used in 2016-2018. The following is the formula for calculating the Regional Fiscal Capacity Index:

$$IKFD_{kabupaten/kota-i} = \frac{KPD_{kabupaten/kota-i}}{(\sum KFD_{kabupaten/kota})/n}$$

di mana:

$IKFD_{kabupaten/kota-i}$ = Indeks Kapasitas Fiskal Daerah suatu kabupaten/kota

$KFD_{kabupaten/kota-i}$ = Kapasitas Fiskal Daerah suatu kabupaten/kota

$\sum KFD_{kabupaten/kota}$ = Total Kapasitas Fiskal Daerah kabupaten/kota

n = 122 daerah kabupaten/kota di Pulau Jawa-Bali

b. Independent Variable

The independent variable is a variable that affects or causes a change or emergence of the dependent (bound) variable.

1. Internal Control System (SPI)

The internal control system is measured using the value of audit findings on the internal control system which is calculated using the ratio scale formula of the number of SPI enforcement. It is calculated using the number of violations of the SPI against the total number of SPIs examined in the BPK RI Audit Result Report. The internal control system in this study consists of the control environment, risk assessment, information and communication, control and monitoring activities.

2. Ability to Maintain Unqualified Opinion (WTP)

Opinion is a professional statement as the auditor's conclusion regarding the fairness of the information presented in the financial statements (Law No. 15 of 2004 concerning Financial Audit). The WTP opinion variable uses an ordinal scale. The ability to maintain an unqualified opinion is measured based on the results of the BPK's opinion by giving a value of 1 for an Unqualified Opinion (WTP) and a value of 0 for a non-WTP opinion.

3. Regional Apparatus Organization (OPD)

Regional Apparatus Organization (OPD) is a government institution that organizes regional government. OPD has a performance measure for its organization. The OPD variable is measured in the BPK RI Inspection Result Report through the level of performance possessed by the OPD, namely by using the number of regional apparatus organizations in each district/city.

III. RESULTS AND DISCUSSION

3.1 Description of Research Data

This study examines the influence of the Internal Control System, the ability to maintain Unqualified Opinions, and the Organization of Regional Apparatuses on the Performance of Local Governments in Java-Bali for the 2016-2018 period. The population in this study during 2016-2018 was 122 districts/cities in Java and Bali. Sampling is by using a purposive sampling method with criteria covering districts/cities that have an Internal Control System, the ability to maintain opinion, and the organization of regional apparatus. All districts/cities in Java and Bali met the criteria for sampling with a total of 122 districts/cities.

3.2 Classical Assumption Test Results

Classical assumption test is used to find out whether the model being tested has met the classical assumptions. To fulfill these conditions, normality test, multicollinearity test, heteroscedasticity test, and autocorrelation test must be carried out.

a. Normality Test

The normality test in this study was carried out using the Central limit Theorem (CLT) test instrument, that is, if the number of observations is large enough ($n > 30$), then the assumption of normality is ignored (Gujarati, 2003). The number of n in this study is $366 > 30$, so it can be concluded that the data is normally distributed and can be called a large sample.

b. Multicollinearity Test

The multicollinearity test aims to test whether the regression model found a correlation between the correlations between the independent variables. To detect the presence of multicollinearity, it can be seen from the tolerance value and the Variance Inflation Factor (VIF). A regression model does not

have multicollinearity if the tolerance value is > 0.10 or equal to the VIF value < 10 . The results of the multicollinearity test are shown in Table 1.

Table 1. Multicollinearity Test Result

Model	Collinearity Statistics	
	Tolerance	VIF
1 (Constant)		
SPI	.966	1.035
WTP	.966	1.036
OPD	.999	1.001

a. Dependent Variable: KPD

Source: Data processed using SPSS 25

Table 1 shows that the calculation results of the tolerance value of all independent variables are > 0.10, and have a VIF value of < 10, so it can be concluded that there is no multicollinearity in the regression model, which means that there is no correlation between independent variables.

c. Heteroscedasticity Test

A regression is said to have no heteroscedasticity if it has a significance value greater than 5% or 0.05. The test used to detect the presence of heteroscedasticity in the regression model is the Spearman test. Based on the results of the heteroscedasticity test, the residual values obtained are as follows:

Table 2. Heteroscedasticity Test Result

Spearman's rho	Variable	Unstandardized Residual	
		Correlation Coefficient	Value
SPI	Correlation Coefficient		.009
	Sig. (2-tailed)		.868
	N		366
WTP	Correlation Coefficient		-.002
	Sig. (2-tailed)		.975
	N		366
OPD	Correlation Coefficient		.041
	Sig. (2-tailed)		.429
	N		366
Unstandardized Residual	Correlation Coefficient		1.000
	Sig. (2-tailed)		
	N		366

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Data processed using SPSS 25

Based on table 2, it shows that the Internal Control System (SPI) variable, the ability to maintain Unqualified Opinion (WTP), and Regional Apparatus Organization (OPD) have a significance value (2-tailed) of 0.868, 0.975, 0.429, respectively. which is more than 5% or 0.05, thus it can be concluded that there is no symptom of heteroscedasticity between independent variables in the regression model.

d. Autocorrelation Test

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One way to detect the occurrence of autocorrelation is by looking at the Durbin-Watson (DW) number which is compared to the DW value in the table. In the regression model, it can be said that there is no autocorrelation if the value of $DU > DW > (4-DU)$. The results of the autocorrelation test are shown in table 3.

Table 3. Autocorrelation Test Result

Model	R	R Square	Adjusted R Square	Durbin-Watson
1	.333 ^a	.111	.104	1.907

a. Predictors: (Constant), OPD, SPI, WTP

b. Dependent Variable: KPD

Source: Data processed using SPSS 25

3.3 Multiple Linear Regression Analysis

Multiple linear regression analysis was used to prove the research hypothesis which states the influence of the Internal Control System, the ability to maintain Unqualified Opinions, and the Organization of Regional Apparatus on the Performance of Local Governments. The results of multiple linear regression analysis are shown in Table 4.

Table 4. Regression Test Results

Model	B	Std. Error	Beta	t	Sig.
C	2.967	0.237		12.514	0.000
SPI	-0.011	0.016	-0.035	-0.691	0.490
WTP	0.035	0.155	0.011	0.227	0.821
OPD	0.015	0.002	0.332	6688	0.000

Source: Data processed using SPSS 25

a. Coefficient of Determination Test

Table 5. Coefficient of Determination Test Results

Model	R	R Square	Adjusted R Square
1	0.333	0.111	0.104

a. Predictors: (Constant), OPD, SPI, WTP

b. Dependent Variable: KPD

Sumber: Data diolah menggunakan SPSS 25

Based on table 5 above, it can be interpreted that the coefficient of determination of the adjusted R square is 0.104. The R2 value is 0.104 or equal to 10.4%. This means that the Internal Control System (SPI) variable, the ability to maintain Unqualified Opinion (WTP), and Regional Apparatus Organizations (OPD) simultaneously affect the dependent variable, namely Local Government Performance (KPD) of 10.4%. The rest (100% - 10.4% = 89.6%) is influenced by other factors outside the regression equation or variables not examined.

b. Simultaneous Test

Table 6. Simultaneous Test Results

Model	Sum of Squares	df	F	Sig.
Regression	30.783	3	15.064	0.000
Residual	246.586	362		
Total	277.369	365		

a. Dependent Variable: KPD

b. Predictors: (Constant), OPD, SPI, WTP

Source: Data processed using SPSS 25

Based on table 6, it can be seen that the value of sig.F (0.000) is less than (0.05), so it can be concluded that the Internal Control System (SPI), the ability to maintain Unqualified Opinion (WTP), and Regional Apparatus Organization (OPD) simultaneously or jointly affect the Performance of Local Governments (KPD).

c. Partial Test

Table 7. Partial Test Results

Variabel	B	t	Sig.
(Constant)	2.967	12.514	.000
SPI	-.011	-.691	.490
WTP	.035	.227	.821
OPD	.015	6.688	.000

Source: Data processed using SPSS 25

From the results of the t-test above, conclusions can be drawn about whether or not the influence of these independent variables is significant on the dependent variable. The results are as follows:

1. The Influence of the Internal Control System (SPI) on the Performance of Local Governments in Java and Bali in 2016-2018
The probability or significance value (sig.) of the Internal Control System variable is $0.490 > 0.05$, then H_0 is accepted. Thus, the Internal Control System (SPI) has no significant effect on Local Government Performance (KPD) in Java and Bali in 2016-2018.
2. The Influence of the ability to maintain an Unqualified Opinion (WTP) on the Performance of Local Governments in Java and Bali in 2016-2018
The probability or significance value (sig.) of the ability to maintain an unqualified opinion (WTP) variable is $0.821 > 0.05$, then H_0 is accepted. Thus, the ability to maintain an Unqualified Opinion (WTP) has no significant effect on the Performance of Local Governments (KPD) in Java and Bali in 2016-2018.
3. The Influence of Regional Apparatus Organizations (OPD) on the Performance of Regional Governments in Java and Bali in 2016-2018
The probability or significance value (sig.) of the Regional

Apparatus Organization (OPD) variable is $0.000 < 0.05$, then H_0 is rejected. Thus, Regional Apparatus Organizations (OPD) have a significant effect on Regional Government Performance (KPD) in Java and Bali in 2016-2018.

3.4 Discussion

a. The Influence of the Internal Control System (SPI) on the Performance of Local Governments in Java and Bali in 2016-2018

From the results of multiple linear regression analysis, it is known that the Internal Control System (SPI) has no effect on the performance of the local government, with a sign (p-value) of $0.490 > (0.05)$ and means that H_0 (Internal Control System (SPI) has no effect. on Local Government Performance) is accepted, so it can be concluded that the Internal Control System (SPI) has no significant effect on Local Government Performance.

These results prove that the improvement of the Internal Control System (SPI) does not have an impact on the performance of the local government. This can happen because the internal control system in an organization is not the main focus, so that the implementation of the Internal Control System within the Regional Government cannot be optimal, as a result the level of performance in the government will decrease and lose resources. These results are in line with research conducted by Ikhyannuddin (2021), where the internal control system has no effect on the performance of local governments in Bireuen Regency in 2020.

Meanwhile, different results were found by Mattoasi et al (2021), where the internal control system has a significant effect on the performance of local government in Gorontalo Regency. Optimal control will contribute to creating a work atmosphere, so that it can encourage employees to improve their performance. The internal control system directly affects the performance of local government apparatus through the control environment, risk assessment, control activities, information and communication, and monitoring. Thus, the better the internal control system is understood and implemented, the better the performance of the local government apparatus.

b. The Influence of the ability to maintain an Unqualified Opinion (WTP) on the Performance of Local Governments in Java and Bali in 2016-2018

From the results of multiple regression testing, it is found that the ability to maintain WTP opinion has no effect on the performance of the local government, because it has a sign (p-value) of $0.821 > (0.05)$, so H_0 (the ability to maintain an unqualified opinion has no effect on the performance of the local government) is received.

The opinion given by the BPK does not affect the current government's performance in getting an opinion. This can happen because the local government in carrying out its work to improve performance has completed its activities and tasks as planned, the outcome has been achieved, and does not violate the SPI, so that WTP opinions are not found. This is in accordance with the research

conducted by Kusuma & Lulus Kurniasih (2017), where opinion has no effect on the performance of district/city governments in Indonesia in 2015.

Kirana (2020) found different results, where opinion had a significant effect on the performance of local governments in Indonesia in 2018. BPK's opinion can be a benchmark in assessing the accountability of a government entity and can reduce or increase the level of stakeholder confidence in the reporting presented by the parties. audited, in this case the local government entity. From this explanation, it can be concluded that the BPK audit opinion is a form of local government accountability that can be assessed by the public, namely the better the ability to maintain opinions, the better the performance of a local government.

c. **The Influence of Regional Apparatus Organizations (OPD) on the Performance of Regional Governments in Java and Bali in 2016-2018**

The test of the Regional Apparatus Organization (OPD) variable on the Regional Government Performance has results that have a significant positive effect, with a sign (p-value) of $0.000 < (0.05)$, so that H_0 (Local Apparatus Organization (OPD) has no effect on Local Government Performance) is rejected.

This shows that regional apparatus organizations affect the level of performance of regional governments, which means that the more regional apparatus organizations, the activities and tasks carried out by regional governments are in accordance with their respective OPD fields, so that there are no concurrent tasks for each OPD. Similar results were found by Kristen et al (2018), where regional apparatus organizations had a significant effect on the performance of local government officials in Semarang City in 2018. Meanwhile, different results were found by Gumilang & Mile (2019), where the number of OPD did not affect the performance of local government officials in Palu City in 2019.

IV. CONCLUSION

Based on the tests and discussions that have been carried out by researchers, it can be concluded as follows:

1. Based on the simultaneous tests that have been carried out, the Internal Control System (SPI), the ability to maintain Unqualified Opinions (WTP), and Regional Apparatus Organizations (OPD) simultaneously have a significant effect on Regional Government Performance.
2. Based on the results of the partial test that has been carried out, the Internal Control System (SPI) has no significant effect on the performance of local governments, then H_0 is accepted and H_1 is rejected.
3. Based on the results of the partial test that has been carried out, the ability to maintain an Unqualified Opinion (WTP) has no significant effect on the performance of local governments, then H_0 is accepted and H_1 is rejected.

4. Based on the results of the partial test that has been carried out, Regional Apparatus Organizations (OPD) have a significant effect on the performance of local governments, then H_0 is rejected and H_1 is accepted.

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Pattern Of Electrocardiography Findings And Correlates Among Pregnant Women At The Three Trimesters Of Pregnancy In Southwest Nigeria

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Abstract- Background: The hemodynamic and cardiovascular status of women during pregnancy changes in a pattern that completely differs from the non-pregnant state which may aggravate pre-existing asymptomatic heart disease or cause new-onset heart disease in the susceptible heart. This study assessed the electrocardiography patterns of women in each trimester of pregnancy.

Method: The study adopted a cross-sectional design carried out on ninety-six pregnant and one hundred nonpregnant women between the ages of 18 and 45 years. A self-administered questionnaire was used to obtain general data with informed consent. Each subject had a complete clinical cardiac status assessment. A resting 12-lead electrocardiogram was obtained in accordance with the recommendations of the American Heart Association specifications. Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 20.0.

Results: This study demonstrated a 39% progressive increase in cardiac output. The individual contribution of stroke volume and heart rate was 23% and 16% respectively. Up to 18% had diastolic blood pressures lower than 60mmHg with significantly lower mean arterial pressure recorded by the end of the first trimester. All the participants had a background sinus rhythm but with a variable abnormality of impulse generation and conduction. The mean frontal plane QRS axis showed a leftward trend among pregnant subjects (35.4 Vs. 48.4°, $p = 0.001$).

Conclusion: The role of Electrocardiography in pregnant women is not limited to establishing cardiac dysfunctions or variations but as a cogent tool in risk assessment of preventable cardiovascular sequelae during pregnancy.

Index Terms- electrocardiography, pregnant women, ECG during pregnancy, cardiac output.

I. INTRODUCTION

The Electrocardiogram (ECG) is the Voltage–Time tracing of the electrical activity of the heart viewed from within the heart

(His-Bundle ECG) and or the surface (Scalar ECG). The ECG is usually affected by several physiologic factors among which is age, sex, height, weight, race, nutritional status and chest circumference.¹⁻³

Pregnancy is a physiological process associated with various hormonal, cellular and tissue adaptations to cope with the increased metabolic demands of the mother and the growing foetus. There are such great changes in the hemodynamic and cardiovascular status of the mother that all measurable cardiovascular variables change in a pattern that completely differs from the general population and in the non-pregnant state.³ These hemodynamics and cardiovascular changes may mimic heart disease in the apparently normal heart and may as well aggravate pre-existing asymptomatic heart disease or cause new-onset heart disease in the susceptible heart. Various reports have shown that one of the commonest causes of pregnancy-related mortality is cardiovascular disease. However, diagnostic difficulties may occur due to haemodynamic and cardiovascular changes associated with pregnancy.⁴

There is evidence from previous studies to suggest that some electrocardiographic parameters are, indeed, altered by the pregnant state⁵⁻⁸ and the known cardiovascular adaptations to pregnancy represent potential mechanisms by which these alterations may arise.

Carr and palmer⁸ reported a leftward axis deviation as a normal characteristic in pregnant Caucasian women in the third trimester while Hollander and Crawford⁴ reported a mean leftward axis deviation of 15° with some individual subjects showing left axis deviation as much as 28°. This deviation was attributed to the transverse displacement of the heart and also to its clockwise rotation around its long axis due to the effect of the gravid uterus. Zatuchi⁹, Carruth *et al.*⁸ and Wenger¹⁰ confirmed the leftward deviation of QRS axis, especially in the third trimester of pregnancy. In addition, increase in heart rate was also reported as accompanying pregnancy. Iwobi *et al.*¹¹ in a study involving 41 Nigerian pregnant women reported leftward QRS axis deviation with no significant changes in the heart rate. However, Akinwusi

et al¹² found a normal frontal-plane QRS axis, normal PR interval, significantly rare normal Negroid pattern ST elevation, significant left ventricular hypertrophy (LVH) based on Araoye RI >12 mm and a rarity of all forms of arrhythmias in a study of 69 Nigerian women.¹²

Although Electrocardiographic changes in normal pregnancy have been clearly demonstrated in Caucasians, similar studies in Negros are relatively scarce. However, there is a paucity of data on these changes in the black population especially in this study area, despite several data showing higher prevalence of pregnancy related cardiovascular death in blacks.⁵

II. METHODOLOGY

Study area

The study was carried out at the Ladoke Akintola University of Technology (LAUTECH) Teaching Hospital (LTH) Ogbomoso, located in Ogbomoso town, Oyo state Nigeria. It is a tertiary institution that serves as a referral Centre for the entire community as well as surrounding cities and states. Ogbomoso lies on the plateau of Yorubaland (elevation 1,200 feet) in an area of savannah and farmland at the intersection of roads from Oyo, Ilorin, Osogbo and Ikoyi which bound the city in the south, north southeast and southwest respectively. Ogbomoso is estimated to have a population of about 1.2 Million people majority of whom are of the Yoruba ethnic group. Ogbomoso is the second largest city in Oyo state after the capital city of Ibadan.^{13,14}

Study design

The study was a cross-sectional study

Sample size

The sample size was determined using the formula¹⁵

$$n = \frac{r+1}{r} \frac{(\bar{p})(1-\bar{p})(Z_{\beta} + Z_{\alpha/2})^2}{p_1 p_2}$$

r = Ratio of subjects to controls

Z_{β} = Represents the desired power (typically 0.84 for 80% power).

$Z_{\alpha/2}$ = Represents the desired level of statistical significance (typically 1.96).

P_1 = Proportion of various abnormalities on ECG in the subjects=0.102

P_2 = Proportion of various abnormalities on ECG in the control=0.000

$$\bar{P} = \text{Average proportion} = \frac{P_1 + P_2}{2}$$

$$n = \frac{2(0.051)(0.949)(0.84+1.96)^2}{0.010404}$$

=72.943. Therefore n=146

The proportion of various abnormalities on ECG from a previous study¹² in Nigeria in the subjects and control was 10.2% and 0.0% representing p_1 and p_2 respectively Therefore 96 cases and 100 (hundred) controls were recruited.

III. STUDY POPULATION

Ninety-six consecutive pregnant women in all trimesters of pregnancy (stratified as follows: 24 pregnant women in first trimester, 39 in second trimester and 33 in the third trimester) and one hundred non pregnant women between the ages 18 and 45 years.

Sampling Technique

Consecutive pregnant women in all trimesters who satisfied the inclusion and the exclusion criteria after administration of questionnaire were serially recruited for the study until the sample size was met.

The controls were age-matched female subjects who were not pregnant. The control participants were selected from the members of staff and undergraduates of various departments of the Ladoke Akintola University of Technology and the members of staff of LAUTECH Teaching Hospital (LTH). All selected controls were free of cardiac disease.

Verbal and written informed consent were obtained after careful explanation of the study to them and the study questionnaire was administered to each participant to obtain biodata and other relevant information.

Procedure

Each subject had a complete clinical cardiac status assessment. A resting 12-lead electrocardiogram was obtained in accordance with the recommendations of American Heart Association specification¹⁶ using the Schiller machine CS-200 model. Recording was commenced after participants had rested for at least 15 minutes and ECG tracing ran at a speed of 25mm/second. For the purpose of this study ECG tracing were evaluated using the abnormalities below:

- (a) Sinus bradycardia = ECG heart rate < 60 beats per min in sinus rhythm
- (b) Sinus tachycardia = ECG heart rate > 100 beats per min in sinus rhythm
- (c) Left ventricular hypertrophy(LVH)
 - (i) $SV_1 + RV_5 \geq 35mV$ (Sokolow – Lyon criteria)⁵
 - (ii) $SV_1 + RV_6 \geq 35mV$
 - (iii) $SV_2 + RV_6 > 3.5mV$ (Araoye's criteria)³
 - (iv) $SV_2 + RV_5 > 3.5mV$
 - (v) Flat or inverted Twaves (strain pattern) in V_5 or V_6 ,
 - (vi) R_1 amplitude > 1.2mV.
 - (vii) $RaVL + SV_3 \geq 20$ Cornell's criteria
- (d) Right ventricular hypertrophy(RVH) = $RV_1/SV_1 \geq 1$ or $RV_1 \geq 7mm$
- (e) Axis deviation
 - (i) Normal axis = QRS axis between 0 to +90°
 - (ii) Left axis deviation = QRS axis less than 0 to -90° (depending on the age of the subject)
 - (iii) Right axis deviation = QRS axis > +90°
- (f) Atrioventricular(A – V) block
 - (i) 1st degree = P – R interval > 0.20 sec¹⁷
 - (ii) 2nd degree (morbitz type 1 or type 2) Morbitz type 1 {characterized by progressive prolongation of the PR interval before a nonconducted P wave} Morbitz type 2 {characterized by a nonconducted P wave without preceding PR prolongation}

- (iii) 3rd degree/Complete A – V block (in which none of the Orthograde impulse reaches the ventricles)
- (g) QT interval corrected for heart rate using the Bazett's formular, $QTc = \frac{QT}{\sqrt{R-R}}$ Prolonged when = QTc interval > 0.47sec¹⁷
- (h) ST segment, T wave repolarization changes (a) J point > 1mm above (ST segment elevation) or below the base line (ST segment depression) (b) Inverted T-waves.¹⁷
- (i) Left atrial enlargement by various indices: Morris index (Biphasic P wave in V1 with terminal force $\geq 1mm$), Macruz index (Ratio of P duration to PR segment >1:1.6 (Macruz index), Duration between peaks of p wave notch >0.04s or Maximal p wave duration >0.11s¹⁷
- (j) OTHERS – any other notable ECG abnormalities (Right atrial enlargement-RAE, arrhythmias).

Data Analysis

Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 20.0 for windows (SPSS Inc; Chic; Ill). Continuous data were presented as mean \pm standard deviation and categorical variables were presented as percentages. The chi-square was used to compare the relationship between qualitative variable, T-test and analysis of variance (ANOVA) to assess for significant associations between group means in quantitative variables. Statistical significance was taken as $p < 0.05$, and the confidence level of 95%.

Ethical clearance

Approval by the Ethical Review Committee of Ladoko Akintola University Teaching Hospital (LTH), Ogbomosho was obtained prior to commencement of the study.

IV. RESULTS

The study included 196 subjects consisting of 96 pregnant women and 100 controls. The mean gestational age of subjects in the first trimester was 10 ± 2 weeks, second trimester was 24 ± 3 weeks and third trimester was 34 ± 3 weeks. The mean age of both pregnant women and the controls were similar (28.1 ± 5.1 vs. 26.4 ± 5.3 years, $p=0.10$). Thirty-six percent ($n= 35$) of the pregnant women were primigravidae. Table I.

The weight of the pregnant women was significantly higher than that of the control (64.9 ± 11.8 vs. 59.7 ± 12.0 kg, $p=0.01$) whereas the height was higher in control than the pregnant women (1.58 ± 0.06 vs. 1.61 ± 0.06 m, $p= 0.17$). The body mass index was significantly higher in the pregnant women than in the controls (26.0 ± 4.1 vs. 23.2 ± 4.4 , $p < 0.001$).

Table I: Socio-demographic and Anthropometric Parameters of subjects and Controls

VARIABLE	SUBJECTS Mean \pm SD (n = 96)	CONTROLS Mean \pm SD (n = 100)	P VALUE
Age (years)	28.1 \pm 5.1	26.4 \pm 5.3	0.10
Weight (kg)	64.9 \pm 11.8	59.7 \pm 12.0	0.010*
Height (m)	1.58 \pm 0.06	1.61 \pm 0.06	0.003*
BMI (g/m ²)	26.0 \pm 4.1	23.2 \pm 4.4	< 0.001*

BSA (m²)	1.68 \pm 0.17	1.63 \pm 0.17	0.093
Average income (Naira)	14,940	\pm 13,401 \pm 8,248	0.566
Parity (N)			
0	35 (36.5%)	84 (84.0%)	
1	29 (20.2%)	6 (6%)	
2	14 (14.6%)	2 (2%)	
3	10 (10.4%)	5 (5%)	
4	7 (7.3%)	2 (2%)	
5	1 (1.0%)	1 (1%)	

Key: **SD**= standard deviation, **BMI**= Body mass index, **SBP**= systolic blood pressure, **DBP**= diastolic blood pressure, **BSA**= Body surface area, **kg**= kilograms, **m**= metres * statistically significant

The mean systolic and mean diastolic blood pressures were lower in pregnant women compared with the controls. However, up to 18% of pregnant women had diastolic blood pressures lower than 60mmHg as against 3% of the controls. (OR= 0.240, CI = 0.067-0.852, $p = 0.018$). None of the pregnant subjects and controls had systolic BP lower than 90mmHg. There was a significantly lower mean arterial pressure (MAP) in pregnancy compared with the controls (83.7 ± 9.9 vs. 90.0 ± 8.8 mmHg, $p < 0.001$). This was already noticeable by the end of first trimester with a further decline to the nadir in the second trimester and a subsequent rise towards term. (Table II)

Table II: Haemodynamic variables of subjects and control

Variables	Subjects (N= 96) Mean \pm SD	Controls (N=100) Mean \pm SD	P-value
Heart Rate (bpm)	87.9 \pm 10.6	75.8 \pm 9.8	<0.001*
SBP (mmHg)	114.2 \pm 14.0	119.1 \pm 13.6	0.047*
DBP (mmHg)	68.5 \pm 9.2	75.0 \pm 10.0	<0.001*
PP (mmHg)	45.7 \pm 10.1	44.1 \pm 15.0	0.444
MAP (mmHg)	83.7 \pm 9.9	90.0 \pm 8.8	0.001*
SV (ml)	68.5 \pm 13.7	57.3 \pm 12.8	<0.001*
CO (L/min)	6.03 \pm 1.30	4.34 \pm 1.11	<0.001*
CI	3.57 \pm 0.68	2.48 \pm 0.67	<0.001*
SVR (dyn x sec/cm⁵)	1106.5 \pm 267.5	1462.7 \pm 304.7	<0.001*

Key: **SD**= standard deviation, **SBP**= systolic blood pressure, **DBP**= diastolic blood pressure, **PP**= pulse pressure, **MAP**= mean arterial pressure, **SV**= stroke volume, **CO**= cardiac output, **CI**= cardiac index, **SVR**= systemic vascular resistance, * statistical significance between all pregnant women and all non-pregnant women.

There was relative higher mean heart rate in pregnancy which was progressive from first trimester through to third trimester. The cardiac output was significantly higher in pregnancy progressively (6.03 ± 1.3 vs, 4.34 ± 1.1 L/min, $p < 0.001$). The maximum increase of heart rate and stroke volume was observed in the third trimester with about 38.7% increase in

cardiac output contributed by 16% increase in heart rate and 20% increase in stroke volume.

The mean systemic vascular resistance was significantly lower in pregnancy which represented a progressive decline from the first through third trimester as shown in Table III.

Table III: ANOVA Table Comparing the Haemodynamic variables among subjects in each trimester and controls

Variables	T1 (N=24)	T2 (N= 39)	T3 (N= 33)	Controls(C) (N=100)		Post Hoc Test [§]
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	p-value	
Heart Rate (bpm)	85.3 ± 10.4	88.7 ± 11.5	88.7 ± 10.2	75.8 ± 9.8	<0.001*	T1>C T2>C T3>C
SBP (mmHg)	115.1 ± 16.1	110.9 ± 12.5	117.1 ± 13.8	119.1 ± 13.6	0.048*	T2<C T2<T3
DBP (mmHg)	68.1 ± 9.0	66.0 ± 8.5	71.7 ± 9.5	75.0 ± 10.0	<0.001*	T1 < C T2 < C T2 < T3
PP (mmHg)	47.1 ± 12.1	44.9 ± 10.5	45.4 ± 8.6	44.1 ± 15.0	0.893	-
MAP (mmHg)	83.7 ± 10.4	81.0 ± 8.7	86.8 ± 10.3	90.0 ± 8.8	<0.001*	T2 < C
SV (ml)	62.5 ± 10.9	66.8 ± 9.5	72.6 ± 15.9	57.3 ± 12.8	<0.001*	T2 > C T3 > C T3 > T1
CO (L/min)	5.32 ± 1.05	5.95 ± 1.27	6.42 ± 1.32	4.34 ± 1.11	<0.001*	T2 > C T3 > C T3 > T1
CI	3.23 ± 0.68	3.64 ± 0.69	3.65 ± 0.65	2.48 ± 0.67	<0.001*	T2 > C T3 > C T3 > T1
SVR (dyn x sec/cm⁵)	1229.4 ± 320.3	1095.6 ± 259.4	1067.5 ± 238.9	1462.7 ± 304.7	<0.001*	T2 > C T3 > C

Key: **SD**= standard deviation, **SBP**= systolic blood pressure, **DBP**= diastolic blood pressure, **MAP**= mean arterial pressure, **SV**= stroke volume, **CO**= cardiac output, **CI**= cardiac index, **SVR**= systemic vascular resistance, **T1**= first trimester, **T2**= second trimester, **T3**= third trimester. * Statistical significance among pregnant women in each trimester and controls. § Post hoc test with Bonferroni's correction

The pregnant women showed significantly higher mean heart rate than non-pregnant women (87.3 ± 12.2 vs. 75.1 ± 11.4 bpm, $p = <0.001$). Sinus tachycardia was found to be significantly more in pregnant women than in non-pregnant women (11% vs. 0%, $p=0.008$), whereas bradycardia was rare and similar in both groups (2% vs. 0%, $p=0.117$) (Table IV).

All the participants had a background sinus rhythm. Atrial and ventricular premature complexes were rare in pregnancy. Left

bundle branch blocks occurred significantly more in pregnant than non-pregnant women (22% vs. 1%, $p < 0.001$). Non-specific intraventricular conduction block was found in 57 (59%) of the pregnant group in the form of Rsr', mostly in lead III, against 14 (14%) in the control group. Similarly, Rsr' pattern was found in lead avF in 36 (38%) of the pregnant group, against 5 (5%) of the control (OR = 6.324, CI = 2.299–17.4393, $p = 0.0105$). Table IV

Table IV: Electrocardiographic parameters of Subjects and Controls

	Subjects N = 96 (%)	Controls N= 100 (%)	OR (95% Confidence interval)	p-value
Number	96 (100%)	100 (100%)		
Bradycardia	1 (1%)	3 (3%)	0.192 (0.020-1.889)	0.117

Tachycardia	11 (11%)	1 (1%)	0.597 (0.524-0.681)	0.008*
APC	1 (1%)	1 (1%)	0.596 (0.037-9.708)	0.713
VPC	1 (1%)	0	1.606 (1.423-1.813)	0.437
LBBB	22 (23%)	1 (1%)	7.0 (2.223-12.032)	<0.001*
Rsr' in lead III	57 (59%)	14 (14%)	4.853 (2.301-10.236)	<0.001*
Rsr' in lead aVF	36 (38%)	5 (5%)	6.324 (2.299-17.4393)	<0.001*
Prolonged PRI	0	2 (2%)	0.367 (0.299-0.450)	0.066
Shortened PRI	0	0	-	-
Prolonged QTc	11 (11%)	4 (4%)	0.524 (0.161-1.705)	0.276
Shortened QTc	2 (2%)	0	0.620 (0.549-0.701)	0.270

Key: **SD**= standard deviation, **APC**= atrial premature complex, **VPC**= ventricular premature complex **LBBB**= left bundle branch block, **PRI**= PR interval, **QTc**= corrected QT interval,* Statistical significance between all Subjects and controls.

The mean frontal plane QRS axis was within the limit of normal in all study participants but there was a leftward trend in the pregnant women as opposed to the non-pregnant control (35.4 Vs. 48.4°, $p = 0.001$). There was also a progressive leftward trend from the first to the third trimester as shown in Table V.

Table V: ANOVA table comparing the Electrocardiographic parameters among subjects in each trimester and Controls

Variables	T1 (N=24)	T2 (N= 39)	T3 (N= 33)	Controls (C) (N=100)		Post Hoc Test [§]
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	p-value	
ECG HR (bpm)	85.5 ± 10.5	86.7 ± 11.9	89.4 ± 14.0	75.1 ± 11.4	<0.001*	T1 > C T2 > C T3 > C
QRS axis (°)	38.3 ± 24.5	36.6 ± 22.0	30.6 ± 26.3	48.4 ± 18.7	<0.001*	T3 < C
p-wave axis (°)	40.5 ± 9.0	38.7 ± 19.1	34.0 ± 15.7	47.4 ± 19.7	0.028*	T3 < C
T-wave axis (°)	26.7 ± 15.7	31.7 ± 12.3	28.1 ± 11.7	30.4 ± 11.5	0.938	-
PR interval (ms)	155.7 ± 22.7	150.3 ± 22.4	149.0 ± 22.4	163.9 ± 25.6	0.020*	T3 < C
QTc (ms)	399.4 ± 80.7	401.5 ± 25.5	398.1 ± 62.7	396.0 ± 30.1	0.018*	T3 < C

Key: **SD**= standard deviation, **HR**= heart rate, **QTc** = corrected QT interval * statistically significant. T1= first trimester, T2= second trimester, T3= third trimester. * Statistical significance among pregnant women in each trimester and controls. § Post hoc test with Bonferroni's correction

V. DISCUSSION

There are fewer women in the first trimester due to delayed antenatal care visits common in this environment. The mean age was similar between the pregnant women and controls. The mean weight and body mass index (BMI) of pregnant women were significantly higher than those of the controls. The decrease in the systolic, diastolic and mean arterial pressures observed in the pregnant women was due to a decline in the systemic vascular resistance associated with pregnancy as shown in this study.

Compared with the age-matched control, this study demonstrated a 39% increase in cardiac output which represented a progressive increase from the first trimester through to the third trimester. The individual contribution of stroke volume and heart rate was 23% and 16% respectively. This is similar to studies by Desai *et al.*¹⁸ and Mabie *et al.*¹⁹

In the meta-analysis of cross-sectional studies, Van oppen *et al.*²⁰ showed a trend to a lower cardiac output in the third trimester compared with the second, the authors observed large ranges in cardiac output among the different studies that did not allow for any firm conclusions. However, in the 6 longitudinal studies evaluated, Van Oppen found that cardiac output between the second and third trimesters plateaued, decreased, or increased. Of these, the 4 studies with comparable techniques still showed striking differences in the course of cardiac output in the third trimester, with Duvekot *et al.*²¹ showing a decrease of 11.5%, no change by Robson *et al.*²² and increases of 9.3% by Mabie *et al.*¹⁹ and 16.4% by Thomsen *et al.*²³ Although design differences and measurement techniques among studies can explain some of the reported differences in maternal hemodynamics in normal pregnancy, most researchers concur that patient factors rather than measurement error are largely responsible for discrepancies in reported studies.

Also, as shown in this study and others,²⁴ parity correlates with cardiac output, so over-representation of women with higher

parity in the third trimester could also result in higher cardiac output relative to the second trimester.

The discrepancies observed in cardiac output in the third trimester could also be a result of maternal position during the examination as lying in the supine position is expected to decrease stroke volume by up to 5%.²⁵⁻²⁷ This is due to the compression of the inferior vena cava by the uterus especially in the third trimester when the weight of the uterus is increased.²⁸

Though the mean heart rate in pregnancy is within the limits of normal, pregnancy was found to cause an increase of 12 beats per minute with up to 11% having tachycardia (OR= 0.597, confidence interval= 0.524-0.681). No documentation of bradycardia in pregnancy. This finding is similar to the earlier reports that found a marginal increase in heart rate by about 10-20 beats per minute^{29,30} and that of Akinwusi *et al.*¹² who found tachycardia in about 9% of pregnant women against 3% of control in a study of 69 pregnant women.

The occurrence of APC and VPC is not significantly higher in pregnancy, both occurring in 5% of pregnant women against 3% and 1% of control. Left bundle branch block and nonspecific intraventricular blocks in form of Rsr pattern in aVF and/or lead III are significantly more common in the pregnant women than the controls. This report is similar to the finding of Akinwusi *et al.*¹² However, Shotan *et al.*³¹ showed a prevalence of isolated APC and VPC in a population of normal pregnant women with complaints of palpitation, dizziness, or syncope to be up to 56% and 59% respectively while multifocal VPCs occurred in 12%.

This study also suggests that there is a leftward displacement of QRS axis with advancing pregnancy. There is also a negative correlation between gestational age and the QRS axis.

This finding is similar to the report of Iwobi *et al.*¹¹

This finding of leftward shift could be explained by the left ventricular hypertrophy which is progressive from the first to the third trimester. Also, the pressure effect of the enlarging uterus on the diaphragm and consequent on the apex of the heart which would then be shifted leftwards

The return of the QRS axis to its original pre-pregnancy direction thought to occur in late pregnancy³², or after delivery³³, is thought to be a consequence of lightening – the process whereby the uterus assumes a lower position, thereby releasing the pressure it exerted earlier in the pregnancy on the diaphragm³⁴

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Determinants of Financial Statement Accountability

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Abstract – This research is motivated by the accountability of financial statements which is a benchmark for the quality of a region's financial reports. The population is 121 regencies/cities on the islands of Java and Bali. Samples were taken by purposive sampling method. Testing using logistic regression. The results showed that the decrease in poverty level affected the accountability of financial statements, the size of the local government did not affect the accountability of financial statements, and the amount of capital expenditure did not affect the accountability of financial statements. The ability of the variable to decrease the poverty level, the size of the local government, and the amount of capital expenditure explained the financial statement accountability variable by 6.6% while the remaining 93.4% was explained by other factors outside the study.

Indeks Terms - Poverty Reduction, Size of Local Government, Total Capital Expenditure, and Accountability of Financial Statements.

I. INTRODUCTION

Accountability is the obligation of the trust holder to provide accountability, present, report, and disclose all activities and activities that are his responsibility to the trustee who has the right and authority to demand such accountability, public accountability consists of two types, namely vertical and horizontal accountability (Mardiasmo, 2002). Vertical accountability is accountability for the management of funds to higher authorities, for example the accountability of work units to local governments, and local government accountability to the central government. Horizontal accountability is accountability to the wider community (Mardiasmo, 2002).

According to (Yacoub, 2012) in his research states that poverty is one of the fundamental problems, because poverty concerns the fulfillment of the most basic needs in life and poverty is a global problem because poverty is a problem faced by many countries.

A government with a large number of assets is considered to have the potential to serve the community better. The government's performance will automatically increase according to the size of its assets (Alvini, 2018). Rahman, (2013) states that large assets will spur the government to publish government financial reports as an indication that the government has carried out government performance well.

Regional expenditures affect financial statements. Regional spending can be a motivating factor for the government to publish financial reports because the larger the regional expenditures should indicate better and quality services to the community (Pratama et al., 2015). Capital expenditure is an expenditure made to increase existing fixed assets/investments to provide benefits for a certain period. Capital expenditures will affect the financial position, the ratio of capital expenditures to total regional expenditures reflects the portion of regional

expenditures spent on capital expenditures, capital expenditures are expected to have a significant influence on the economic growth of a region apart from the private sector, households, and abroad. Therefore, the higher the spending ratio, the better the effect on economic growth. On the other hand, the lower the number, the worse the effect on economic growth (Nora et al., 2020).

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Stewardship Theory

Stewardship theory argues that humans are essentially capable of acting responsibly, with high integrity, and honesty and can be trusted. Stewardship theory views management as a party that can carry out very good actions that function to meet the needs of stakeholders. This theory is the basis for the theory which states that this theory does not have the desire to fulfill personal interests as a form and effort to avoid conflicts with stakeholders. Stewardship theory can function as an accountability mechanism to ensure good monitoring, auditing, and reporting to help achieve organizational goals (Jefri, 2018).

Signaling Theory

Signaling theory explains that the government wants to give a good signal to the community because the government has a responsibility and a mandate to build this country in a more advanced direction in the future. The way to make it happen is to present financial reports accurately, not cover up in the process of delivering government performance information, then improve services to the community and include achievements and financial performance that are simple and interesting to read (Hilmi & Martani 2012).

Financial Report Accountability

Financial Report Accountability is the obligation of local governments to account for and report the results of the regional financial accounting process in the form of financial reports on the management of the resources that have been provided (Mahmudi, 2011). According to Athifah et al., (2018), Accountability comes from other words compare which means reliable, especially from the word essential computare which means to consider. In English it is a responsibility that implies a duty or condition to be represented or a condition to be held responsible. Accountability is a model of 3 dimensions; responsibility, transparency, and accountability (Zahavy & Leonenko, 2019).

Poverty level

According to Presidential Regulation Number 166 of 2014 concerning the Program for the Acceleration of Poverty Reduction that poverty is an urgent national problem and requires systematic, integrated, and comprehensive handling and approaches, to reduce the burden and to fulfill rights as citizens properly through inclusive, equitable, and equitable development. and continue to live a dignified life.

Local Government Size

The size of a regional government is expressed by the size of the wealth owned by a region. Assets can be the size of the government, the larger the assets, the more capital invested (Nosihana and Yaya, 2016). Asset Represents the amount of resources owned by the entity to carry out its operating activities. Assets owned can also be used to prepare the entity's financial statements. The greater the number of assets, the more resources that can be used to disclose greater information (Hilmi & Martani, 2012).

Capital Expenditure

According to Government Regulation Number 71 of 2010 concerning Government Accounting Standards, capital expenditures are budgetary expenditures for the acquisition of fixed assets and other assets that provide benefits for more than one accounting period. Capital expenditures include, among others, capital expenditures for the acquisition of land, buildings and buildings, equipment, and intangible assets. Capital expenditures are used to acquire local government fixed assets such as equipment, infrastructure, and other fixed assets. How to get capital expenditure by buying through an auction or tender process.

The poverty rate is following the signal theory because the government must be able to make policies that cover the needs of the community and the high and low levels of poverty depend on how the government can provide good financing for economic development and growth. This is in line with research conducted by Syamsudin et

al., (2016), Astuti (2018) that the poverty level affects the financial performance of local governments. Based on the explanation that has been explained previously, the hypotheses in this study are:

H1: The reduction in the poverty rate affects the accountability of financial statements

The size of the area describes the size of an area and the magnitude of the demands on the area. Areas with large sizes have a better chance to improve their performance than areas with small sizes because the resources they have are better in terms of quality and quantity (Anzarsari, 2014).

Several indicators can be used to assess the size of local government, including the number of employees, assets, income, and productivity levels. (Mayora, 2015) uses the total assets in the local government balance sheet to get the size of the local government. Research conducted by Mustikarini & Fitriyani (2012) shows a significant difference in performance scores between government groups with large sizes compared to government groups with small assets. Aziz (2016) in his research concluded that the larger the size of an area, the better the performance of the government. Based on this description, the hypotheses in this study are:

H2: The size of the local government affects the accountability of financial reports

Regional spending is a driving factor in economic growth, and is also an instrument of fiscal policy carried out by the government. According to Law No. 32 of 2004 article 167 paragraph 1 concerning Regional Government, regional expenditures are used to protect and improve the quality of people's lives. This is manifested in the form of improving services to the community. Therefore, the higher the government spending, the higher the quality provided to the community.

Based on this description, the hypothesis in this study:

H3: The amount of capital expenditure affects the accountability of financial statements

III. RESEARCH METHOD

Population and sample

The population used in this study is the regency/city government in Java and Bali. The sampling technique was carried out by purposive sampling. The sampling criteria in the study are:

1. Regencies/Cities that have LKPD from 2016-2018
2. Regencies/Cities that have decreased poverty rates from 2016-2018
3. Regencies/Cities that have government size from 2016-2018
4. Regencies/Cities with total capital expenditures from 2016-2018

Each of these research variables has a definition that will be explained in this study. Variables (X1) Poverty Level Reduction, (X2) Local Government Size and (X3) Total Capital Expenditure, (Y) Financial Report Accountability.

1. Poverty

According to BPS, Poverty is a condition in which a person is unable to meet basic food and non-food needs. This poverty data is taken from the percentage of district poverty in the 2016-2018 period

2. Size of Local Government

The size of the local government shows the size of an object (Sumarjo, 2010). The proxy for the variable size of local government in this study uses total assets. Total assets are obtained in the regional balance sheet.

3. Total Capital Expenditure

Total expenditures realized in the context of capital formation which are fixed assets to finance maintenance which are to increase benefits, increase capacity and quality of assets. Obtained from the realization of capital expenditures.

4. Accountability of Financial Statements

Accountability of Financial Statements proxy with opinion from BPK. The measurement of opinion from BPK is categorized as follows : Disclaimer of Opinion, Unfair, Fair with Exception with a value of 0 and Fair without Exception with Explanatory Paragraph, and Fair without Exception with a value of 1

IV. RESULT AND DISCUSSION

Table 1 Feasibility Test of Regression Model

Step	Chi-square	Df	Sig.
1	13.437	8	.098

The following information is provided from the table as follows:

That the statistical value of Hosmer and Lemeshow Goodness of Fit is 13,437 with a significant probability of 0.098, which is greater than 0.05. Because the probability value is 0.098 0.05, then H0 is accepted. This means that the regression model is suitable for further analysis. It can be seen that the number -2 log-likelihood Block Number = 0 is 211,820 while it can be seen that the number -2 log-likelihood Block Number = 1 is 201.002. From the model, it turns out that the overall model fit test at -2 log-likelihood Block Number = 0 indicates a decrease in -2 log-likelihood Block Number = 1. This decrease in likelihood indicates a better regression model or in other words, the hypothesized model fits the data.

Tabel 2 Nagelkerke's R Square test

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	201.002 ^a	.029	.066

Table 2 above shows that the value of Cox and Snell's R Square is 0.029 and the value of Nagelkerke's R Square is 0.066. The value of the coefficient of determination in the logistic regression model is indicated by the value of Nagelkerke's R square. The value of Nagelkerke's R Square is 0.066, which means that the variability of the dependent variable can be explained by the independent variable by 6.6%, while the remaining 93.4% is explained by other variables outside the study. Examples of other variables outside the study include fiscal decentralization, internal control systems, and local government performance.

Table 3 Regression Coefficient and Logistics Test

	B	SE	Wald	df	Sig.	Exp(B)
Step 1 ^a PTK	-.134	0.41	10,438	1	.001	.875
UPD	-.090	.462	.038	1	.845	.914
BM	.000	.000	.186	1	.666	1,000
Constant	5.457	6,828	.639	1	.424	234.375

Based on table 3 it can be concluded that:

1. The Effect of Poverty Reduction on Financial Statement Accountability has a significance value of .001 or less than 0.05, which means H1 is accepted. The decrease in the poverty rate affects the accountability of financial reports because when a region decreases the percentage of poverty, it means that there are programs that are planned and implemented on target by the regional government.
2. The influence of the size of the local government on the accountability of financial statements has a significance level of 0.845 or greater than 0.05, which means H2 is rejected. The size of the local government does not affect the accountability of financial statements because the assets owned are not necessarily relevant to the needs of the community, so they cannot be maximized to make financial statement accountability. For example, the total assets of Semarang Regency in 2016 amounted to Rp. 2,759,751,487,194 have an opinion from the Unqualified BPK while the total assets of the Semarang district in 2017 are Rp. 3,112,499,506,159 has an opinion from the Unqualified BPK which proves that a larger total asset does not affect the accountability of financial statements.
3. The effect of Total Capital Expenditure on Financial Statement Accountability has a significance level of 0.666 or greater than 0.05, which means H3 is rejected. The realization of capital expenditures does

not affect the accountability of financial statements because the size of the realization of capital expenditures does not ensure that the accountability of financial statements is made properly. For example, the realization of the Cianjur regency capital expenditure in 2017 was Rp. 823,214,700,634 has an opinion from the Unqualified BPK while the realization of the Cianjur Regency capital expenditure in 2018 is Rp. 928,610,308,238 have an opinion from BPK Fair with Exceptions, this proves that a large realization does not necessarily get a better opinion value.

V. CONCLUSION

The decrease in the poverty rate affects the accountability of financial statements. This is evidenced by a significance value of 0.001 or less than 0.05, so H1 in this study is accepted.

The size of the local government does not affect the accountability of financial statements. This is evidenced by a significance value of 0.845 or greater than 0.05, so H2 in this study was rejected.

The amount of capital expenditure does not affect the accountability of financial statements. This is evidenced by a significance value of 0.666 or greater than 0.05, so H3 in this study was rejected.

In this research process, it is inseparable from limitations so improvements are needed for further research. The limitations in this study are that data collection is only in 2016-2018, while good research uses more years so that it can explain the real variability of the data. The limited number of references is because the appropriate variables are still rarely studied.

Suggestions to further researchers can use more diverse independent variables that can affect the accountability of financial statements. Future research is expected to increase the number of research periods to more than three years to make it more maximal.

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Evaluation of the Implementation of Hospital Management Information Systems: Literature Review

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Abstract- Hospital Management Information System (SIMRS) is an application system and a communication information technology system that processes and integrates the entire flow of hospital service processes in the form of a network of coordination, reporting and administrative procedures that aim to assist hospitals in improving existing services at the hospital. The information systems can help an organization to be able to carry out various activities more accurately, with quality and on time so as to increase efficiency and effectiveness. Evaluation of an information system is a real effort to find out the actual condition of an information system implementation. With this evaluation, the achievements of the implementation of an information system can be identified and further actions can be planned to improve the performance of its implementation. The purpose of this literature review is to describe the evaluation of the application of hospital management information systems in outpatient services using the Hot-Fit method. This research method uses a literature review with observational and descriptive methods using 14 research journals that are in accordance with the topics raised. Journal search using Google Scholar database and researchgate.

Index Terms- Evaluation, Implementation, Hospital Management Information System (SIMRS).

I. INTRODUCTION

Entering the digital era, technological developments are increasingly rapid in various fields including the health sector [1]; [2] Hospital Management Information System (SIMRS) is one of the subsystems in the hospital that processes all information related to humans as users according to their respective roles. Information systems play an important role in supporting the entire process in hospitals with information technology (R.-F. Chen et al 2012; [2]. Hospitals are complex organizations in providing health services through health care approaches (promotive, preventive, curative and rehabilitative) which are carried out thoroughly in accordance with applicable laws and regulations. The hospital as one of the public service institutions requires the existence of an information system that is accurate and reliable, and adequate enough to improve its services to patients and other related environments [3]; [4].

The importance of recording and reporting in hospitals is regulated by Article 52 Paragraph (1) of Law No. 44 of 2009 concerning Hospitals, which explains that the obligation of each hospital in carrying out activities is to record and report in the form of a Hospital Management Information System [5]. SIMRS according to PMK No. 82 of 2013 states that there is a process and integration of hospital services in communication information technology systems in the form of a network of coordination, reporting and administrative procedures aimed at establishing a Health Information System in order to obtain precise and accurate information [6].

In the process of using information systems, the implementation part is one of the most crucial parts in determining the success or failure of the system. Implementation is all organizational work activities in adopting, managing, and routinizing an innovation. To be able to measure the success and failure of a system, evaluation is needed. In this phase, it is determined whether the current system is good and needs to be maintained or new planning is needed for repairs, or even replacement of the existing system. If it is felt that the system that is running is not in accordance with the goals of the organization, then the steps that can be taken are to return to the planning phase which consists of analyzing the hospital situation, determining goals and strategies and determining the necessary changes (Laudon & Laudon, 2015; [4].

There are five components that underlie the implementation of SIMRS, namely human resources (HR), hardware (hardware), software (software), data, and networks. HR as SIMRS users is a major factor in the acceptance of a new technology. The adoption process in the application of SIMRS is part of human behavior and determines the smooth implementation of SIMRS. Technological devices play a role in the level of difficulty or ease of implementation as well as benefits for individuals and organizations, so that each component can be a problem and cause interference in the implementation of SIMRS [7].

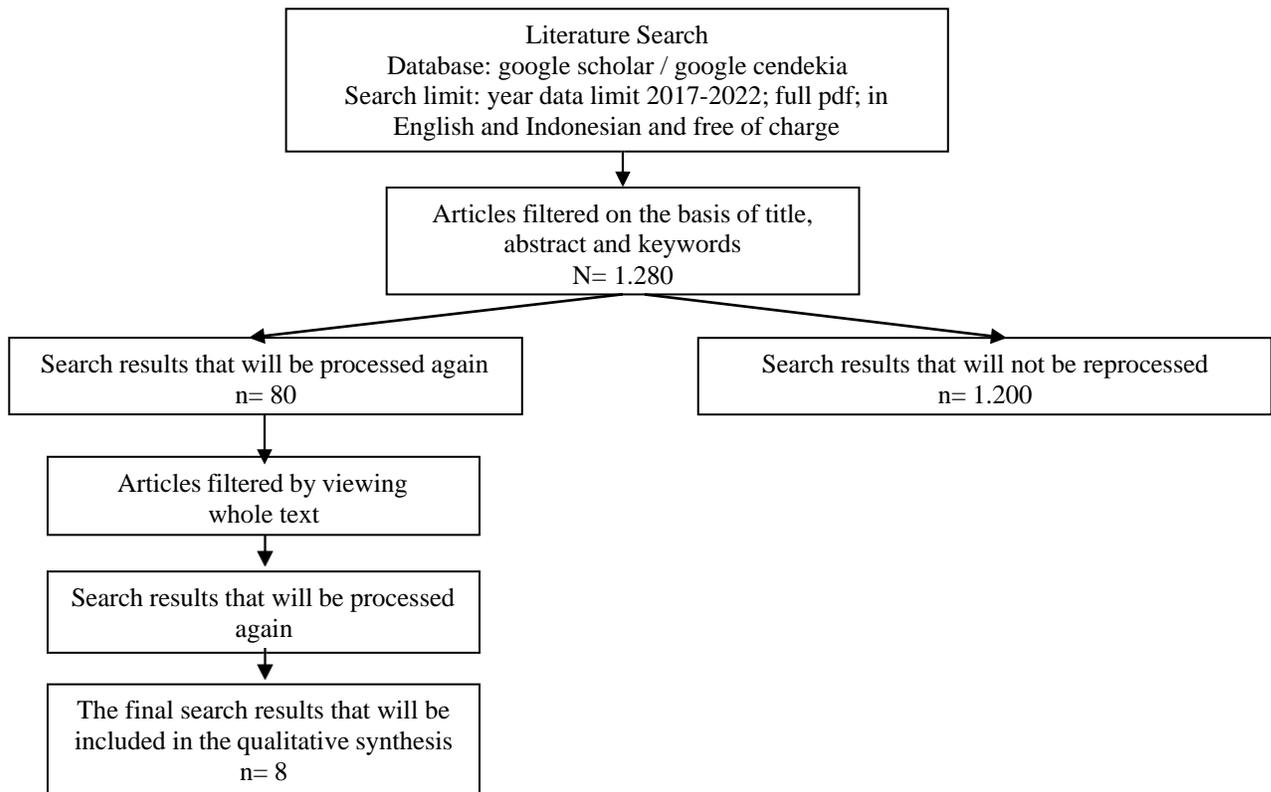
Evaluation of an information system is a real effort to find out the actual condition of an information system implementation. With this evaluation, the achievements of the implementation of an information system can be identified and further actions can be planned to improve the performance of its implementation.

Research conducted by Anika Gusfita 2021 on "Evaluation of the Implementation of Hospital Management Information Systems (SIMRS) at Arosuka Hospital, Solok Regency in 2021" obtained results from the human aspect, the use of SIMRS is intended for entry and searching of patient data. There has been no special training for officers. In the organizational aspect, there is no SK and SOP for SIMRS implementation, computers are lacking, planning and funding for SIMRS development has not become a priority. Aspects of technology, on the quality of the system network problems still occur, the quality of information is appropriate and appropriate but data entry by officers is still incomplete, the quality of service by IT staff is quite good. In terms of net benefits, SIMRS has helped improve the efficiency and effectiveness of officers at work. This is similar to Afriza Faigayanti's research on "Evaluation of the Implementation of Hospital Management Information Systems (SIMRS) at Besemah Hospital, Pagar Alam City in 2021" which states that there are three factors that influence net benefits, namely organizational environment, user satisfaction, and service quality. While the factors that do not have an influence on the net benefit of SIMRS in Besemah Hospital are: system use, organizational structure, system quality, and information quality.

Based on the research journal above, several factors were found to be unsuccessful, namely SIMRS user satisfaction, system use, support from management, and technology quality. So that researchers are interested in conducting a "Literature Review Study on "Evaluating the Application of Hospital Management Information Systems in Outpatient Services".

II. METHODS

This study uses a literature review design, namely research that examines scientific articles by integrating and drawing conclusions about evaluating the application of hospital management information systems (SIMRS). The data used in this study is secondary data obtained not from direct observation, but from the results of research that has been done by previous researchers. Sources of research data obtained in the form of articles or journals that are relevant to the topic of Evaluation of the Implementation of Hospital Management Information Systems. The data search was carried out using the Google Scholar database. The keywords used in this study are "Evaluation" OR "Implementation of SIMRS" AND "Hospital Management Information System/SIMRS". Data analysis was carried out using literature review techniques including looking for similarities (compare), looking for dissimilarities (contrast), giving views (critique), compare (synthesize), and summarize.



Gambar 1. PRISMA *Flow* diagram

III. RESULTS

In collecting articles on Evaluation of the Implementation of Hospital Management Information Systems, the author conducted a search using keywords that had been compiled and after that selection was carried out and produced as many as 80 articles and then re-selected into only 8 articles. The articles that were re-selected were carried out a descriptive approach by covering the discussion requirements, namely in the form of an overview of the evaluation of the implementation of the hospital management information system in 2021-2022. Based on a literature review conducted on 8 sources from national articles, the results obtained can be seen in table 1.

Table 1: Overview of 8 National Article Sources

No	Title	Author	Methods	Result	Database
1	Evaluation of Simrs Outpatient Information System at Dr. Hospital. Reksodiwiryono Using the Hot-Fit Method year 2021	Regita Nolandari, Yulia Fitriani.	The research was conducted at Dr. Reksidiwiryono Hospital Padang, the time of data collection was 4-12 July 2021. This type of qualitative research with a phenomenological approach. The research was conducted with in-depth interviews and observations of 1 head of medical records, 1 IT officer, 2 outpatient registration officers. The research tools used interview guides, voice recorders (mobile phones) and cameras	The results of the SIMRS evaluation study found that there was a shortage of human resources, lack of staff skills, no training for IT officers and lack of support from management. Money according to SOP, no management support other than RM. There is a network error problem.	Google Scholar
2	Evaluation of the Hospital Management Information System (SIMRS) at the Outpatient Registration Section using the HOT-FIT method year 2018	Gita Agustina, Amalina Susilani, Supatman Rina Tri	The research method used is observational analytic research. The subjects in this study were the outpatient registration officer and the head of the medical record. The independent variables are system quality, service quality, people and organization. The dependent variable is the benefit. Statistical test using linear regression test.	The result of the beta coefficient KS -> M has a value of 0.516, the result of the beta coefficient KS -> O has a value of 0.533, the result of the beta coefficient KL -> M has a value of 0.548, the result of the beta coefficient of KL -> O has a value of 0.495, the coefficient results beta M -> NB has a value of -4.034, the result of the coefficient of beta O -> NB has a value of 4.375.	Google Scholar
3	Evaluation of the Hospital Management Information System Using the Hot-Fit Method at the Tora Belo Regional General Hospital (RSUD) Sigi Regency year 2017	Astria Lolo, Eko Nugroho	Quantitative research with a cross sectional design to measure the variables of human, organization, technology, leadership and regulation of the net benefit of SIMRS in Tora Belo Sigi Hospital. Because the total population is less than 100, the sample is taken using a total sampling technique. Data analysis was carried out using SEM PLS and the name of the application used was	The results of this study explain that there are three factors that influence the net benefit, namely: user satisfaction, organization structure and regulation. While the factors that do not have an influence on the net benefit of SIMRS at Tora Belo Hospital are: system use, environment organization, system quality, information quality, service quality and	Google Scholar

			SmartPLS version 3.0.	leadership.	
4	Evaluation of the Implementation of Hospital Management Information Systems at SLG Hospital Kediri by Using the HOT-Fit. Method year 2022	Ilafi Nastiti dan Dian Budi Santoso	Analytical quantitative research was conducted with a cross-sectional approach. Data collection was done by distributing online questionnaires to SIMRS users. From 54 respondents, 39 responsive data were analyzed using multiple linear regression method to see the relationship of each variable to the net benefit.	The highest percentage of satisfaction is found in the system use variable of 71.79%, while the highest percentage of dissatisfaction is found in the vendor support variable of 26.28%. The p-value (95% CI) of the relationship with the net benefit for system quality is 0.000 and IT capability of staff is 0.028, so this has an influence on the net benefit. User satisfaction (0.079), top management support (0.774), project management (0.446), vendor support (0.56), system quality (0.381), information quality (0.084), and service quality (0.696) are known to have no effect.	Google Scholar
5	Factors Affecting User Satisfaction and Benefits of SIMRS at the Regional General Hospital Beriman year 2021	Lis Indrayati, Irwandy, Noer Bahry Noor, Fridawaty Rivai, Lalu Muhammad Saleh, Ansariadi	This research is a quantitative research using an analytical survey design with a cross sectional study approach. The study was conducted at the Beliman Regional General Hospital (RSUD) Balikpapan from March to April 2021 with 145 respondents who were SIMRS users. Data analysis was carried out using path analysis.	The results showed that the system quality variable had no effect on user satisfaction with a significance value of 0.844 ($p > 0.05$). There is an effect of information quality variable on user satisfaction with a significance value of 0.000 ($p < 0.05$). There is an effect of service quality variable on user satisfaction with a significance value of 0.000 ($p < 0.05$). There is an effect of user satisfaction on benefits with a significance value of 0.033 ($p < 0.05$).	Google Scholar
6	Model of Improving The Utilization of Hospital Management Information System (SIMRS) Based On Human, Organization Technology-Fit (Hot-Fit) Method at RSPI Prof. Dr. Sulianti Saroso year 2021	Anang Suryana, Fransiskus Adikara, MF Arrozi, Akhmad Rizky Taufik	This research uses quantitative research methods with explanatory causality research. The analytical method used is multiple linear regression analysis. Respondents in this study were respondents RSPI Prof. Dr. Sulianti Saroso who directly operates SIMRS as many as 154 employees.	The results of this study indicate that there is a significant influence from Human, Organization, Technology, Knowledge, and Regulations that affect the benefits of 80.9%. Humans, Organizations, Technology, Knowledge, and Regulations partially affect the benefit, with the	Google Scholar

				provisions of the regulation being the variable that has the most influence on the benefit.	
7	Evaluation of the Implementation of Hospital Management Information System (SIMRS) at Besemah Hospital, Pagar Alam City year 2021	Afriza Faigayanti	Quantitative research with a cross sectional design to measure human, organization, and technology variables on the net benefit of SIMRS at Besemah Hospital. Because the total population is less than 100, the sample is taken using a total sampling technique. Data analysis was carried out using SEM PLS and the name of the application used was SmartPLS version 3.0.	The results of this study explain that there are three factors that influence the net benefit, namely: organizational environment with p-values of 0.007, user satisfaction with p-values of 0.008, and service quality with p-values of 0.020. While the factors that do not have an influence on the net benefit of SIMRS in Besemah Hospital are: system use, organizational structure, system quality, and information quality.	Google Scholar
8	Evaluation of the Implementation of Hospital Management Information System (SIMRS) at Arosuka Hospital, Solok Regency year 2021	Anika Gusfita	The design of this study is a qualitative research conducted in June 2021. Informants were determined by purposive sampling. The study used the HOT-Fit evaluation model. Data was collected by interview, observation, and document review. Data processing is carried out by means of data reduction, presentation, drawing conclusions and conducting data analysis by data triangulation.	The human aspect, the use of SIMRS is intended for entry and retrieval of patient data. There has been no special training for officers. In the organizational aspect, there is no SK and SOP for SIMRS implementation, computers are lacking, planning and funding for SIMRS development has not become a priority. Aspects of technology, on the quality of the system network problems still occur, the quality of information is appropriate and appropriate but data entry by officers is still incomplete, the quality of service by IT staff is quite good. In terms of net benefits, SIMRS has helped improve the efficiency and effectiveness of officers at work.	Google Scholar

IV. DISCUSSION

In conducting a journal review, it can be done by using literature review techniques, including determining compare, contrast, criticize, synthesize, summarize.

a. Similarity

Of the eight journals that have been analyzed, there are similarities to the Evaluation of the Application of Hospital Management Information Systems, namely the similarity seen from the data collection methods used in the study. According to research conducted by Gita Rina Agustina, et al [8], Anika Gusfitadan [9], Afriza Faigayanti, et al [10] and Anang Suryana, et al [11]. the method used is data collection methods such as conducting interviews, observations, and questionnaires. This is in line with research conducted by Regita Nolandari, et al [12], Astria Lolo, et al [13], Ilafi Nastiti, et al [14] and Lis Indrayati, et al [15]. The data collection method also uses the method of observation, interviews, and questionnaires.

b. Inequality

Of the eight journals that have been analyzed, there are differences between one another, due to looking at the results of research in the journals used. According to research conducted by Regita Nolandari et al, Astria Lolo et al, Ilafi Nastiti et al and that the cause of the problems that occurred in this study was the lack of human resources, lack of staff skills, no training for IT officers and lack of support from management. Monev according to SOP, no management support other than RM. There is a network error problem. This contradicts the research conducted by Lis Indrayati et al, Gita Rina Agustina, et al, Anika Gusfitadan, Afriza Faigayanti, et al and Anang Suryana, et al that the cause of the problems that occurred in this study showed that there was an influence on the quality of information and service quality on user satisfaction, while the quality of the system has no significant effect on user satisfaction.

c. View

From the analysis of several journals, in some hospitals, it is still found that there is a lack of compliance by outpatient registration officers in filling out the Hospital Management Information System, the lack of quality of the Hospital Management Information System in determining its relationship to the monitoring process, evaluation and assessment of internal control, and it still happens frequently. Error during outpatient registration, there is still a shortage of human resources in the hospital.

Hospitals should have a standard operating procedure (SOP) for those devoted to routine control, supervision and attention to SIMRS so that the maintenance of company assets on the tools and facilities used to support the process of monitoring, evaluating, and assessing internal control problems can be directly replaced by the tools and facilities used as well as the resource requirements that run the system must always be monitored and there is always scalable maintenance in order to maintain the accuracy of the system.

The officer who runs and is responsible for the SIMRS must have special education and training to more easily correct errors or disturbances in SIMRS without the need for a third party to correct the disturbance so that business processes run in a timely and efficient manner without wasting time, and for that it is necessary recommendations to make system improvements, especially related to existing functions on the system, improving data accuracy and conformity between system functions and system user needs.

d. Comparison

The results of research conducted by Regita Nolandari, Yulia Fitriani (2022) that the causes of problems in the application of hospital management information systems in outpatient services can be seen from three aspects, namely aspects of human resources and aspects of infrastructure and monitoring and evaluation, while according to Anika Gusfita (2021) that the causes of problems in implementing the hospital management information system can be seen from two aspects, namely in terms of human resources, aspects of the SIMRS implementation process. From these two opinions, it is said that the causes of problems in implementing hospital management information systems in outpatient services include: aspects of human resources and aspects of infrastructure and aspects of the SIMRS implementation process, monitoring and evaluation so that it will affect the quality of hospital services.

e. Summary

The results of research conducted by Gita Rina Agustina, et al, Anika Gusfitadan, Afriza Faigayanti, et al and Anang Suryana, et al, Lis Indrayati et al, Gita Rina Agustina, et al, Anika Gusfitadan, Afriza Faigayanti, et al and Anang Suryana, et al. That the causes of problems that occur in the application of hospital management information systems can be seen in terms of:

1. Human Resources

Human resources are people who are in the hospital and have the competence and characteristics to work and have their respective roles in doing work, which can be seen from the responsibilities they have, knowledge, and motivation to work in accordance with applicable rules. From the results of the research that has been carried out by the eight researchers, the officers implementing the hospital management information system still do not have good competence in implementing the implementation of the hospital management information system, the lack of responsibility of the officers implementing the hospital management information system, and the lack of responsibility for implementing the hospital management information system. Motivation of hospital management.

2. Infrastructure

Facilities and infrastructure are everything that is used as a support in carrying out an activity. The facilities and infrastructure used to support SIMRS implementation activities are hardware, software, networks, SOPs. From the results of the research that has been carried out by the eight researchers. For Problems Supporting facilities such as hardware, software are good enough, for network problems they still often experience disturbances/errors in this case, there is no quick solution for handling problems, and also for SOP problems that have not performed well in the hospital from the three journals.

3. Implementation

Implementation is defined as the activity steps and activities carried out by medical record officers in using the SIMRS application. From the results of the research that has been done by the eight researchers, the implementation of the hospital management information system has not run optimally.

4. Monitoring and Evaluation

Monitoring and evaluation is an important part of the process because with the evaluation will get feedback on the program and implementation of activities. Monitoring is an activity to monitor the process or course of a program or activity, while evaluation is an activity to assess the results of a program for activities. From the results of the research that has been carried out by the eight researchers, the Monitoring and Evaluation of each hospital has not been carried out properly, in fact there are still hospitals that have never carried out an evaluation of their hospital management information system. This is what causes the implementation of the hospital management information system to not run optimally in accordance with existing standards.

V. CONCLUSION

Based on a review of eight journals conducted regarding the Evaluation of the Implementation of Hospital Management Information Systems, the following conclusions were obtained:

1. Human Resources

From the research results of eight journals that have been analyzed, for officers implementing hospital management information systems, they do not have good competence in implementing the implementation of hospital management information systems, lack of training for SIMRS officers, lack of responsibility for implementing home management information systems. Illness, and lack of support from management/motivation of hospital management information system officers.

2. Infrastructure

From the results of the research of eight journals that have been analyzed for problems. Supporting facilities such as hardware, software are good enough, for network problems they still often experience disturbances / errors in this case there is no quick solution for handling problems, and also for SOP problems that have not been implemented properly. Good on the hospital of the eight journals.

3. Implementation

From the results of the research, the eight journals that have been analyzed for the implementation of the hospital management information system have not run optimally.

4. Monitoring and Evaluation

From the results of the research, eight journals that have been analyzed for Monitoring and Evaluation of each hospital have not been carried out properly, in fact there are still hospitals that have never carried out an evaluation of the hospital management information system. This is what causes the implementation of the hospital management information system to not run optimally in accordance with existing standards.

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Migration of Batch Processing Systems in Financial Sectors to Near Real-Time Processing

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Abstract- Technology has evolved and has become part of people's lives today. Information systems (IS) are now embraced in all spheres of management. Essentially, this is because of its efficiency and reliability in different fields. Knowledge of IS has enabled the control of advanced sectors (1). IS helps distinguish raw and factual data, which are helpful to any firm. A company must always follow a specific protocol while handling these transactions, whether placing orders for a customer or processing many invoices. The two most popular methods are batch and real-time processing. Batch processing is the procedure to process a large volume of data all at once whereas real time is the procedure to process data instantaneously record by record usually in a matter of seconds or milliseconds. They both solve different needs in financial sector and the industry chose one vs other depending on the criticality and complexity of the need, users of the outcome (internal vs external) and overall customer satisfaction index. In addition to above two methods, near real time processing is the process of being able to almost instantaneously analyze data that is streaming from one device to another. The financial sector is looking for solution to migrate batch processing system to near real time systems using streaming solutions like Apache Kafka and AWS Kinesis and re-use real time systems wherever possible for better customer experience and lower operational cost.

Index Terms- Batch processing, financial sector, Apache Kafka, AWS Kinesis, Near real time processing, Event streaming.

I. INTRODUCTION

This article talks about the benefit of using near real time processing in financial sector. Dealing with data has become a key element in today's business circles. Handlers must learn batch processing to ease the handling of sensitive data [4]. Batch processing systems are part of technology incorporated in today's business sphere. In most cases, to gather, transfer, preserve, retrieve, modify, and display data, the IS components must cooperate. The IS components interact together to produce data, and the information is complementary to the people and organization in filtering, processing, and distribution of data [9]. The hardware as a component refers to the physical equipment and its associate input and output devices that communicate for a common goal. Generally, the hardware is supported by the software, which refers to the internal programs in a computer.

Information system helps the organization in management functions. Through the information system, managers receive information regarding the performance of the employees in their roles. When there is a weakness, the management seeks ways of addressing the issue for improved versions. Moreover, the IS helps the organization's top managers strategically make decisions to improve the organization's goals and objectives [3]. In decision-making, managers enter the data regarding the problem at hand. On the other hand, the information systems offer a solution to the problem by seeking information from various computer databases. Furthermore, the IS assists in the performance of the executive roles in the organization. IS allows the top managers to closely monitor the organization's performance, specifically the workers' performances, assessing the organization's external environment since it is the main factor determining the organization's direction [3]. The external environment in business settings includes the market of the products and services, competition from other business firms, and a source of crucial resources. Therefore, the IS enables monitoring trends in the external environment, helping the organization make informed decisions.

When processing data through batch systems a sizable static dataset, the result is delivered after the calculations are complete [2]. Generally, it requires a longer time compared to real-time data processing due to the grouping. Since business circles entail handling data from various sources and for different purposes, batch processing must suit the high data analysis. Systems that handle huge data quantities use batch processing in their operations. The Batch system's ability to have no user interface makes the application more realistic and widely embraced due to its easy accessibility. Batch processing systems are used in the financial industry in analysis, controlling, compiling organization, and report generation. Generally, its reliability makes it a necessity in business operations today.

In the real-time data processing the input and output of data is available immediately upon processing. The real time framework takes less time and requires a continuous data flow as output occurs immediately after input [5]. An example for real-time processing is fast and interactive queries on big data warehouses, in which user wants the result of his queries in seconds rather than in hours. Principally, the goal of real-time processing is to provide solutions that can process big data very fast and interactively.

In the near-real time data processing, data are produced by producers, who create a stream of them, and consumed by consumers, who respond to them. This type of architecture enables applications to act on events as they happen. We can produce and react to a huge number of events in real time using scalable event driven architecture. Since neither the producers nor the events are aware that the consumers are listening to them, this architecture is also loosely coupled.

In this article, we talk about a financial sector use case which is currently running through batch process and how the system can be migrated to near-real time system using Apache Kafka.

II. FINANCIAL SECTOR USE CASES

Speed in performing E-Banking services is a determining factor of customer satisfaction according to Parasuraman, Zeithaml, and Berry (1985). Efficiency in terms of quick speedy service is also confirmed by Wirtz and Bateson (1995) and Khadem and Mousavi (2013). Liao and Cheung (2002) find reliability as one of the most important features that customers seek in evaluating their E-Banking service quality. A similar result was also obtained in an empirical study done by Kettinger and Lee (2005)[12].

In financial sector, providing customer service when it is needed is essential for improving client satisfaction, which will ultimately boost sales and the bank's image. Financial industries typically use both batch and real-time systems to manage customer support, depending on what is anticipated from the customer experience. While services that engage directly with consumers are frequently pushed toward real-time processing, those that are opaque to customers are frequently pushed toward batch processing solutions.

A. Product upgrade

Let's consider a credit card company which offer product upgrade as a feature. The product upgrade is available to the customers in two ways 1. Whenever they reach out to the company through any servicing channel like Mobile app, Online, automated phone and request for a product upgrade which is often called as reactive 2. The credit card identifies the potential customer who are eligible for product upgrade and upgrade their credit card whoever has given a consent upfront to do which is called as proactive. In this scenario, usually reactive use cases are handled through the real time processing whereas proactive use cases are handled through batch processing system.

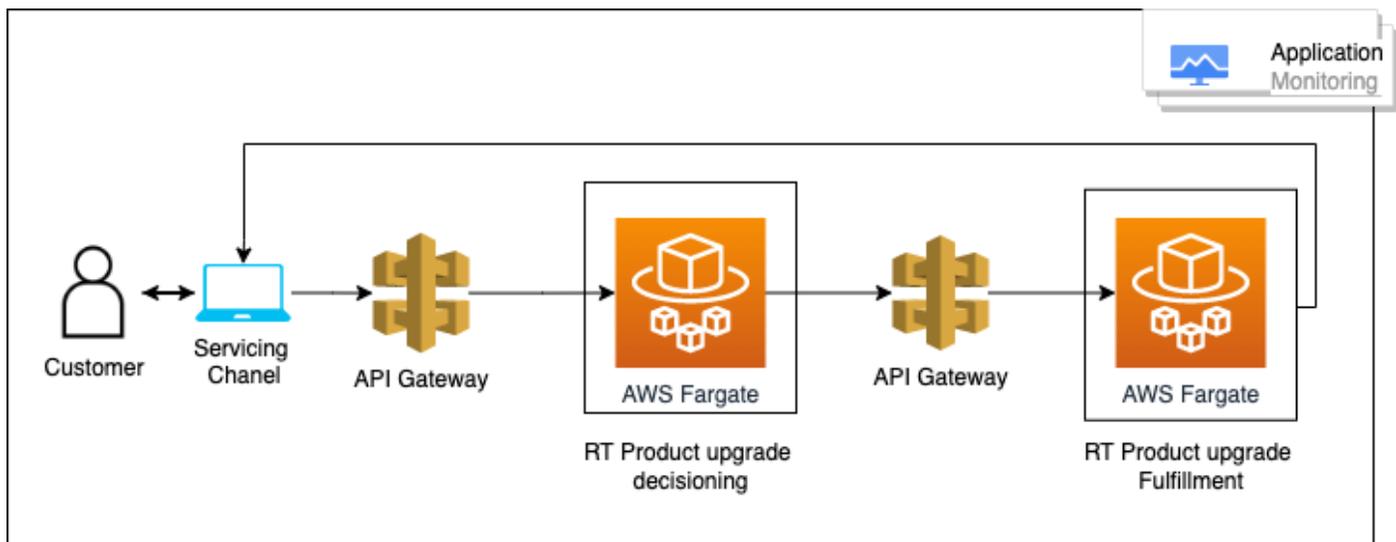


Fig -1: Real time processing architecture of product upgrade feature

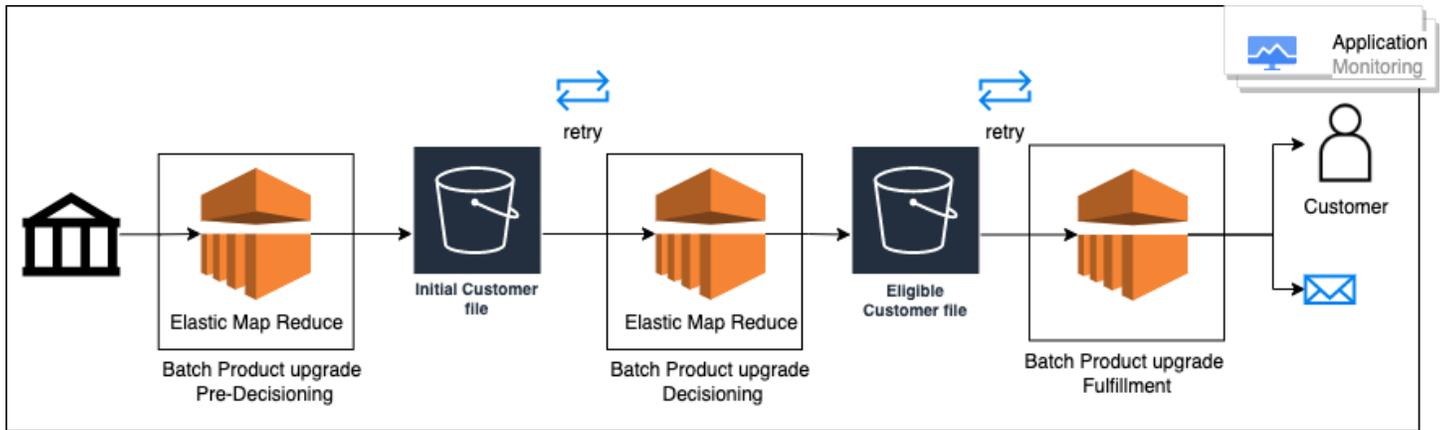


Fig -2: Batch processing of architecture of product upgrade feature

In this use case, credit card company spend duplicate operational cost as it need to maintain both batch and real time system but from the customer standpoint, both processes result in the product upgrade on their account. In addition, any business changes on the product upgrade often need to happen in both systems which duplicate the time to market cost. As batch system usually uses the batch files, deciding a customer for product upgrade usually happens with older data whereas real time system uses most accurate data which enables accurate decisioning and better customer experience.

B. Reward management

Let’s consider another use case in the credit card company which offer rewards to the customer as points based on the credit card usage. Rewards are awarded to the customer once the transaction on credit card is approved by the bank. Once the transaction is approved, the transaction details are stored in analytical database. A daily batch job trigger every day and queries all the eligible transaction from the analytical database and feeds to a batch reward management decisioning engine. The decisioning system calculates the eligible reward for the account and add back to the customer account through a batch fulfillment process. Compared to critical needs of customers, reward management is often considered as non-critical and awarded to the customer through batch process daily instead of awarding it in real time upon the approval of the credit card transaction. This causes bad customer experience as the customer need to wait for at least a day or two days before they see the reward their account.

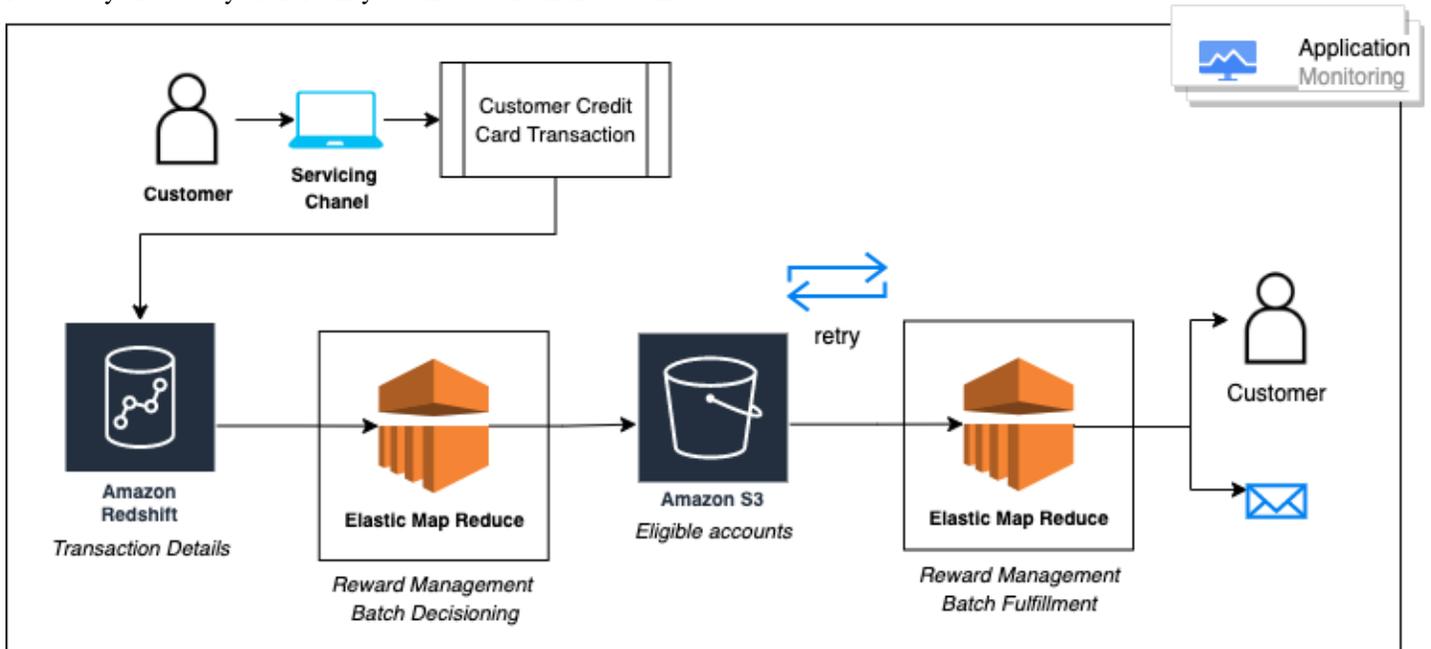


Fig -3: Batch processing architecture of reward management feature

One of the ways to handle the mentioned issues with batch processing and use the power of real time processing system for better customer experience and to reduce the operational cost for the company i

s to migrate to near-real time processing systems.

III. BATCH PROCESSING

In software world, Batch systems usually consists of Extract, transform and load (ETL) tools are software applications responsible for data extraction from multiple sources, cleansing, customization, and insertion into a data warehouse. ETL tools integrate data, which enables the building of the enterprise data warehouse.[11]

A. Batch processing architecture

The batch system functions primarily from three different architectural layouts. Essentially, these components serve as the input, processing, and output. All three are put together to create a seamless batch process together. The dataset is usually persistent, large, and bounded [2]. Essentially, this is because it serves in both the input and the output processes. As information from a queue is obtained, the processor computes the data according to the seller's requirements. Therefore, the output is not raw data but added data ready for use. The output after processing may be printed out or stored in a database awaiting the next step if required. Additionally, the Batch system is function-oriented and not object-oriented. The reason is that data in it is processed serially and does not need to be obtained in state. Such is seen when printing invoices, financial statements, and issuing renewals for invoices.

Batch processing works effectively for calculations where having access to all records is necessary. For example, datasets must be seen rather than a collection of individual records for calculating totals and averages. In essence, for the length of the computations, these operations demand that the state be maintained [2]. A bank statement is intended to demonstrate in detail what transpired with a person's account over the previous month, including their spending patterns and any expenses made. Most bank statements begin by compiling all deposits, giving customers a clear picture of what was deposited into their accounts throughout the previous month [7]. Clients can then see a summary of the withdrawal activities. The account balance at the start of the period is included in the summary, followed by the outstanding balance at the end of the time after all deposits and withdrawals have been tallied.

The following are some of the basic features of a batch system

A.1 Apache Hadoop

The first big data platform to experience considerable growth in the open-source community was Hadoop. Hadoop updates the algorithms and element stack to provide accessibility for large-scale batch operations [2]. They successfully tackle the most common business concerns like fraud, financial crimes, and data breaches. Banks can detect and reduce fraud by analyzing point of sale, authorization, and transactions, among other aspects. The time and resources needed to execute these tasks are significantly reduced thanks to big data, which assists in identifying unexpected trends and informing banks of them.

Hadoop has numerous strengths. Some of its strengths come from the MapReduce model. For example, easy programming model, near-linear speedup and scalability, and fault tolerance are three major features. Besides these, Hadoop itself provides some extra features like different schedulers, more sophisticated and complex job definitions using YARN, high available master machines, pluggable I/O facilities, and etc. Hadoop provides the basic platform for big data processing. For more usability, other solutions can be mounted over Hadoop [7]. Major examples are HBase for storing structured data on very large tables, Pig and Hive for data warehousing, and Mahout for machine learning. Although Hadoop, i.e., standard MapReduce, has numerous strengths, but it has several shortcomings too. MapReduce is not able to execute recursive or iterative jobs inherently [12]. Total batch behavior is another problem. All of the input must be ready before the job starts and this prevents MapReduce from online and stream processing use cases. The overhead of framework for starting a job, like copying codes and scheduling, is another problem that prevents it from executing interactive jobs and near real-time queries. MapReduce cannot run continuous computations and queries, too.[13]

A.2 Hadoop Distributed File System (HDFS)

The distributed file system component known as HDFS controls retention and synchronization among network nodes. Essentially, HDFS is the storage section of the Hadoop applications. HDFS keeps data accessible despite any inevitably occurring host malfunctions [2]. Additionally, it is used as the data source to preserve intermediate processing outcomes and the results of the final calculations. In banking, MapReduce processes the data, HDFS archives the data, and Yarn divides the responsibilities

B. Advantages of Batch Processing Systems

Using batch processing has a few benefits, including decreased cost being the primary factor. Batch processing has become more affordable due to the reduced frequency of the procedures. For instance, most banks do offer bank statements for free to their clients. Businesses view batch processing as a fixed expense. The total cost for each step would decrease the more batches processed in a given period. The well-proven batch processing approach of Apache Hadoop and its MapReduce computing engine is better suited for handling

massive datasets where speed is not a significant consideration [2]. The final benefit of batch patch processing is that it allows the company to edit the data before it is distributed. Transaction changes can be made without creating additional processes, if necessary.

C. The Downsides of Batch Processing Systems

Batch processing has a lot of drawbacks in addition to these advantages. One example is the loss of transactions within a larger batch that needs to be handled. In essence, it could be challenging to identify and correct an error if the cluster contains too much data. Think about a business that operates its accounts receivable once every month. When a lot is processed at once, there can be mistakes with some of the bills that are sent out. However, this issue can be resolved by splitting the batch processing into two or even three distinct processes. Overall, batch processing of bank statements is only most effective when a large volume of data needs to be sent out at once. Grouped data and generated batches are not easy to monitor during the process. [2], this system is generally slow since it depends on permanent storage, reading, and recording for each activity. The inability to watch it means it will take considerable time to debug. The reason is that identifying the mistake traces back to a long chain before it can be identified. Having time to debug is a risk as the information safety through the process is uncertain. Errors in the process come costly. An instance is when a process malfunctions and there is a delay in sorting the issue. The delay means the entire process will have to be held to an unknown period, complicating the process, and delaying operations in the organization.

IV. REAL TIME PROCESSING

Unlike batch systems, real-time processing has a more cost-effective output [5]. The main reason why financial sectors are opting for migration is due to risk management. In real-time processing, the risk is noted, and management strategies are implemented to counter the threat almost immediately. However, more time may be required to sort the batches back to single data in Batch processing to identify the risk and set up management strategies. The process may take some time and delay output as data inflow must be postponed. Convenience being the critical marker of today's e-commerce platforms, real-time personalization comes in handy. Creating top-tier personalized customer service is what is embraced in today's world.

Most of the above-stated challenges are almost non-existent in real-time processing. The minimum downsides of real-time processes are why most organizations, especially financial sectors, are trying to migrate to real-time processing. Compared to human data input, computerized bank data extraction software simplifies the underwriting process.

For the banking use case mentioned above, we are considering real time systems which consists group of microservices orchestrated through API layer.

Micro services have risen in popularity as a novel approach to designing distributed applications. It is made up of several loosely connected software components that are designed to be independent, automatically deployable, and cohesive. This architecture claims to meet continuing software development requirements such as resilience, continuous delivery, enhanced maintainability, and scalability. Each micro service has a smaller codebase, which makes it easier for developers to grasp and hence more productive. Micro service design also allows for the organization of work across many development teams, as well as improved testability and deployment autonomy. In contrast to a monolithic design, where one failed component knocks down the entire stack, a micro service architecture makes it simple to isolate faults and detect concerns.

V. NEAR REAL TIME PROCESSING

Near real-time processing is when speed is important, but processing time in minutes is acceptable in lieu of seconds. The term "near real-time" or "nearly real-time", in telecommunications and computing, refers to the time delay introduced, by automated data processing or network transmission, between the occurrence of an event and the use of the processed data, such as for display or feedback and control purposes. For example, a near-real-time display depicts an event or situation as it existed at the current time minus the processing time, as nearly the time of the live event. The distinction between the terms "near real time" and "real time" is somewhat nebulous and must be defined for the situation at hand. The term implies that there are no significant delays. In many cases, processing described as "real-time" would be more accurately described as "near-real-time". The common pattern for near real time processing is through event driven architecture.

A. What's an event?

Any notable occurrence or state change for system software or hardware is referred to as an event. A message or notification provided by the system to inform another component of the system that an event has occurred is not the same thing as an event.

B. Types of event driven architecture models

B.1 Pub/sub model

This messaging architecture, which maintains track of subscribers, is based on subscriptions to an event stream. With this strategy, subscribers who need to be informed are notified once an event occurs or is published.

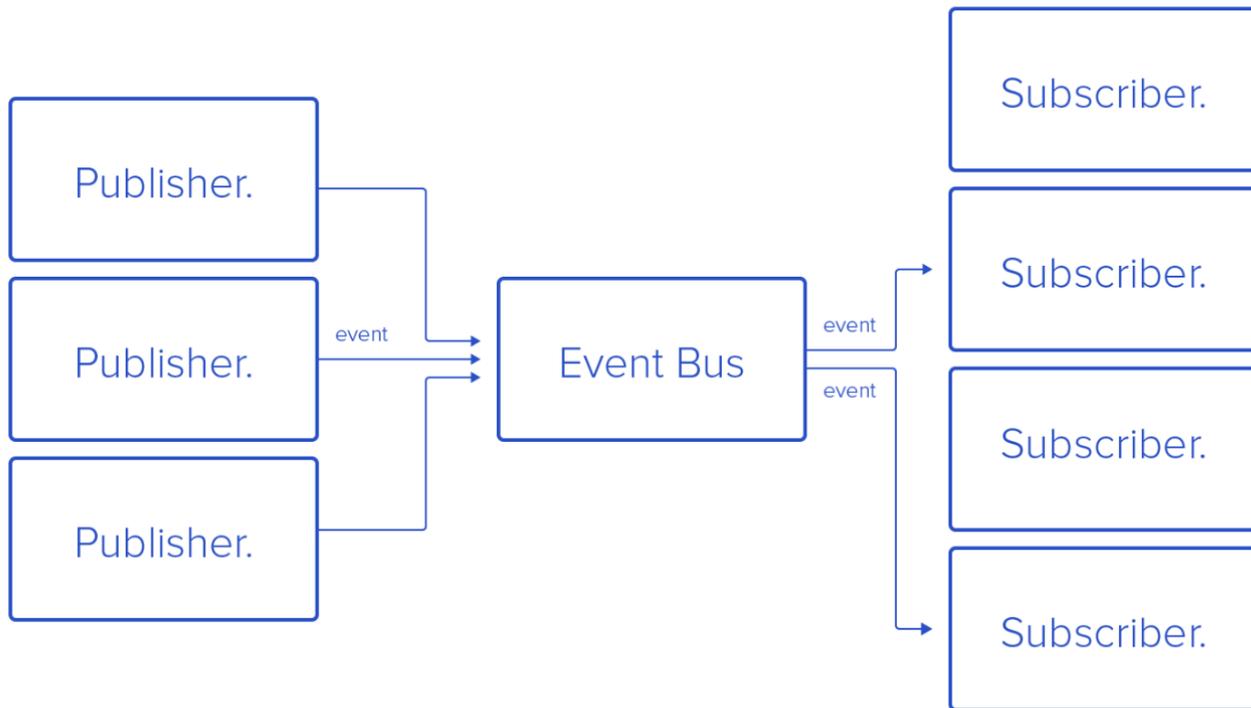


Fig -4: Pub/Sub Model

B.2 Event- streaming model

Event-processing programs aggregate information from distributed systems in real time, applying rules that reveal key patterns, relationships, or trends. An “event stream” is a sequence of business events ordered by time. With event stream processing you connect to all data sources and normalize, enrich, and filter the data. You can then begin to correlate events and over time you see patterns emerge that describe events you care about. You add contextual data to ensure proper interpretation of events and then you apply real-time business logic and rules or machine learning to trigger action.[15]

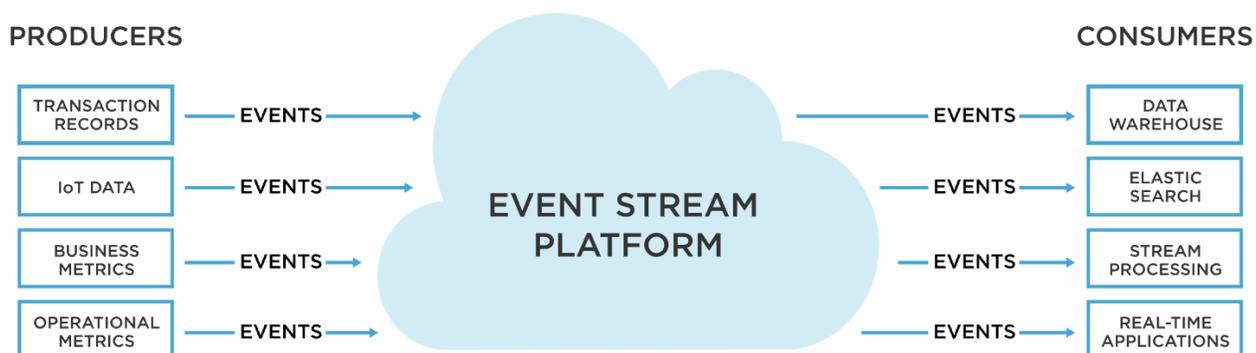


Fig -5: Event Streaming Model

C. Options for Near real time processing

The available software architecture to move the batch system to near real-time processing include Apache Kafka, AWS Kinesis, AWS SQS, spark streaming.

C.1 Apache Kafka

Kafka is a solution to the real-time problems of any software solution, that is, to deal with real-time volumes of information and route it to multiple consumers quickly. Kafka provides seamless integration between information of producers and consumers without blocking the producers of the information and without letting producers know who the final consumers are. Kafka [2] is distributed and scalable and offers high throughput. On the other hand, Kafka provides an API like a messaging system and allows applications to consume log events in real time. [14]

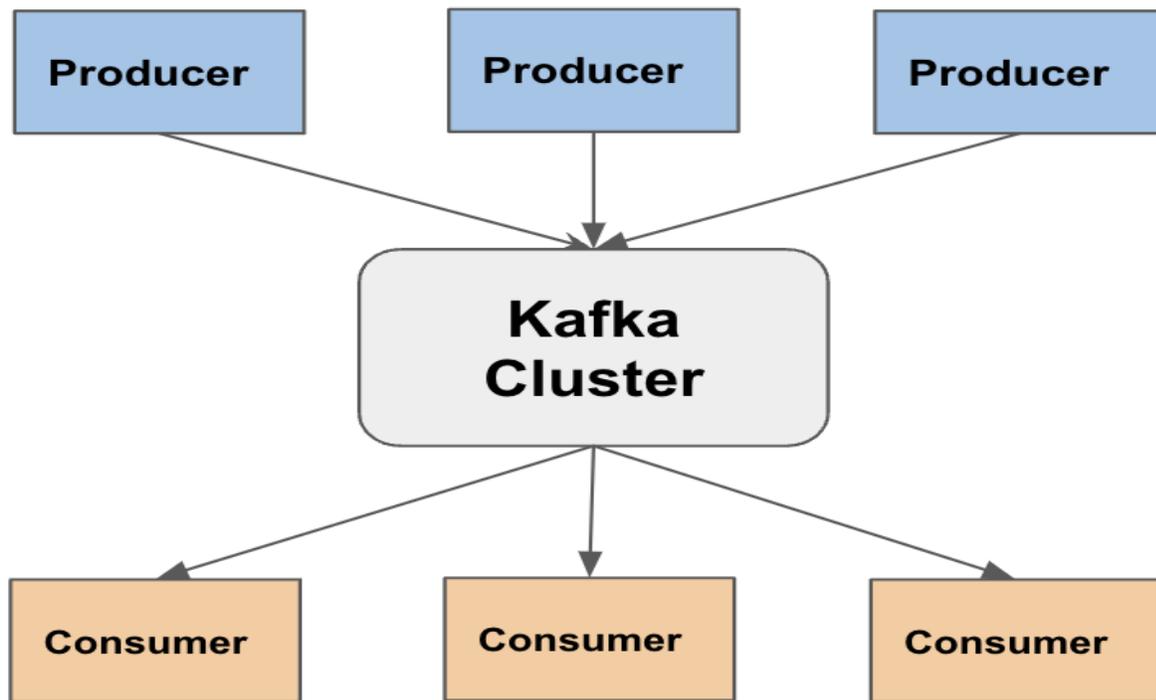


Fig -6: Kafka Framework

Kafka is a distributed, partitioned, replicated commit log service. Kafka [3] maintains feeds of messages in categories called topics. We'll call processes that publish messages to a Kafka topic are producers. And we'll call processes that subscribe to topics and process the feed of published messages are consumers. Kafka is run as a cluster comprised of one or more servers each of which is called a broker. At a high level, producers send messages over the network to the Kafka cluster which in turn serves them up to consumers like this in Fig.4.

Producers publish messages to Kafka topics, and consumers subscribe to these topics and consume the messages. A server in a Kafka cluster is called a broker. For each topic, the Kafka cluster maintains a partition for scaling, parallelism, and fault-tolerance. Each partition is an ordered, immutable sequence of messages that is continually appended to a commit log. The messages in the partitions are each assigned a sequential id number called the offset.

C.2 AWS Kinesis

Amazon Kinesis, better known as AWS Kinesis, is a new software that serves real-time data streaming. Large-scale data input and real-time analysis of streaming data are made possible by AWS Kinesis Streams [8]. Essentially, it allows for record ordering and the reading or replaying of records in the same order. The system can briefly handle large chunks of data, thus ensuring efficiency in the data computation process. AWS Kinesis is better has made modern-day consumer interaction easier as it generates a new reaction to new information. Moreover, it gives one the ability to create massive data. They have ensured a seamless transition from traditional to modern, batch, and real-time. Generally, AWS provides the most comprehensive and in-depth selection of machine learning solutions that can be used to improve compliance and verification, automate procedures, enhance consumer experiences, and detect fraud.

In serverless systems, publish-subscribe or pub-sub messaging is a type of asynchronous service-to-service communication. Any communication sent to a subject is immediately received by all the users in a pub-sub paradigm. Essentially, this enables software components like AWS Kinesis to connect the topic to receive and send messages. On the other hand, in event streams, decisions are made on data as soon as it is produced or broadcast. Generally, this can be made possible by Apache Kafka, eliminating end-to-end dependency and ETL duplication.

VI. SOFTWARE ARCHITECTURE TO MOVE THE BATCH SYSTEM TO NEAR REAL-TIME PROCESSING

Out of the options available to enable near real time processing, we used Apache Kafka and below we discuss the approach of financial sector need through near real time processing.

A. Near real processing architecture of product upgrade feature

As mentioned above, batch processing of product upgrade produces a file which consist of data of eligible customer for product upgrade. Instead of processing the files through multiple batch systems to do decisioning (inclusion, exclusions, identify offer) and fulfillment (product upgrade, notification), eligible customer file can be streamed through Kafka producer module. The real time application which processes the real time request from customers in Fig2 can be enabled to support REST API protocol as well as SDP consumer pattern. This enables us to re-use the real time processing application for batch need as well.

The one of the disadvantages to the above approach, is that existing batch system can do reconciliation of input to output at various stages of batch processing and retries in case needed whereas in real time processing, there is a need to build a module to reconciliation and retry in case of any failures. The reconciliation and retries are enabled in this pattern through dead letter queue which is part of recon/retry module which publish the data back to same Kafka topic in case of any failure due to system error.

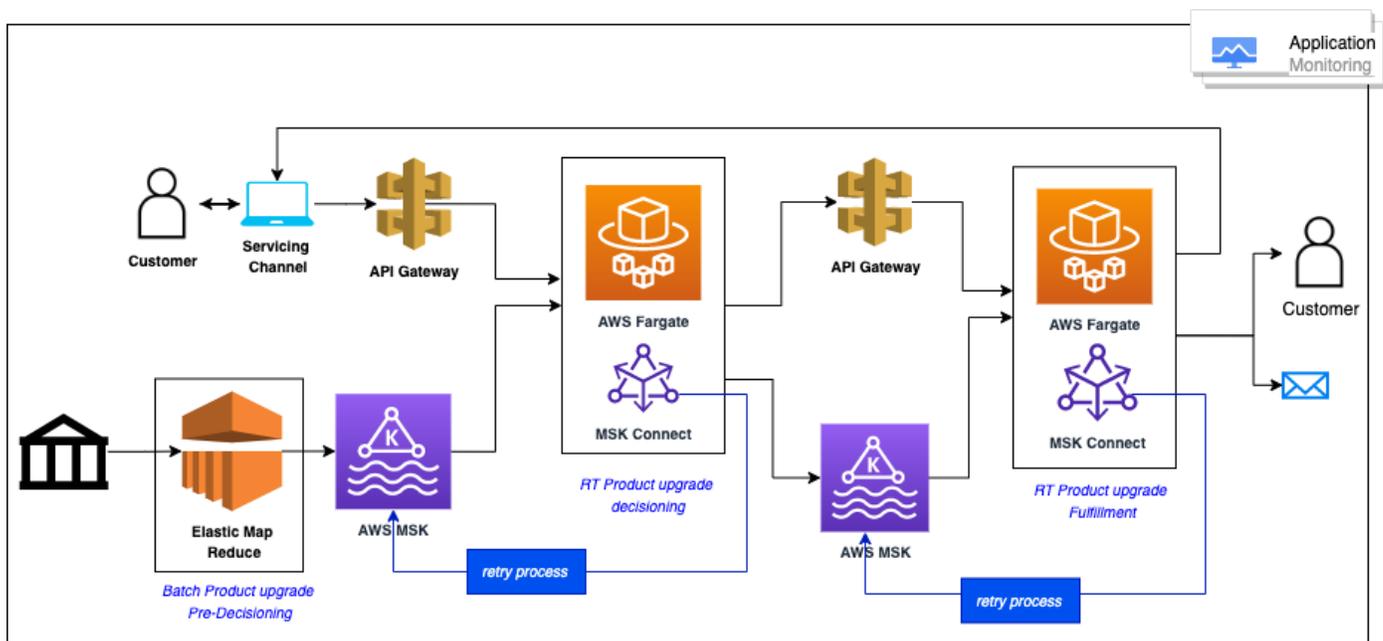


Fig -7: Near real time processing architecture of product upgrade feature

B. Near real processing architecture of reward management feature

In case of reward management architecture to near real time, as soon as the customer transaction is approved, the event can be published to a Kafka topic through a publisher module which can be consumed by a microservice which takes care of updating the reward to the customer account instantaneously. As this process happens asynchronously, monitoring can be built to support recon and retry in case of any failure. Once the reward is added successfully to the customer, the events published from the reward management can be fed to another Kafka topic which is consumed by a microservice to send a communication back to customer in near real time.

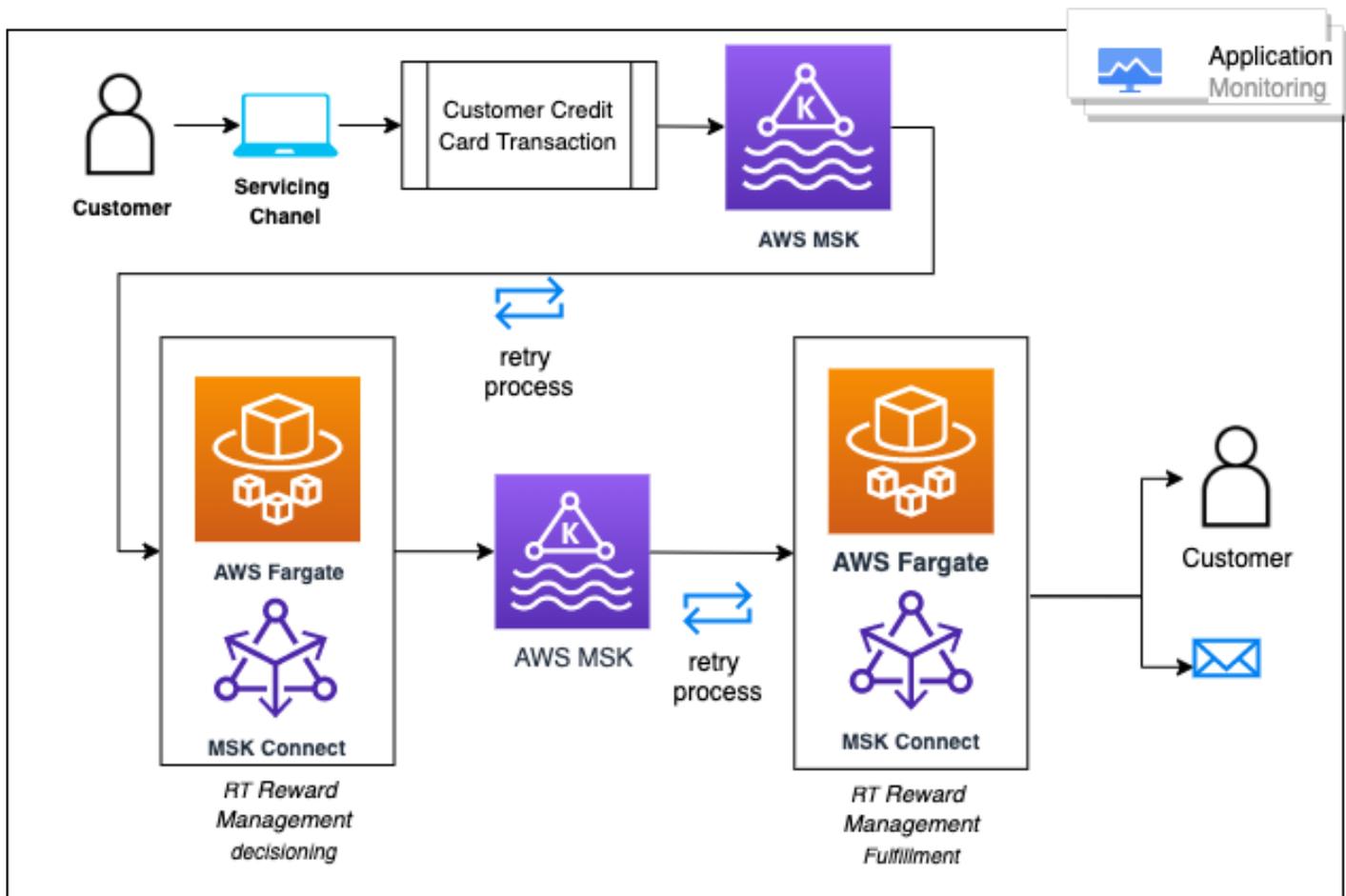


Fig -8: Near real time processing architecture of reward management feature

C. Comparison of cost and execution time

Below work is conducted to process 1M transaction using batch and near real time processing using above discussed architecture . Best case scenario includes no failure happened during the processing window. The processing time of batch process include the time taken in between batch process considering the batch job initiate every 12 hours. The processing time of near real time process consider the systems process at the rate of 100 TPS.

Worst case scenario include failure retries happen during the failure which increase the overall processing time of batch process as well as reduced the TPS of near real time process to 50TPS.

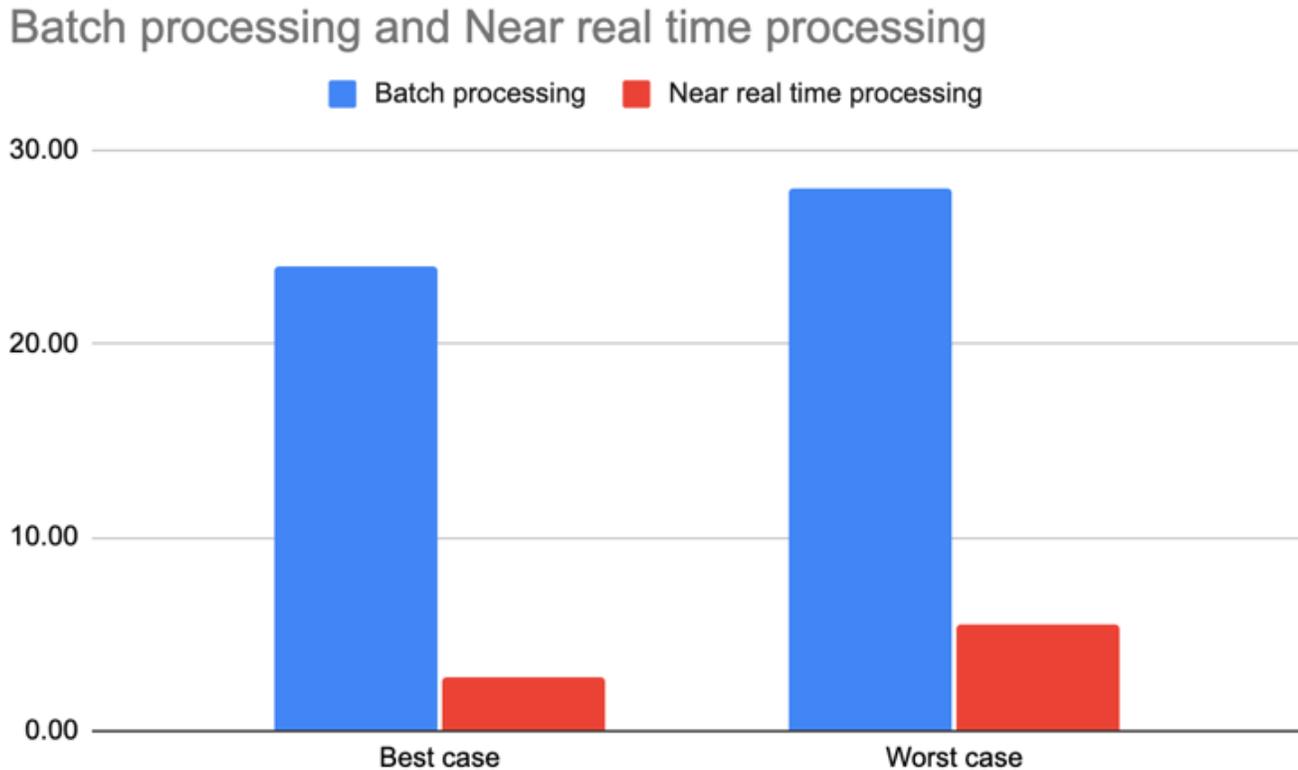


Fig -8: comparison of processing time between batch vs near real time processes.

VII. CONCLUSION

Essentially, because many banks and other financial institutions' operations, systems, and architecture are still batch-based for the non-time critical proactive applications and this in turn causes different customer experience as well as takes times more time which reduces customer satisfaction index overall. Along the same line, the financial institution is spending extra cost on maintaining both real time and batch. Considering the reactive nature of real time application which often need to respond in seconds to milliseconds as well as throw error in case of any issue. Hence just migrating batch applications to real time application tends to be over kill which could increase error rate based on the volume. Hence another option for financial institution is to switch their batch processing to near real-time processing. The benefit of this transition are, processes which needn't be real time can be asynchronously processed by re-using the efficiency of real time and be done in minutes as well as infrastructure, operational and maintenance cost can be reduced and consolidated. The transition can be gradual, beginning with processes that make the most sense for each bank separately, then broadening as advantages become apparent. The great news is that even with this strategy, banks will still see tangible benefits because near real-time processing enhances overall systems.

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Social Assistance Expenditure as Mediating in Regional Original Income, General Allocation Funds, Against the Number of Poor People

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Abstract – This research is motivated by the high level of poverty causing the costs to be incurred for economic growth to be greater, so that it can hamper the rate of economic growth. The purpose of the study was to determine the effect of Regional Original Income and General Allocation Funds on social assistance spending, the effect of Regional Original Income and General Allocation Funds on the number of poor people, and whether social assistance expenditures were able to mediate the relationship between Regional Original Income and General Allocation Funds on the number of poor people. The population is 122 regencies/cities on the islands of Java and Bali, and the sample is taken by a purposive sampling method. The test methodology makes use of path analysis. The results of the study show that Regional Original Income has an effect on social assistance spending, General Allocation Funds have no effect on social assistance spending, Regional Original Income does not affect the number of poor people, the General Allocation Funds affect the number of poor people, and social assistance spending can mediate the relationship between income Regional Original Income on the number of poor people and spending on social assistance cannot mediate the relationship between the General Allocation Fund and the number of poor people on the islands of Java and Bali in 2016-2018. The ability of the variables of Regional Original Income, General Allocation Funds, and Social Assistance Expenditures to explains the variable of Number of Poor People by 43.5%. While the remaining 56.5% is influenced by other factors not examined.

Index Terms – Regional Original Income (PAD), General Allocation Fund (DAU), Social Assistance Expenditure (Bansos), and Number of poor people (JPM).

I. INTRODUCTION

Poverty is a classic problem and a burden for the world, especially in developing countries. Poverty is a problem of concern in every country and must be faced together. The phenomenon of poverty in Indonesia is one of the main problems that has occurred since the past up until now, the problem of poverty has often been found in big cities and in remote parts of the country. The government will make various efforts, including planning, policies, and development programs, to reduce the number of poor people (Nalle and Khia, 2018). Based on article 34 paragraph 1 of the 1945 Constitution of the Republic of Indonesia, it mandates the state's obligation to care for the poor and neglected children. The poor and neglected children, as referred to in the 1945 Constitution of the Republic of Indonesia, namely, the government and local governments, provide social rehabilitation, social security, social empowerment, and social protection as a manifestation of the state's obligations in ensuring the fulfillment of the rights to basic needs of citizens who are poor and incapable.

Poverty can arise due to limited human resources who have formal and non-formal education provisions (Rarun et al., 2018). Many poverty problems occur because of the backwardness of society which then increases into economic inequality, so that there are people who cannot follow the development process or use the results of development (Ramadhan et al., 2017). According to Tambunan (2016), of the many poverty problems that occur in Indonesia, there are several main indicators of poverty: Formal education, basic housing infrastructure, stairwells, and health care are all provided.

Based on Law No. 28 of 2009 concerning the source of PAD, which comes from regional taxes, regional levies, results of separated regional wealth management, and other legitimate regional original income. The function of local revenue is as a source of regional expenditure. If the regional original income increases, the funds owned by the regional government will be higher, so that the level of regional independence will increase, so that the regional government will explore the potential of the region to the maximum and economic growth will also increase (Tambunan, 2006). General allocation funds have the nature of "block grants", i.e., local governments have power over the use of general allocation funds in accordance with the needs and aspirations of each region (Halim, 2017). According to Halim (2017), the most important goal of allocating general allocation funds is the distribution of service provision to the community by local governments in Indonesia. Based on Permendagri Number 32 of 2011 concerning guidelines for grants and social assistance sourced from the APBD, it is stated that social assistance is the provision of assistance in the form of money or goods by local governments to individuals, families, groups, and or communities that is not continuous and selective in nature. It aims to protect against possible social risks. According to Rafli and Sari (2021), the types of social assistance can be in the form of goods or money that can be received directly by the recipients of social assistance. In addition, donors of social assistance must meet certain criteria, among others: selective, meet the specified requirements, be temporary, and in accordance with the purpose of using social assistance.

Based on data from the Central Statistics Agency (BPS), on the island of Java, there are 5 provinces with 113 regencies/cities, while on the island of Bali, there is only 1 province with 9 regencies/cities. BPS recorded that in March 2016 the number of poor people (population with expenditure per capita per month below the poverty line) in Indonesia reached 28.01 million people (10.86%), a decrease of 0.50 million people compared to the condition in September 2015 of 28.51 million people (11.13%). Furthermore, data on the number of poor people in September 2017 was 26.58 million people (10.12%), then decreased by 1.19 million people compared to the condition in March 2017, which was 27.77 million people (10.64%). In March 2018, the number of poor people (people with monthly per capita expenditure below the poverty line) in Indonesia reached 25.95 million people (9.82%), a decrease of 633 thousand people compared to September 2017, when it was 26.58 million people (10.12%). In the period from 2016 to 2018, the number of poor people has decreased, so it is necessary to follow up to find out the factors that can reduce the poverty level.

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Institutional Theory

The main idea of institutional theory is that organizations form because of the pressures of the institutional environment that lead to institutionalization. So, that organizations that prioritize legitimacy are formed by the institutional environment around them because these organizations have a tendency to try to adapt to external expectations or social expectations where the organization is located (DiMaggio and Powell, 1983). Failure to meet these norms/expectations will threaten the legitimacy, resources, and even survival of the company (Lourenco, et.al., 2012). According to DiMaggio and Powell (1983), the process of legitimacy is often carried out by organizations, namely through state pressure and statements. Thus, the institutional theory's distinctiveness is found in the paradigm of norms in the form of regulation and legitimacy, modes of thought, and all socio-cultural phenomena that are consistent with the implementation of instruments in organizations.

Agency Theory

Jensen and Meckling (1976) state that agency theory refers to a type of agency relationship in which one or more (principals) hire others to perform some services on their behalf by delegating decision-making authority to the

agent. Agency theory in this study is used to explain the relationship between principals and agents in the budgeting process and budget changes.

Stewardship Theory

Stewardship theory describes a situation where *stewards* are not motivated by individual goals but rather set goals in the interests of the organization to achieve the desired goals or targets. This theory also illustrates that stewards will behave in accordance with the common interest. If the interests of the *steward* (*steward*) are not the same as those of the owner, then the *steward* will prefer to cooperate rather than oppose it because the *steward* feels that common interests and behavior in accordance with the owner's behavior is a rational consideration because the *steward* looks more at efforts to achieve organizational goals (Kumar and Sivaramakrishnan, 2008).

The Effect of Regional Original Income on Social Assistance Expenditure

According to Law No.33 of 2004 concerning Regional Original Revenue (PAD), namely income obtained by the region and collected based on regional regulations in accordance with applicable laws and regulations. PAD is one source of regional income obtained from sources of revenue in the region. Meanwhile, Rafla and Sari (2021) stated that the regional original revenue budget had no effect on changes in the increase in the regional government's social assistance budget. Based on the results of the research above, the following hypotheses can be proposed:

H 1: Regional Original Income has an effect on Social Assistance Expenditure.

The Effect of the General Allocation Fund on Social Assistance Expenditure

Talangamine et al. (2018) explained that the General Allocation Fund (DAU) is a number of funds allocated to each Autonomous Region (province/district/city) in Indonesia annually as development funds. Based on the Minister of Home Affairs Regulation Number 32 of 2011 concerning Guidelines for the Provision of Grants and Social Assistance sourced from the Regional Revenue and Expenditure Budget, regional governments can provide social assistance to members/community groups according to regional financial capabilities. The provision of social assistance is carried out after prioritizing the fulfillment of mandatory business expenditures by taking into account the principles of justice, propriety, rationality, and benefits for the community. According to Wibisono et al. (2021), the DAU had an effect on social assistance in local governments throughout the Madiun Bakorwil. Based on the results of the research above, the following hypotheses can be proposed:

H 2: The General Allocation Fund has an effect on Social Assistance Expenditure.

The Effect of Regional Original Income on the Number of Poor People

The implementation of development in the regions requires quite a lot of funds, and in this case, the regions cannot only depend on balancing funds from the center, so the regions must be able to explore the potential of their regions to be used as financing for routine expenditures and regional development expenditures in the era of regional autonomy in order to increase their income. High Regional Original Income will affect development and development in the region, which is realized in the form of building public facilities so that it can improve the welfare of the community. According to Astuti et al. (2021), PAD has an effect on poverty rates in Java. Based on the results of the research above, the following hypotheses can be proposed:

H 3: Regional original income affects the number of poor people.

The Effect of the General Allocation Fund on the Number of Poor People

General allocation funds (DAU) are funds originating from the APBN which are allocated with the aim of an equitable distribution of financial capacity among regions to finance their expenditure needs in the context of implementing decentralization (Halim, 2007). According to Wijaya et al. (2018), the DAU had an effect on poverty in East Java province in 2015–2016. Based on the results of the research above, the following hypotheses can be proposed:

H 4: The General Allocation Fund affects the number of poor people.

Social Assistance Expenditures can mediate the relationship between Regional Original Income and General Allocation Funds on the Number of Poor People

Based on the Minister of Home Affairs Regulation No. 32 of 2011 concerning Guidelines for the Provision of Grants and Social Assistance sourced from the Regional Revenue and Expenditure Budget, regional governments can provide social assistance to members/community groups according to the regional financial capacity. According to Melati et al. (2021), social assistance spending had a positive but not significant effect on poverty in districts/cities in West Java Province in 2015–2019. Meanwhile, according to Rarun et al. (2018), social assistance spending has no effect on poverty in the province of North Sulawesi. Based on the results of the research above, the following hypotheses can be proposed:

H 5: Social Assistance Expenditures can mediate the relationship between Local Original Income and the Number of Poor People.

H 6: Social Assistance Expenditure can mediate the relationship between the General Allocation Fund and the Number of Poor People.

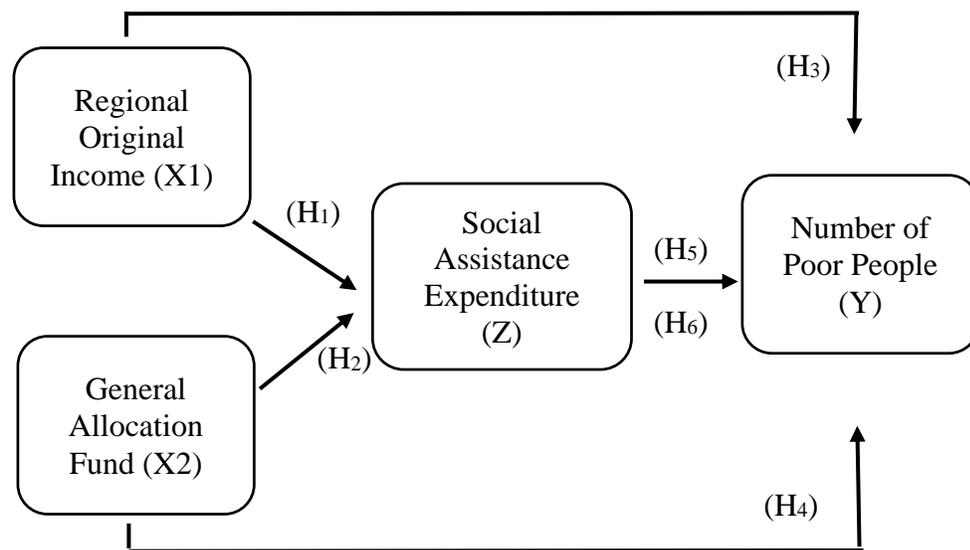


Figure 1. Hypotheses and Conceptual Framework

III. RESEARCH METHOD

Population and Sample

This research is research with a quantitative method. The method used to analyze data related to the problem of the influence of regional original income and general allocation funds on the number of poor people with the mediating variable of social assistance expenditure. The population in the study is in the form of data from as many as 122 regencies/cities on the islands of Java and Bali. The research sample was taken using a purposive sampling method with criteria covering districts and cities that have PAD and DAU, districts and cities that have a number of poor people, and districts and cities that have social assistance spending.

Variable e Measurement

Each of these research variables has a definition that will be explained in this study. (X1) Regional Original Income and (X2) General Allocation Fund, (Y) Number of Poor People, and (Z) Social Assistance Expenditure are the variables.

1. Poverty is where a person lives below the standard minimum needs that have been set based on basic food needs that make a person able to work and live a healthy life based on rice and nutritional needs (Nalle and Khia, 2018).
2. Regional original income (PAD) is all regional revenues originating from regional original economic sources, such as taxes, user fees, the results of separated regional wealth management and other legitimate regional original income (Halim, 2007). Based on Law No. 33 of 2004, PAD is sourced from regional

taxes, regional taxes are regional income derived from taxes. The formula for calculating Regional Original Income (PAD) is:

$$PAD = \text{regional taxes} + \text{regional levies} + \text{regional wealth management results} + \text{other legitimate PAD}$$

3. The General Allocation Fund (DAU) is a number of funds allocated to each Autonomous Region (province/district/city) in Indonesia annually as development funds (Talangamin *et al.*, 2018). Wibisono *et al.* (2021) explained that, local governments really need DAU in order to reduce or cover the lack of regional income. The General Allocation Fund formula per area:

$$DAU = AD + CF$$

Information :

DAU = DAU allocation per region

AD = Allocation of DAUs based on Base Allocation

CF = Fiscal Need – Fiscal Capacity

4. Social assistance is a transfer of money or goods given to the community to protect against possible social risks. Based on Permendagri Number 32 of 2011 concerning guidelines for grants and social assistance sourced from the APBD, it is stated that social assistance is the provision of assistance in the form of money or goods by local governments to individuals, families, groups, and or communities that is not continuous and selective in nature. It aims to protect you from the possibility of social risk.

IV. RESULT AND DISCUSSION

1. Descriptive Statistics Test

Table 1. Descriptive Statistical Test Results

	N	Minimum	Maximum	Mean	Std. Deviation
PAD	366	6638534815 3.00	5161844571 171.67	5638153884 69,1120	706292897659 ,22100
DAU	366	670278830. 00	3162102111 000.00	9766266473 74,8960	358236248705 ,58500
JPM	366	7040000.00	120060000. 00	11849224.0 437	9966437,0858 0
Bansos	366	0.00	2237853297 30.00	1402434613 5,1451	21089383760, 17900
Valid N (listwise)	366				

Based on table 1 above, it shows that the amount of data used in this study was 366, taken from 2016-2018. With the following results:

a. Regional Original Income (PAD)

The Local Original Income Variable has a minimum value of Rp. 66,385,348,153.00 located in Pangandaran Regency in 2016 and a maximum value of Rp. 5,161,844,571,171.67 located in the city of Surabaya in 2017, with a *mean value* of Rp. 563,815,388,469,112 and a standard deviation of Rp. 706,292,897,659,221.

b. General Allocation Fund (DAU)

The General Allocation Fund variable has a minimum value of Rp. 670,278,830 located in Yogyakarta City in 2016 and a maximum value of Rp. 3,162,102,111,000 located in Tegal Regency 2016, with a *mean value* of Rp. 976,626.647,374,896 and a standard deviation of Rp. 358,236,248,705,585.

c. Number of Poor People (JPM)

The variable “Number of Poor People” has a minimum value of 704,000 located in Mojokerto City in 2018 and a maximum value of 120,060,000 located in Sumedang Regency in 2016, with a *mean value* of 11,849,224,0437158 and a standard deviation of 9,966,437,0858037.

d. Social Assistance Expenditure (Bansos)

The Social Assistance Expenditure variable has a minimum value of Rp. 0.00 because several districts/cities did not receive social assistance spending and the maximum value was Rp. 223,785,329,730 located in Badung Regency in 2018, with a *mean value* of Rp. 14,024,346,135,1451 and a standard deviation of Rp. 21,089,383,760,179.

2. The Classic Assumption Test

The normality test is carried out to test whether, in a regression model, an independent variable and a dependent variable or both have a normal or abnormal distribution (Ghozali, 2016). In this study, the normality test uses the CLT (Central Limit Theorem) test, that is, if the number of observations is large enough ($n > 30$), the assumption of normality can be ignored (Gujarati, 2003). In this study, the number of n is $366 > 30$. This shows that the data is said to have a normal distribution, and the data is referred to as a large sample.

The multicollinearity test was carried out by looking at the value of the variance inflation factor (VIF) and the tolerance value. Based on the results of SPSS output equations 1 and 2, the VIF value for each independent variable is less than 10 and the tolerance value is above 0.10, so it can be concluded that all independent variables in this study are not indicated by multicollinearity. An autocorrelation test is used to detect the presence or absence of autocorrelation by performing a run test. Based on the results of the SPSS output, equation 1 shows the *Asymp value. sig. (2-tailed)* of 0.143 more than 0.05. Equation 2 shows the *Asymp value. Sig. (2-tailed)* of 0.075 more than 0.05. So, it can be concluded that the regression model used in the study is free from autocorrelation.

The test used to detect the presence of heteroscedasticity in the regression model is the Spearman Rho test. Based on the results of SPSS output equation 1, it shows that the sig value of regional original income is 0.016 0.05, suggesting that the regional original income variable experiences heteroscedasticity symptoms in the regression model. While the General Allocation Fund has a sig value of 0.953 $>$ 0.05, so that the General Allocation Fund variable does not show heteroscedasticity symptoms in the regression model. The value of sig $>$ 0.05, so it can be concluded that there is no symptom of heteroscedasticity in the regression model. The regression model is feasible to use to predict the effect of regional original income, general allocation funds, and social assistance expenditures on the number of poor people.

3. Hypothesis test

a. Path Analysis

The results of path analysis in this study can be seen in the following table:

Table 2. Path Analysis Results

Equation 1					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	8524689468.	30106421		2.832	.005
PAD	.011	.001	.360	7.181	.000
DAU	-.001	.003	-.010	-.194	.847

Equation 2					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	8524689468.	30106421		2.832	.005
PAD	.011	.001	.360	7.181	.000
DAU	-.001	.003	-.010	-.194	.847

	B	Std. Error	Beta		
(Constant)	-	1154521.	-	5.465	.000
PAD	6309425.325	.027	-.026	-.601	.548
1	0,0000184615			16.49	
DAU	835065849	.000	.664	8	.000
Bansos	0.0000023834 0631302279	.000	.050	1.197	.232

Based on the results of the SPSS output equation 1 and equation 2 above, the path analysis equation can be arranged as follows:

Equation 1

$$\text{Social Assistance Expenditure} = 8524689468,323 + 0.011 \text{ PAD} - 0.001 \text{ DAU} + e$$

Based on the regression equation, it can be interpreted as follows:

- 1) The constant value of 8524689468.323 indicates that if the Regional Original Income (PAD) and General Allocation Funds (DAU) variables do not change or are considered constant at value 0, then the social assistance expenditure is 8524689468.323.
- 2) The regression coefficient on the Regional Original Income (PAD) variable shows a value of 0.011 and is positive. This shows that if the value of Regional Original Income increases by 1 unit, then social assistance expenditures increase by 0.011 units with the assumption that other variables have a fixed value.
- 3) The regression coefficient on the General Allocation Fund (DAU) variable shows a value of -0.001 and is negative. This shows that if the General Allocation Fund increases by 1 unit, then social assistance spending will decrease by 0.001 units, assuming other variables are fixed or constant.

Equation 2

$$\text{JPM} = - 6309425,325 - 3,648\text{E-}7 \text{ PAD} + 0.0000184615835065849 \text{ DAU} + 0.00000238340631302279 \text{ Social Assistance Expenditure} + e$$

Based on the regression equation, it can be interpreted as follows:

- 1) The constant value of -6309425.325 indicates that if the variables of Regional Original Income, General Allocation Funds, and Social Assistance Expenditures do not change or are considered constant at value 0, then social assistance spending is -6309425.325.
- 2) The regression coefficient on the Regional Original Income variable shows a value of -3.648E-7 and is negative. This shows that if the value of Regional Original Income increases by 1 unit, the number of poor people will decrease by 3,648E-7 units with the assumption that other variables have a fixed value.
- 3) The regression coefficient on the General Allocation Fund variable shows a value of 0.0000184615835065849 and is positive. This shows that if the General Allocation Fund increases by 1 unit, then the number of poor people increases by 0.0000184615835065849 units, assuming other variables are constant or constant.
- 4) The regression coefficient on the Social Assistance Expenditure variable shows a value of 0.0000238340631302279 and is positive. This shows that if Social Assistance Expenditure increases by 1 unit, then the number of poor people increases by 0.00000238340631302279 units with the assumption that other variables are fixed or constant.

b. T Uji test

Hypothesis testing is done by using the t-test is used to partially test the regression coefficient by looking at the effect of the independent variable on the dependent variable. Based on the regression model testing, the following results were obtained:

Table 3. T-Test Results

Equation 1					
Variable	Standardized Coefficients Beta	t _{count}	t _{table}	Sig	Information
PAD	0.360	7,181	1,966	0.000	H1 accepted
DAU	-0.010	- 0.194	1,966	0.847	H2 rejected
Equation 2					
Variable	Standardized Coefficients Beta	t _{count}	t _{table}	Sig	Information
PAD	-0.026	- 0.601	1,966	0.548	H3 rejected
DAU	0.664	16, 498	1,966	0, 000	H4 accepted
Bansos	0.050	1, 197	1,966	0, 232	H5 is accepted and H6 is rejected

Based on the results of the SPSS output equation 1 and equation 2 above, it shows that:

1) The Effect of Regional Original Income (PAD) on Social Assistance Expenditure (X₁)

The results of statistical testing of the t-test of the PAD variable obtained a t-count value of 7.181 with a sig level of 0.000 and obtained a t-table of 1.966. Due to the value of t arithmetic 7.181 > t table 1.966 with a sig value of 0.000 < 0.05, hypothesis 1 is accepted. This research proves that regional original income (PAD) affects social assistance spending. Social assistance spending allocated from PAD sources is a priority for local governments. The Social Assistance Budget is an implementation of social development in each region. Social development aims to solve poverty, covering aspects of income, consumption, and social and environmental aspects. The expectation from the allocation of social assistance by Regency/City governments is to reduce poverty.

This study supports the results of research conducted by Wibisono *et al.* (2021), which states that PAD affects social assistance in regional governments throughout the Madiun Bakorwil. However, this study does not support the research conducted by Rafli and Sari (2021), which stated that the regional original revenue budget did not affect changes in the social assistance expenditure budget of Regency or City governments in Sumatra in 2016–2019.

2) The Effect of the General Allocation Fund (DAU) on Social Assistance Expenditure (X₂)

The results of statistical testing of the t-test of the DAU variable obtained a t-count value of -0.194 with a sig level of 0.847 and obtained a t-table of 1.966. Due to the value of t arithmetic - 0.194 < t table 1.966

with a sig value of $0.847 > 0.05$, hypothesis 2 is rejected. This study proves that the General Allocation Fund (DAU) does not affect social assistance spending. The General Allocation Fund (DAU) is a collection of funds allocated to each autonomous region (province/district/city) in Indonesia annually as development funds (Talangamin et al., 2018). By Law Number 33 of 2004, at least twenty-six percent (26%) of the government's net domestic revenue is allocated to DAU. General allocation funds are allocated to each region based on the allocation formula (by formula).

The results of this study do not support the research conducted by Wibisono *et al.* (2021), which states that the DAU has an effect on social assistance in local governments throughout the Madiun Bakorwil.

3) The Effect of Regional Original Income (PAD) on the Number of Poor People (X₃)

The results of statistical testing of the t-test of the PAD variable obtained a t-count value of -0.601 with a sig level of 0.548 and obtained a t-table of 1.966. Due to the value of t arithmetic $-0.601 < t$ table 1.966 with a sig value of $0.548 > 0.05$, then hypothesis 3 is rejected. This study proves that regional original income (PAD) does not affect the number of poor people. The realization of regional original income does not affect the number of poor people because the size of the realization of regional original income does not ensure that the number of poor people is affected. For example, the realization of the Tabanan Regency Original Revenue budget in 2016 was Rp. 318,083,799,105.63, with the number of poor people of 2,190,000. The realization of the Tabanan Regency Original Revenue budget in 2017 was Rp. 426,635,750,740,34 with a total poor population of 2,166,000. While the realization of the Tabanan Regency Original Revenue budget in 2018 was Rp. 363,370,469,708.67 with a number of poor people of 1,977,000. This proves that the realization of a large budget does not necessarily affect overcoming the increase in the number of poor people.

This study supports the results of research conducted by Fitriyanti and Handayani (2020), which states that Regional Original Income has a significant negative effect on the poverty level of districts/cities in Central Java Province. However, this study does not support the research conducted by Astuti, *et al.* (2021), which states that PAD partially and simultaneously affects the poverty rate in West Java.

4) The Effect of the General Allocation Fund (DAU) on the Number of Poor People (X₄)

The results of statistical testing of the t-test of the DAU variable obtained a t-count value of 16,498 with a sig level of 0.000 and a t-table of 1.966 were obtained. Due to the value of t arithmetic $16.498 > t$ table 1.966 with a sig value of $0.000 < 0.05$, hypothesis 4 is accepted. This study proves that the General Allocation Fund (DAU) has an effect on the number of poor people. With the regional autonomy policy, for regions that have reliable potential resources, both human and natural, this policy is welcomed, considering that free government intervention will provide faster opportunities and have a positive impact on improving the welfare of the public.

This study supports the results of research conducted by Wijaya *et al.* (2018), which states that the DAU affects poverty in East Java province from 2015-2016. However, this study does not support the research conducted by Astuti *et al.* (2021), which states that the DAU does not affect poverty in East Java.

5) Social Assistance Expenditure can mediate the relationship between Local Original Income and the Number of Poor People (X₅)

The results of the indirect test of social assistance obtained a value of 0.018. Due to the beta results of regional original income of 0.360 multiplied by the beta results of social assistance expenditures (Bansos) of 0.050, the indirect test results are 0.018, so hypothesis 5 is accepted. This study proves that social assistance spending (Bansos) can mediate the relationship between regional original income and the number of poor people. While the direct test value is too small, namely -0.026, then what is used is the result of indirect testing. Social assistance is one of the government's ways of reducing poverty in Indonesia. These expenditures are always routinely available to address various social and economic risks. In Permendagri Number 32 of 2011 concerning guidelines for grants and social assistance sourced from the APBD, it is stated that social assistance is the provision of assistance in the form of money or goods by local governments to individuals, families, groups, and or communities that is not continuous and selective. It aims to protect against possible social risks.

This study supports the results of research conducted by Rarun *et al.* (2018), which states that social assistance spending has a significant negative impact, meaning that if social assistance spending increases, it will reduce the poverty rate in the province of North Sulawesi. And in line with research conducted by Wibisono *et al.* (2021), which states that PAD affects social assistance in regional governments throughout the Madiun Bakorwil.

6) Social Assistance Expenditure can mediate the relationship between the General Allocation Fund and the Number of Poor Pople (X_6)

The results of the indirect test of social assistance obtained a value of -0.0005. Due to the beta result of the General Allocation Fund (DAU) of -0.010 multiplied by the beta result of social assistance spending (Bansos) of 0.050, the indirect test result is -0.0005, so hypothesis 6 is not accepted. This study proves that social assistance spending (Bansos) cannot mediate the relationship between the General Allocation Fund (DAU) and the number of poor people, because the indirect research results are smaller than direct research. Meanwhile, the direct test results have a greater value, namely 0.664.

This study supports the research conducted by Melati *et al.* (2021), which states that social assistance spending has a positive but not significant effect on poverty in districts/cities in West Java Province from 2015–2019. Because the impact received is very small and cannot help people move out of poverty, it is difficult for the government to identify the poor to receive social assistance.

V. CONCLUSION

Conclusion

Based on the results of research and hypothesis testing that have been carried out, the following conclusions can be drawn:

1. Regional Original Income (PAD) has a positive and significant effect on social assistance spending. This result is evidenced by the value of t arithmetic $7.181 > t$ table 1.966 with a sig value of $0.000 < 0.05$, so **H1 is accepted**.
2. The General Allocation Fund (DAU) does not affect social assistance spending. This result is evidenced by the value of t arithmetic $-0.194 < t$ table 1.966 with a sig value of $0.847 > 0.05$, so **H2 is rejected**.
3. Regional original income (PAD) does not affect the number of poor people. This result is evidenced by the value of t arithmetic $-0.601 < t$ table **1.966** with a sig value of $0.548 > 0.05$, so **H3 is rejected**.
4. The General Allocation Fund (DAU) has a positive and significant effect on the number of poor people. This result is evidenced by the value of t arithmetic $16,498 > t$ table 1,966 with a sig value of $0.000 < 0.05$, so **H4 is accepted**.
5. Expenditures on social assistance (Bansos) can mediate the relationship between regional original income and the number of poor people. This result is evidenced by the multiplication value of the indirect test beta $0.018 >$ the direct test beta value of -0.026 , so **H5 is accepted**.
6. Social assistance spending (Bansos) cannot mediate the relationship between the General Allocation Fund and the number of poor people. This result is evidenced by the multiplication value of the indirect test beta of $-0.0005 <$ the direct test beta value of 0.664, so **H6 is rejected**.

Research Limitations

The limitations put forward by researchers in carrying out this research are as follows:

1. The data collection period is only 2016-2018, while good research uses more years so that it can better explain the real variability of the data.
2. The data used in this study is too heterogeneous, causing the Regional Original Income (PAD) variable in equation 1 to have heteroscedasticity symptoms because it has a sig value of less than 0.05.

Suggestion

The suggestions that the author can give in this research are as follows:

1. For further research, it is better to use more diverse independent variables that can affect the number of poor people.
2. The year of sampling should use the latest year so that the data used in the research is relevant.

3. It is expected to use a wider sample so that more accurate research results can be found regarding the number of poor people.

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Analysis of the Influence of Auditor Characteristics and Company Characteristics Towards Audit Delay in Companies on the IDX

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Abstract- This study aims to analyze the effect of auditor characteristics and company characteristics on audit delays in companies on the IDX in the 2019 financial statements. The research data comes from the number of companies tested the financial statements of companies selected from the annual financial statements of companies listed on the IDX. 2015 to 2019, and which have been through the audit process. The sample was selected through purposive sampling method and technique. The type of data chosen to be used in the implementation of this research is secondary data. The method used in this research is a causal method with a quantitative approach. The data obtained will be processed using the method (system). The results of the study state that the variables do not have a significant effect on Audit Delay, while a significant effect is found on the on Audit Delay.

Index Terms- Board of Directors Size, Audit Committee Size, Audit Committee Meetings, Audit Committee Expertise, and Audit Delay

I. INTRODUCTION

Financial reports play an important role in producing economic decisions in a company. The information contained in a financial report must be complete, clear and include actual financial data of the company which is described in detail. Financial reports remain one of the most reliable sources of accounting information for stakeholders and external users (Rusmin & Evans, 2017). In general, the related parties who use financial reports in a company are managers or company leaders, investors, creditors, employees, customers, tax agencies, government, capital market analysis, society and non-governmental organizations (Harahap, 2010).

The information contained in the financial statements must be presented and reported in a manner that is relevant, comparable and easy to understand. The main factor affecting the quality of information in the annual report is the timeliness and accuracy that can be used by external users (Kurniawan & Laksito, 2015). The timeliness of financial reports is very important for company value because unnecessary delays will affect the relevance of the report's information content (Ahmed & Che-Ahmad, 2016).

Audit takes an important role in obtaining and evaluating evidence in an objective financial report that contains all kinds of statements in the form of economic activities and events that aim to determine the level of compatibility between these statements and predetermined conditions, and convey these results to users who need them. (Mulyadi, 2014). Audit also has the objective of obtaining knowledge regarding the financial statements submitted by the company (management) which have been arranged in a comprehensive and generally applicable accounting practice and state the actual conditions regarding the company's finances at the reporting date and management performance within a certain time (Bhayangkara, 2015).

Audit delay is the audit completion period calculated based on the period between the date of closing of the annual book and the date of issuance of the audit report (Suryanto, 2016). The factors that influence audit delay have been tested by several researchers. These factors are generally seen from the

aspect of the company and from the aspect of the auditor. Audit delay is identified as the number of days from the end of the company's fiscal year to the date of the audit report (Swanson & Zhang, 2018). Several studies have shown that audit delay is very important because of this related to public trust in audited financial reports (Salleh, Baatwah & Ahmad, 2017).

The Indonesia Stock Exchange (IDX) is one of the capital market institutions in Indonesia (Khairan, Tikollah, & Anwar, 2018). The Indonesia Stock Exchange is the official capital market institution in Indonesia, the IDX provides stock trading transaction services that allow companies in Indonesia to participate in the process of transaction activities. The task of the Indonesia Stock Exchange is to provide facilities and control the securities transaction process in Indonesia so that it can run efficiently.

II. LITERATURE REVIEW

Theoretical basis

Audit Delay

Timeliness in audit reports is an important factor in the growth of new and developing capital markets where the audited annual financial reports are data in the form of information that investors can rely on (Azubike & Aggreh, 2014). Audit report delay, also known as audit delay, is the time (measured as the number of days) from the end of the company's fiscal year and the date of the audit report. This is an important factor because it is directly related to the timeliness of the completion of financial statements (Nehme et al., 2015).

Timeliness of financial reporting is very important for the functioning of the capital market because it reduces asymmetry in information and increases the usefulness of decisions in information (Vuko & Ćular, 2014). Timely reporting is a function of audit-related and company-specific factors. Audit-related factors are factors that hinder the performance of audit work or issue an audit report on time. On the other hand, company-specific factors help management release annual reports on time or reduce the cost of late reports (Fathi & Gerayli, 2017).

Audit delays have implications for the financial statements submitted at a certain time, in other words changes in the company tend to have an influence on user decisions. If information is not conveyed in a timely manner, it will lose the quality of information which will have an impact on the quality of decisions (Arry Eksandy, 2017). Delay in financial statements may indicate some errors and fraud in the financial statements, so auditors need more time to complete the audit (Yendrawati & Mahendra, 2018). Audit delays that exceed the time of publication of the financial statements are likely to tarnish the company's reputation with investors. In addition, delays in publishing audit information make it difficult investors to make investment decisions, which can have a negative impact on the corporate image of the public accounting firm (Maggy & Diana, 2018).

Relationship Between Board of Directors Size and Audit Delay

The size of the board of directors is the scale or how many members of the board of directors have the task of increasing the value of the company and this is followed by an increase in shareholder wealth with an increase in share prices (Elshawarby, 2018). The board of directors must play a role in ensuring the accuracy of information that will be intended for the public or the general public (Ilaboya & Christian, 2014). A large number of boards will bring together directors with a greater degree of specialization from a wider variety of fields. On the other hand, directors also have the opportunity to put a lot of thoughts into it and efforts to ensure the quality and timeliness, so as to improve the performance and quality of financial reports as optimally as possible (Alfraih, 2016).

Relationship Between Audit Committee Size and Audit Delay

According to agency theory, the effectiveness of monitoring and group cohesion can be increased by small audit committee sizes (Jensen, 1993; Hillman & Dalziel, 2003). It has been argued that increasing the size of the audit committee may result in a lack of active participation by some directors,

which in turn undermines cohesion in decision-making, and undermines control and monitoring functions (Lipton & Lorsch, 1992; Hillman & Dalziel, 2003). Bédard and Gendron (2010) assert that small audit committees have a diversity of expertise and can ensure appropriate monitoring. Meanwhile, according to (Al-Matari et al., 2012) the size of the audit committee determines the effectiveness of the committee's ability to carry out its responsibilities. If the audit committee can guarantee that the company's internal control is carried out properly, the risk of financial delivery errors will be low along with low control risk.

Relationship Between Audit Committee Meetings and Audit Delays

Audit committee meetings are a means used to conduct discussions and study methods or techniques applied in order to produce opinions on financial statement information that is useful for internal company parties (Mohamad-Nor et al., 2010). So that its a meeting carried out by the audit committee to function as appropriate to determine that all principles and rules have been obeyed and implemented as financial commitments by each organization (Apadore & Mohd Noor, 2013). According to (Mohamad-Nor et al., 2010) the meeting held was used by members of the audit committee in discussing all the problems and difficulties encountered during the process of making up to the publication of the financial statements. The implementation of the meeting provides an opportunity for the audit committee to obtain information related to audit procedures as well as more full attention in carrying out their duties so that the conclusion is drawn that meeting routines also facilitate the audit process of financial statements and shorten the lags of audit reports (Nehme et al., 2015). Audit committee meetings are clearly in the interest of being the right platform for directors to discuss the financial reporting process in monitoring financial reporting issues (Mohamad-nor et al., 2010). However, the frequency of meetings can reflect the activeness of the audit committee in assessing internal control and can also respond to problems (Krishnan, 2005).

Relationship Between Audit Committee Expertise and Audit Delay

Another important factor and belief is that the audit committee is composed of experts who have experience in understanding and carrying out the entrusted duties and responsibilities so that it is easier to identify errors in the audit and communicate with external auditors. This can reduce doubts arising from related parties regarding the originality and authenticity of the preparation and delivery of the audit report. The expertise of the audit committee plays an important role in dealing with external auditors effectively; This is because the audit committee is often relied on to be a mediator between management and auditors (U. J. B. Hashim & Rahman, 2011). According to Yadirichukwu and Emibomowei (2013), audit committees that tend to better understand and master the risks and timeframes of auditing with the audit method are committees that are more capable and expert in accounting processing. This increases the speed of completing the auditor's tasks in the reporting process thereby shortening the audit completion stage.

Relationship Between KAP Size and Audit Delay

The larger the KAP size, the greater the effect on an incident (ARL Gilling, 1977; Ashton et al, 1989). This happens because the size of the KAP is getting bigger, the completion of the audit will be more efficient and will have a more flexible schedule. Prabandari and Rustiana (2007) stated that a larger KAP size requires a shorter time or The Big Four in completing the audit, because The Big Four is considered to be more efficient in conducting audits and can complete audits in a timely manner with a more flexible schedule. (Afify, 2009) said that larger audit firms tend to be motivated to complete audit work earlier than smaller firms to maintain their reputation. If they do not keep their timelines, they will likely lose clients in the coming year. Added by (Shukeri & Islam, 2012) which stated that they were significantly negative in the results of their research, that big 6 companies would be faster in conducting their audits than companies that were not big 6.

Relationship Between Company Size and Audit Delay

Company size is a measure that determines whether companies are categorized as large or small scale. Large-scale companies tend to maintain the image and good name of the company so that they will still be seen by investors and the general public. The company will increase the speed and timeliness of the issuance of financial statements as the company size increases. Large-scale companies tend to spend shorter and faster time in completing financial statements because they have good system mechanisms and a greater number of accountants than small-scale companies (Owusu-Ansah & Leventis, 2006). According to (Carslaw & Kaplan, 1991) that large-scale companies tend to be stronger in terms of internal control so that they are in a position to demand pressure on auditors to complete audits with the aim of producing a shorter period of audit delay. This is because a larger company size has a better internal control system so that the risk of financial statement error rates is smaller, besides that a good internal control system can make it easier for auditors to audit financial reports (Owusu-Ansah, 2000; Puspitasari & Latrini, 2014).

Relationship Between Profitability and Audit Delay

The profitability ratio is defined by Kashmir (2014), as the company's ability to make a profit. According to Carslaw & Kaplan (1991) companies that are experiencing a loss condition will request their auditors to postpone their auditing schedule compared to the schedule they should have, so that submission of the results of auditing financial statements takes longer, apart from that in this study it explains that companies tend to slow down their financial statements more if the company believes bad news contained in financial reports will have an influence on earnings quality. Novice and Bob (2010) wrote that the higher the level of profitability a company has, it will require a faster financial report audit process due to the need to convey good news to the public as soon as possible.

Relationship Between Leverage and Audit Delay

Leverage is a financial ratio tool used to determine calculations that measure the level of dependence on creditors by a company in terms of financing company assets. Companies with high leverage levels require a long relevant time in completing financial statements (Güleç, 2017). According to Carslaw & Kaplan (1991), the debt ratio can show the financial health of a company. A debt ratio with a large proportion can increase the probability of the company failing and will cause auditors to worry about the reliability of the company's financial statements from the usual standard. According to A. A. A. Ahmed and Hossain (2010), because of the high risk of lawsuits, auditors must carry out a more thorough and professional audit to anticipate undesirable things. So that companies with a high proportion of debt cause audit delays to get longer.

Previous Research

Afify (2009) conducted an analysis of audit delays using the ownership concentration, board independence, duality of CEO, existence of an audit committee as an independent variable and company size, as well as the size of the public accounting firm, industry, company performance as control variables. Mohamad-nor et al., (2010) conducted a study with the aim of examining the effect of the nature of the audit committee on the timeliness of the audit report. The nature of the audit committee examined includes size, expertise, independence and the number of meetings that act as part of the independent variable. Likewise, Hashim & Rahman (2011) have conducted research with board factors, board independence and board expertise as independent variables.

Alkhatib & Marji (2012) conducted research on audit delay, using independent variables in the form of public accounting firm size, company size, industry type, profitability, and solvency. Apadore & Mohd Noor (2013) have also conducted research analysis with audit committee, audit committee meetings, audit committee expertise, audit committee size, board independence, internal audit investment and ownership concentration as independent variables. Al-Shwiyat (2013) examined the factors of audit delay with leverage, company size, timeliness and earnings per share ratio as independent variables. Enofe et al., (2013) conducted a study on audit delay in Nigeria using independent variables as audit firm rotation, audit fees, size of public accounting firm, firm size, year-end dates. Research on

corporate governance and audit report delay in Nigeria was conducted by Sc & Sc, 2014. The study used five independent variables, namely board size, company size, type of audit firm, size of audit committee and board independence. Azubike & Aggreh (2014) conducted a study on audit delays in Nigeria. The independent variables used are board size, board independence, and the size of the public accounting firm.

Vuko & Ćular (2014) explored the causes that influence audit delay. This study uses KAP size, audit opinion, profitability, leverage, audit effort, absolute level of total accruals, firm size and audit committee as independent variables. Aditya & Anisykurlillah (2014) analyzed the elements that resulted in audit delays in manufacturing companies listed on the IDX from 2010 to 2013. The independent variables consist of company size, company profit, audit opinion, and size of KAP. Rachmawati (2015) conducted research on internal and external causes of audit delays and timeliness of manufacturing companies listed on the Jakarta Stock Exchange. The independent variables used include profitability, solvency, internal auditors, company size and KAP. Kurniawan and Laksito (2015) conducted research on delays in submitting audit reports. The independent variables used include company size, solvency, profitability, type of industry, auditor opinion, reputation of the Public Accounting Firm (KAP).

Al-tahat (2015) conducted research on audit delays. The independent variables are company size, profitability, growth, company age, solvency, and size of the public accounting firm. Several researchers also conducted research with similar dependencies including Muchran (2016) with the size of the company influence, the influence of income, profitability and debt ratio as independent variables, Ahmed & Che-Ahmad (2016) with audit quality, frequency board meetings, board size, committee size audit, risk management committee size, board expertise, board committee and women on the board committee as independent variables, Baldacchino et al. (2016) with factors of company size, audit firm size, audit opinion, profitability, presence of extraordinary items, and type of industry as independent variables, Sugnam (2016) with factors of profitability, solvency, company size, liquidity and size of public accounting firm as variables. independent. Mazkiyani & Handoyo (2017) conducted research on audit delay reports of companies listed on the Indonesia Stock Exchange. The independent variables are firm size, profitability, solvency, company age, size of public accounting firm, audit committee on audit delays. Research conducted by Rubianto (2017) research on the Analysis of Factors that influence Audit Delay on Manufacturing Companies Listed on the Indonesia Stock Exchange using independent variables, audit firm reputation, company operation complexity and company size have no effect on audit delay. Prameswari & Yustrianthe (2017) conducted research on the analysis of various factors that have an influence on audit delay. The independent variables are company size, solvency, profitability, reputation of the public accounting firm and auditor opinion. Diana (2018) conducted research on audit delays using profitability, solvency, complexity, audit committee, size of public accounting firms as independent variables and company size as control variables. Yendrawati & Mahendra (2018) conducted research on audit delays. The independent variables used are profitability, solvency, liquidity, company size, and the size of the public accounting firm.

Similar dependent variables were also studied by Sumantri et al. (2018) with independent variables of company size, audit complexity, profitability, debt ratio, type of industry, company age, size of public accounting firm, audit opinion and auditor turnover, Yendrawati & Mahendra (2018) with independent variables company size, profitability, solvency, size of KAP and liquidity, M. Ridwan Tikollah (2019) with independent variables of company size, operating profit and loss, and reputation of KAP auditors, Wijayanti et al. (2019) with company size and profitability factors as independent variables and public accounting firm reputation factors as moderating variables.

Hypothesis Development

Board of Directors Size and Audit Delay

The conclusion from the test analysis shows that the size of the board of directors has no significant effect on the audit report delay variable. The insignificant effect is due to the incomplete implementation of the control and direction functions of the board of directors. Regardless of the number of members, the obligation of the board of directors to oversee management's behavior can be declared

efficient and effective if it can narrow the possibility of audit delays, the result of this problem will increase the assurance of auditors to reduce the process of assessing the risk of internal control of their customers (Habib, 2015). This analysis is significantly related to the results presented by Mohamad-nor et al. (2010), Sultana et al. (2014), Basuony et al. (2016), and Samaha & Khlif (2017), but not significantly related to the results of studies studied by Hassan (2016), Ishaq and Che-ahmad (2018), Handoyo and Maulana (2019). From the explanation above, we can take the following hypothesis:
Ha1: Board of Directors Size affects Audit Delay

Audit Committee Size and Audit Delay

In the research, the second hypothesis reveals that there is a significant negative effect between the audit report delay variable and the audit committee size variable. This is due to the inability of the audit committee to complete the responsibilities printed in the official audit letter as well as the actions that must be carried out and determined by the OJK which has the function of assessing and monitoring the effectiveness of internal supervision which contains standard processes for compiling financial reports (Mahendra & Widhiyani, 2017). This problem relates to the compliance score of the audit committee regardless of how many boards are hired. If an entity regardless of the number of members recruits members of the audit committee just as a formality, then it will not necessarily find smoothness in its internal control procedures. The audit committee size variable does not have a significant impact on the audit report delay variable due to the role and function factors that are less than optimal and convincing (Apadore & Mohd Noor, 2013). Researchers Faishal and Hadiprajitno (2015), Setiawan and Nahumury (2014), Frischanita (2018), Ishaq and Che-ahmad (2018), and (Yadirichukwu & Emibomowei, 2013) show significant results in their research, but not significant with research from Mahendra and Widhiyani (2017), (Haryani & Wiratmaja, 2014), Nehme et al. (2015), and Raweh et al. (2019). From the explanation above, we can take the following hypothesis:
Ha2 Audit Committee Size affects Audit Delay

Audit Committee Meetings and Audit Delays

The variables at the audit committee meeting have an insignificant effect on the dependent variable. The increase in the number of audit committee meetings has an increasing impact on the problems at hand. In a meeting, it is necessary to obtain agreement from some of the thoughts of the people involved in the meeting. The higher the number of meetings and the number of people attending the meeting, the more difficult it will be to reach agreement on an issue. Yadirichukwu & Emibomowei (2013), Mohamad-Nor et al (2010) Nelson & Shukeri (2011) and Hashim & Rahman (2011) show consistent results. The research results are not significant with (Aljaaidi et al., 2015), (Shukeri and Islam, 2012), (Apadore & Mohd Noor, 2013), and (Mahendra & Widhiyani, 2017). From the explanation above, we can take the following hypothesis:
Ha3: Audit Committee Meetings affects Audit Delay

Audit Committee Expertise and Audit Delays

The variable of audit committee expertise has a significant negative effect on the dependent variable. The backgrounds of people involved in a certain field do not always meet the competency or expertise requirements which means that even though an audit committee member when carrying out his / her duties in the process of making financial reports can master a certain field, it is not necessarily able to master other competencies properly. (Setiawan & Nahumury, 2014). Similar results were also found in research by Apadore and Noor (2013), Shukeri and Islam (2012), and Wan-hussin et al. (2018). The results of this analysis are not significant with Handayani and Yustikasari (2017), Sultana et al. (2014), and Raweh et al. (2019). From the explanation above, we can take the following hypothesis:
Ha4: Audit Committee Expertise affects Audit Delay

KAP Size and Audit Delay

The size of the public accounting firm has a significant negative impact on the dependent variable. This states that the size of the KAP which has competent employees and the division of audit time that is not bound is also not guaranteed to minimize the risk of audit delays (JogiC, 2018). Big4 and non Big4 accounting firms require relatively the same delay in audit. This is because the experts and technology owned by KAP Big4 and non Big4 are relatively the same (M. Ridwan Tikollah, 2019). Research results were also found by (Surachyati et al., 2019), (M. Ridwan Tikollah, 2019), (Aditya & Anisykurlillah, 2014), (Gienam, 2016), (Rubianto, 2017), (Kartika, 2011), (JogiC, 2018), (Apriyana & Rahmawati, 2017), and (Dibia & Onwuchekwa, 2013). Different research results are by (Savitri & Surya, 2019), (Prameswari & Yustrianthe, 2017), and (Ni Putu Desy Darmiari, 2014). From the explanation above, we can draw the following hypothesis:

Ha5: KAP Size affects Audit Delay

Company Size and Audit Delay

The firm size variable has a significant negative impact on the dependent variable. The test results indicate two possibilities in this study. First, the collected research data, namely through sources from entities that are in the regulator's capital, the act of controlling investors and the government. This implies that an entity regardless of size will experience the same pressure in the process of presentation to delivery of financial statements. Second, auditors may give consideration to practicing the same method and process of checking independent of the size of the asset ownership of a company (Rubianto, 2017). The research significant with this analysis is Basuony et al. (2016), Rusmin and Evans (2017), Al-Tahat (2015), Lestari and Nuryatno (2018), Ishaq and Che-ahmad (2018), Yendrawati and Mahendra (2018), Wiyantoro and Usman (2018). Research, Baldacchino et al. (2017), Mutiara et al. (2018), and Raweh et al. (2019) provide insignificant conclusions with this analysis. From the explanation above, we can take the following hypothesis:

Ha6: Company Size affects Audit Delay

Profitability and Audit Delay

Test analysis explains that there is a significant negative impact of the profitability variable on audit delays. Companies that have a low ability to earn profits will have a negative effect on market responses and result in a decrease in the value of the company's workability. This problem has a bad impact, as a result the risk of delays in submitting financial reports will increase (Suryanto & Pahala, 2016). Companies that report losses will tend to extend the audit time limit more than they should (Gienam, 2016). This happens because the profit a company gets does not affect the time limit on a company when it reports its financial statements. The number of profits that a company gets does not mean that the company has good management performance, so it cannot ensure that companies that can generate high profits are able to present their financial reports in a timely manner (E Janrosl, 2018). Researchers Baldacchino et al. (2017), Mawardi (2017), Rubianto (2017), Syachrudin and Nurlis (2018), Raweh et al. (2019), Yendrawati and Mahendra (2018), Abdillah et al. (2019), and (Ahmed & Che-Ahmad, 2016) also found a conclusion that is significant in this analysis. This study is not significant with the results of research from Kurniawan and Laksito (2015), Modugu et al. (2012), Setiawan and Nahumury (2014), and Lestari and Nuryatno (2018). From the explanation above, we can draw the following hypothesis:

Ha7: Profitability affects Audit Delay

Leverage and Audit Delay

Leverage results in a significant negative effect on the audit report delay. Leverage figures represent actions that are detrimental to the company's finances so that they affect the company's business continuity. This proves that a higher corporate leverage does not necessarily lead to longer audit report delays. Companies with high leverage tend to complete the audit process more quickly, because they are under pressure from their own creditors who demand that the audit results be published more quickly (Yendrawati & Mahendra, 2018). This research is in line with the results of research (Mouna &

Anis, 2013), Muchran (2016), (Al-tahat, 2015), (Syachrudin, 2018), and (Güleç, 2017) but inconsistent with research (Al-Ajmi, 2008).), (Raweh et al., 2019), (Samaha & Khlif, 2017a), (Alkhatib & Marji, 2012), and (Rubianto, 2017). The test value on the adjusted R square shows the number 0.3728 or 37.28% of the independent variable can explain the delay in the audit report and 62.72% is described by other influences that have not been described in this analysis. From the explanation above, we can draw the following hypothesis:

Ha8: Leverage affects Audit Delay

I. IDENTIFY, RESEARCH AND COLLECT IDEA

Data

In compiling a study, of course, it is necessary to determine the sample as the test target. The sample chosen is the annual financial statements of companies listed on the IDX from 2015 to 2019, and of course these financial reports have gone through an audit process. The sample was selected through a non-probability sampling method and the sampling technique used was purposive sampling technique. Two criteria that must be met in this research model are as follows:

1. Companies in the IDX breakdown that have carried out annual reports in a row from 2015 to 2019.
2. Annual financial reports that have passed the audit stage from the authorities and KAP from 2015 to 2019.

Operational Definition of Variables and Variable Measurements

Audit Delay

Owusu Ansah and Leventis (2006), similar to previous research in 2000, defined "timeliness" as the number of days between the end of a company's financial year and the day of public release of the company's audited financial statements. Ettredge et al. (2006) define Audit Report Lag as the duration from the end of the company's fiscal year to the date the auditors sign their reports.

Board of Directors Size

Elshawarby (2018) argues that the size of the board of directors is a member of a collective body whose work is oriented towards the interests of shareholders. The size of this variable can be determined through a ratio scale, using data that has been included in the annual report on the profile of the board of directors.

Board of directors size = number of members of the board of directors at the end of the period

Audit Committee Size

The size of the audit committee is the scale of the committee members that determines the effectiveness in manifesting their expertise in applying obligations. The ratio scale is used in measuring this variable data and the data is presented on the audit committee page.

Audit committee size = Number of company audit committees

Audit Committee Meetings

Mohamad-Nor et al. (2010) explained that the audit committee meeting is a means for boards to discuss the activities of the preparation and supervision of the financial reporting process. The level of activity of the committee can be viewed from the frequency of meetings held using a ratio scale. In detail, the recording of the number of audit committee meetings can be seen on the audit committee page.

Audit committee meeting = Number of audit committee meetings held

Audit Committee Expertise

According to Mohamad-nor et al., (2010) and Hashim & Rahman (2011) the expertise of the audit committee is a member of the audit committee who has expertise and professionalism in the financial sector. In this study, audit committee expertise was measured in proportion to how many memberships were from the audit committee who has expertise in accounting and financial management to the size of the audit committee (Raweh et al., 2019).

KAP size

The size of the public accounting firm is divided into two groups, namely bigfour and other than bigfour. Public accounting firms that are included in the bigfour category are Deloitte Touche Tohmatsu, Ernst & Young Office Limited, KPMG Phoomchai, and Pricewaterhouse Coopers. The method of measuring public accounting firm size variables according to Vuko & Ćular (2014) is calculated as follows:

KAP size = 1, if the company uses the services of a bigfour accounting firm.

KAP size = 0, if the company does not use the services of a bigfour accounting firm.

Company Size

Owusu-Ansah (2000) states that the size of the company can be seen from the size of a company. Company size is measured by the log of total assets at the end of the financial year (Vuko & Ćular, 2014). The measurement is done by setting the ratio scale as the measurement scale. Company size is defined in the model as follows:

$$\text{Company Size} = \text{Log (Total Sales)}$$

Profitability

Profitability is a measurement scale that is used by a company to show the company's ability to earn profits over a certain period of time. The scale of measuring profitability uses a ratio scale. The formulation for measuring the level of profitability in this study is detailed below:

$$\text{Profitability} = \frac{\text{Net profit}}{\text{Total Equity}} \times 100\%$$

Leverage

Leverage is a ratio that reflects the level of qualification of the company in meeting short-term and long-term obligations. Leverage measurement scale uses a ratio scale. The formulation for measuring the level of leverage in this study is detailed below:

$$\text{Leverage} = \frac{\text{Total Amount of debt}}{\text{Total Activa}}$$

Data Analysis

There are 688 companies listed on the IDX. There were 237 companies whose data was incomplete. Companies that were used as analysis samples for 5 years were 451 companies and did not have outliers data. Therefore, the object of research that is suitable for this study standard is 2255 data.

Santoso (2011) states that a variable data can be said to have a high level of variation, namely where the standard deviation of a variable with a value that exceeds 33% of the average. This value is calculated by separating the standard deviation value from the mean described in the table above.

The Indonesian government requires every public entity to make Regulation Number 29 / POJK.04 / 2016 as a basis for operation where the regulation contains a policy to submit an annual report by including an audit report no later than 120 days from the closing book period. Referring to the results of descriptive statistical test results, a figure of 83 days or the equivalent of 2-3 months in fulfilling the obligation to submit annual reports to the IDX is obtained, which means that the owner of the entity has not passed the given deadline.

The Chow test explains that the FEM is a suitable model to use, because the test results show a probability value of 0.0000. Then it will be followed up with the Hausman test to determine the final regression model. The application of the Hausman test shows a probability value of 0.0000 which is shown in table 4.5. Then according to the criteria that have been applied, the FEM will be used in this study.

II. FINDINGS

Descriptive statistics provide the mean, standard deviation, maximum and minimum values of Board of Directors Size, Audit Committee Size, Audit Committee Meetings, Audit Committee Expertise, Company Size, Profitability, Leverage and Audit Delay as dependent variables.

Table 3. Test Result Statistic t

Variable	Unstandardized Coefficients (B)	Sig	Description
(Constant)	91,9758	0.0000	
Board of Directors Size	-0.8414	0.4584	No Significant
Audit Committee Size	0.0037	0.9988	No Significant
Audit Committee Meetings	0.1939	0.3652	No Significant
Audit Committee Expertise	-19.2172	0.0006	Significant (-)
KAP Size	4.5313	0.3603	No Significant
Company Size	-0.1290	0.9022	No Significant
Profitability	0.0342	0.6124	No Significant
Leverage	-3.9891	0.0000	Significant (-)

Source: computed data

Table 4.3 shows the conclusion that the variable of audit committee expertise and leverage has a significant negative effect on audit delay. Variables that do not have a significant effect on the dependent variable include board size, audit committee size, audit committee meetings, firm size, firm size, and profitability.

III. CONCLUSION

This observation aims to examine the influence of the characteristics of auditors and companies on audit delays in companies on the IDX. The results of the latest tests conducted show that audit committee expertise and leverage in this observation topic have a significant negative relationship. Auditor and company characteristics factors in the form of audit committee size, board size, audit committee meetings, KAP size, company size, and profitability did not have a significant positive effect.

Recommendations that must be submitted to the next researcher, namely:

1. Can increase the number of research sample data in the comparison between the two countries of Singapore and Indonesia, so that it will double the number of sample data from the study in order to increase the opportunity to have an estimate of the factual condition of the entity.
2. In order to obtain explanations of observations that are not published in the annual report, primary data and secondary data must be combined.

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The Impact Of Interior Layout On Human Behavior; A Study Of Co-Working Spaces

with reference to Colombo, Sri Lanka

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Abstract. While coworking has been a trending topic globally since the new millennium, the Sri Lankan coworking industry gets started with the economic boom at the end of the war. As coworking is a new concept in the country, its adaptations and impacts need to study in future adjustments and growth. Hence, as the first research in the subject area, a broad framework is developed while using the Theory of Proximity and the Five Coworking Core values as the base. The layouts of two Colombo-based coworking environments were examined; Co-nnect and Likuid Spaces. The results showed that both the coworking environment layout arrangements and co-workers' attitudes should improve in being true to core working core values. While it gives a standard framework for future research, it sheds light on the Sri Lankan interior designers, business researchers, and venture capitalists towards new opportunities in the coworking industry.

Keywords. *Coworking, Interior Layout, Human Behaviour, Proxemics, Core Values*

1. Introduction

From the very beginning of humanity, the interaction between human and their environment has been spontaneous and unavoidable. Environmental Psychology, which is derived from the field of behavioral science based on the impact of environmental conditions on human behavior, has an in-depth theoretical background for understanding the interaction between humans and their environment as a research field.

Coworking is a social working system, teamwork is always performed in interior spaces, and there is a vast dynamism related to it. In the places which gave birth to the coworking concept, people were more eager to interact with each other than in conventional working environments. And as a new concept with a mass growth in the working world, the adaptations of the core idea of coworking in different socio-cultural conditions would give a complete contemporary understanding of its future shape. So, this dissertation focuses on the interaction between human behavior and the interior, especially concerning the coworking spaces of Sri Lanka.

As we trace the history and the origin of the concept, we see that coworking is a product of Europe and Western cultures. So, as it is a product of their nature, the Western community knows the coworking system's flow and process. However, being a new formation of human arrangement foreign to their nature, most other regions faced some issues adapting to the concept.

As a new concept with a mass growth in the working world, the adaptations of the core idea of coworking in different socio-cultural conditions would give a full contemporary understanding of

its future shape. So, this dissertation focuses on the interaction between human behavior and the interior, especially concerning the coworking spaces of Sri Lanka.

2. Literature Review

As it is a new concept in the country, the impact of Sri Lankan culture in adapting to coworking should be examined in future adjustments and growth. Five Coworking Core value system and The Theory of Proximity paved the ground for the study.

2.1. START OF COWORKING

Software development and related technologies were introducing and developing the latest advancements of human creation since it was produced on a mass scale after the 1980s. Due to the nature of the requirement of high efficiency in production methods, software architects and software developers still think of new dimensions to introduce more efficient ways of process handling.

The practice of the idea was first elaborated as hackerspaces in Germany in the mid-1990s. According to the ethics of the hackerspace concept, the places were community-operated physical places where people could meet and work on their projects. The exact functioning varied from place to place and was determined by its members. But they generally followed a 'hacker ethic.' (Kostakis, Niaros, & Giotitsas, 2014) Germany's Berlin located c-base e.V. established in 1995, is considered the first notable coworking space that influenced so many likewise spaces later. Then, due to the many plus points of the concept, coworking became popularized among many freelancers who share common values. (Weijs-Perrée et al., 2018)

Before coworking (the 1950s - 2000s) popularized, stark, zero-atmosphere offices and cramped cubicles were the norms. When this new idea of coworking came out, the shift was inevitable; many companies adopted the related new concepts into their working environments to energize the workforce to get the most out of them. The open plan was the first big step when workspaces began to change.

Coworking is primarily popular among the new generations named Xennials and Generation Y of the working population. But not that popular among Generation I, Generation II, and Generation X, who are much more familiar with the older setting.

2.2. INTENDED ADVANTAGES AND DISADVANTAGES OF COWORKING SPACES

The main advantages of the coworking spaces are the productivity boost, the inspiration from the diverse community, and the flexibility of the culture.

The infrastructure and the facilities (ex: Location, Community, culture, Inviting Space, Facilities, Flexibility, Cost, and Promotions) of the coworking environment are critical. (Miller et al., 2016)

Coworking is still in its developing and expansion stage. Hence, the disadvantages like Lack of Privacy, Diminished Productivity, Tech Headaches and Hassles, Lack of frequentation, etc., are not that discussed.

In analyzing and systemizing the coworking concept toward shaping it into a global movement, initial contributors have identified five core values of coworking. According to Kwiatkowski A. & Buczynski B., 2011 those five are.

2.2.1 Community

The focus on community means emphasizing the people, their interactions, and the relationships they form. That formation and humanity in it are above everything else. No one governs the community in a centralized way as in a traditional office. The shape or the color of the community is a product of the members. The Manager and the management are facilitators and do their participation may be measured by the facilitation and infrastructures provided.

2.2.2 Openness

It is about being more transparent, more expansive, more liberal, and more inclusive in both moral and economic perspectives. Making coworking 'open' could evolve into something much more significant than any one of the founders could control. It is the potential of openness. Hence, openness builds trust and the strength of the community.

2.2.3 Collaboration

Sharing the shared values and common goals as a community and helping each other co-workers as a part of the daily routine, both as a consultant and a newbie, are significant parts of the coworking concept. Sharing the shared values and common goals as a community, helping each other coworker as a part of the daily routine, both as a consultant and a newbie are significant parts of the coworking concept. The mix of people with different abilities and experiences creates a large pool of knowledge.

2.2.4 Accessibility

Accessibility can be viewed in financial and physical dimensions. While the financial perspective aims to provide the necessary infrastructure for the early stages of a start-up without having substantial initial investments, the physical view ensures the accessibility of the spaces for members at any time. Moreover, accessibility can be viewed in financial and physical dimensions. While the financial perspective aims to provide the necessary infrastructure for the early stages of a start-up without having substantial initial investments, the physical perspective ensures the accessibility of the spaces for members at any time (24-hours-access).

2.2.5 Sustainability

Sustainability requires a contained system or process that can continue without drawing upon resources outside. In coworking spaces, it means making sure the businesses and communities related to the co-workers are structured to create a continuous loop of giving and receiving, balancing the persistence of the community. Sustainable engagement on the economic and environmental levels can be achieved through the collective use of resources.

2.3. COWORKING IN SRI LANKA

The idea of coworking came to Sri Lanka as an emerging business venture with the end of the war (in 2009). The tech-savvy independent freelance workers and the startup companies that did not see the importance of maintaining a 24/7 workspace in the high-cost Colombo city area were grabbed by the idea initially.

Here is a list of contemporary operating coworking spaces in Sri Lanka; Business Hubs, Agaya Holdings, HUB9, Coco-space, Cafe Sociale, HomeTree Coworking, Wehive, Likuid Ventures (Likuid Spaces), Colombo Cooperative, Loft 1024, John Keells X, Y Impact Hub, Shangri-La Hotel Chain (Co-nnect), Hatch, MAS (Catalyst HQ, The Hive, MAS Active), Orion City (NEST, Kitted Out, Warm Shell).

The price range differs per person from 500 LKR to 30,000 LKR based on the days booked in the coworking spaces of Colombo and suburban contexts.

In the study, three categories were identified as short-term (from One Day up to 1 Week), mid-term (up to 2 Weeks/ 1 Month regularly), and long-term users (up to 6 Months/ 1 Year regularly) among the coworking space user community.

2.4. THEORY OF PROXIMITY (PROXEMICS)

The theoretical background of the research is based on the theories of American Anthropologist Dr. Edward Twitchell Hall. He was a well-known researcher for developing the concept of proxemics and cultural-social cohesion. Moreover, he explored how people behave and react in cross-cultural events defining personal space to the situation.

Dr. Hall coined the term proxemics in 1963, defining it as "the interrelated observations and theories of humans' use of space as a specialized elaboration of culture." (Hall, 1982). In his foundational work on proxemics, *The Hidden Dimension*, Hall emphasized the impact of proxemic behavior (the use of space) on interpersonal communication. According to Hall, the study of proxemics is valuable in evaluating not only the way people interact with others in daily life but also "the organization of space in houses and buildings, and ultimately the layout of towns." (Hall, 1963) According to Hall's theory, space, distance, and territory are the main three components of the study of proxemics. These components are discussed further below.

2.4.1 Space

Space Proxemics as a manifestation of micro-culture has three aspects: fixed-feature, semi-fixed-feature, and Informal.

2.4.2. Distance

People have specific patterns for delimiting the distance when they interact, and this distance varies according to the nature of social interaction. There are four zones of space called Intimate, Personal, Social, and Public.

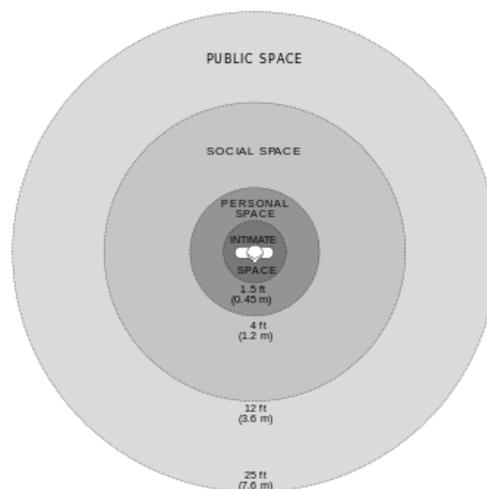


Figure 1: Intimate, Personal, Social, and public distances (Source: <https://www.livescience.com>)

2.4.3. Territory

The territory is the geographic area that indicates ownership. The distinction is carefully made between private property, the territory of an individual, and public property, the group's territory.

2.4.4. Communal interactions in a space

The definition in the dictionary for 'social gathering' is 'a gathering to promote fellowship.' There are two types of gathering places: Socio-fugal spaces and Socio-petal spaces.

3. Research Question

Coworking is a product of Europe and Western cultures where its origins and development. However, being a new formation of human arrangement foreign to their nature, most other regions faced some issues adapting to the concept. It is reflected by the number of research done in the Western world, such as in Eastern and South-Eastern Asian regions.

Hence, the questioned area focuses on identifying the qualities of Sri Lankan coworking culture, which are unique to its placement in providing maximum productivity and efficiency in the environment.

- Identifying the adaptations of the coworking concept to the Sri Lankan context.
- Deciding on the measuring methods optimized for the context.
- Identifying context-related factors that impact the adaptability of a co-worker.
- Producing materials for interior designers to optimize their coworking spaces' interior designs to be more convenient to the community.
- Measuring coworking interior impact on human behaviours.
- Identifying sustainable methods to develop the Sri Lankan coworking community and its standards.

4. Methodology

The main three domains in evaluating the efficiency and productivity in any human process related to one another are physiological, psychological, and social. There are cultural factors upon them reacting and influence all three of them.

Previous researchers such as Lyndon Garret mention this domain system and use it as a guideline for the research. (Garrett, Spreitzer, & Bacevice, 2014) The study was based on four resources in interlinking the three domains. They are:

- Layout drawings of the coworking space
- Frequency maps related to specific functions of coworking
- A questionnaire to the members of the coworking space
- Interviews with the coworking space managers

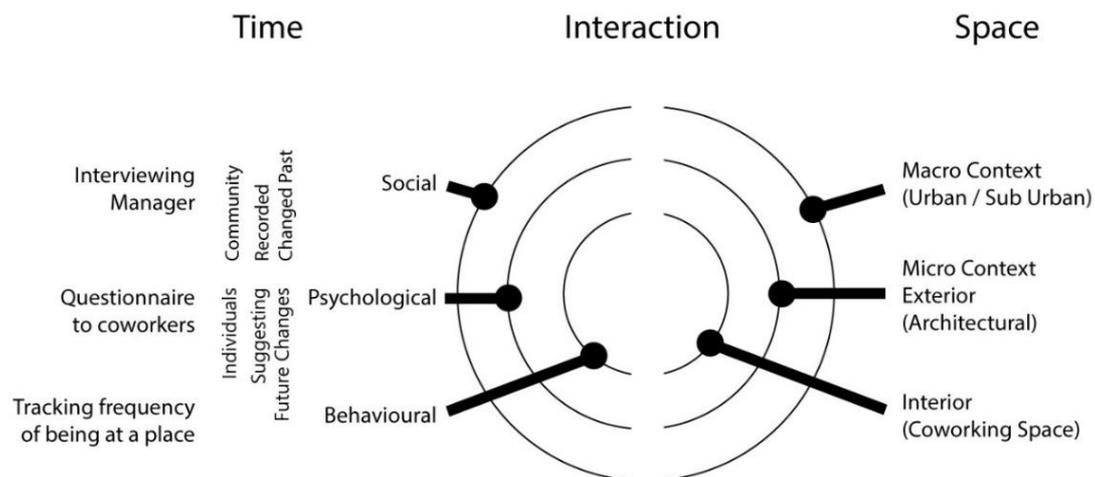


Figure 2: Identifying the Research Context

The other three components that have various factors associated with them and the time were taken as the variables to observe. The Layout defines and interlinks the other three. The interrelatedness of these four is shown in the below image.

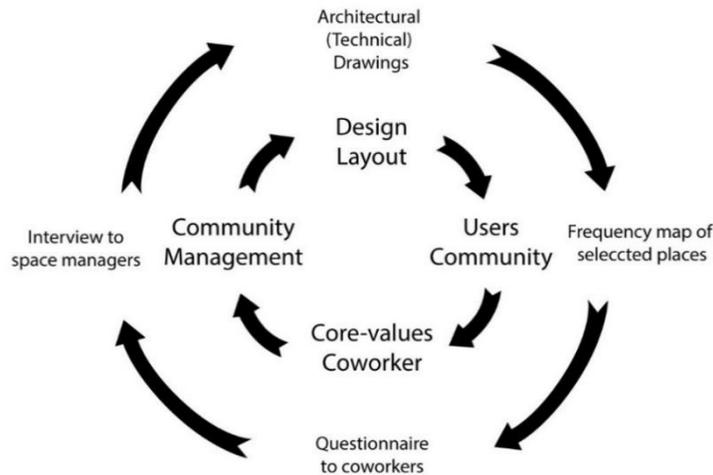


Figure 3: Coworking Process under Four Elements

Also, the below chart shows the three domains, data collecting methods related to each of them, and the traits intended to observe by each part.

Domains	Data Collecting Method	Traits
Layout	Architectural Drawings	Theories
Community	Frequency Map	Behavioral
Coworker	Questionnaire	Psychological
Management	Interview	Social

Table 1: Coworking Process under Four Domains

5. Finding and Analysis

Two coworking environments were selected to cover the diverse ranges of crowd capacities, facilities provided, opening hours, daily monthly charges, and the coworking community's characteristics, such as their expertise and the nature of the business they are involved in.

5.1 LAYOUT ANALYSIS

Layout analysis was conducted by preparing layout maps of space, distance, and territory based on Dr. Hall's Proximity Theory (Proxemics). As an overall comment, it was identified that the findings of both case studies in terms of space, distance, and territory, which helped to understand the Layout domain, are similar. Moreover, it was noted that Dr. Hall's Theory of proximity had been applied in both case studies intentionally or unintentionally, as both coworking places have provided and facilitated productive coworking spaces. However, there were some cases where some of the theories related to Dr. Hall's idea of proximity had not been applied to the layouts. One of the significant findings is that no informal spaces had been included in Co-nnect and Likuid interior layouts, which could have given more exciting content to discuss further.

In both cases, space arrangements in terms of personal and social spaces seemed similar. Also, the atmosphere and layout of meeting rooms that fall into public spaces type in both cases seemed identical in terms of distance variable, which derived from the theory of proximity as both meeting rooms had formal furniture arrangements. However, it would have been more effective if these meeting rooms were designed to consider other distance types that come under the distance variable, as it helps to create a space that goes well with the coworking concept.

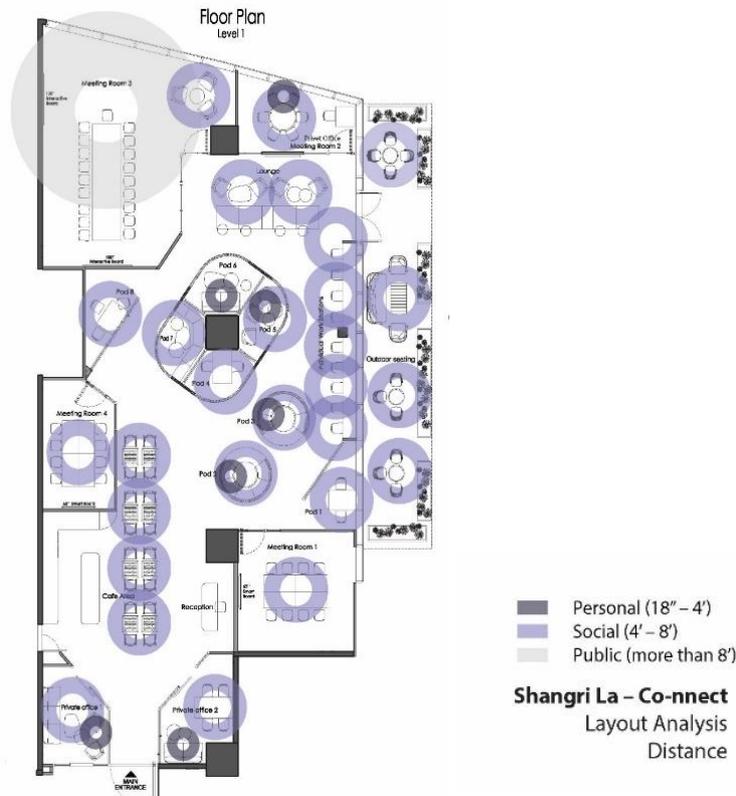


Figure 4: Co-onnect - Layout Analysis - Distance, Ground F.

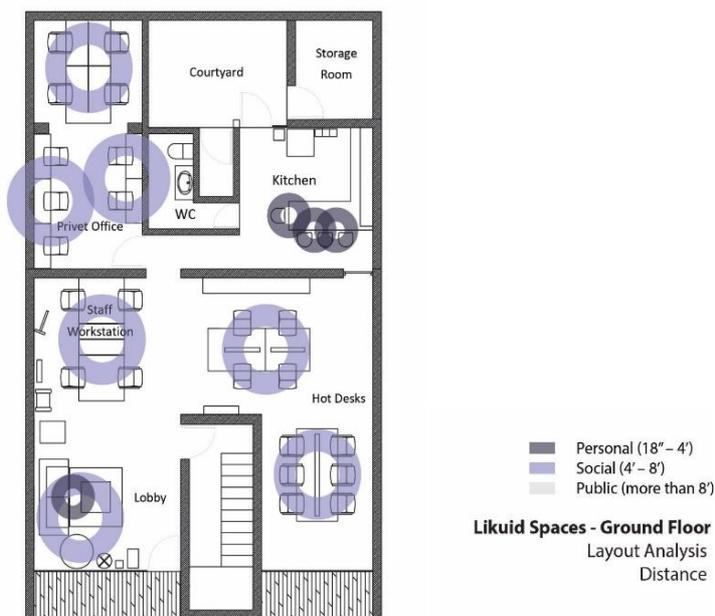


Figure 5: Likuid Spaces - Layout Analysis - Distance, Ground F.



Figure 6: Co-onnect & Likuid Spaces - Layout Analysis - Space. Ground F.

5.2 FREQUENCY MAP

Regarding the frequency maps, it was identified that natural and artificial elements such as natural lighting, relaxing environments, and flexible furniture arrangements impacted co-workers' interactions. The food and personality of the users play a crucial part in social gatherings. Regular coworkers repeatedly restrict their territories by possessing the same spot in both places, even though the coworking concept does not encourage that. Also, it was evident as humans, people unconsciously tend to restrict the areas where they will feel safe, secure, and comfortable even though the interior environment is not encouraging the users to create their territories within the coworking space.

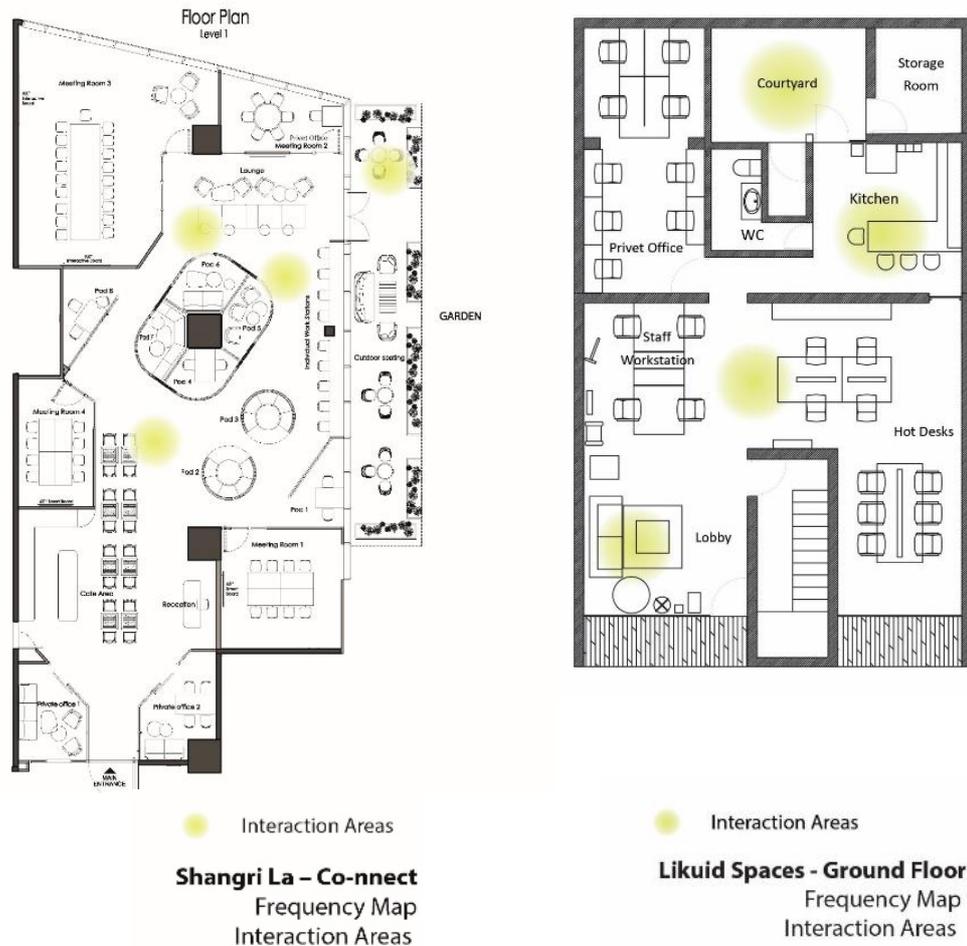


Figure 7: Co-nect & Likuid Spaces - Frequency Map - Interaction Areas, Ground F.

5.3 QUESTIONNAIRE

The questionnaire was generated by considering the five core values of coworking derived from the literature review.

Community - Finding of both cases in respect to community indicated both Co-nect and Likuid has been able to attract various people from various social backgrounds who are willing to go with the coworking concept by providing decent atmospheres.

Ex: Question:

10. Events in coworking space

- None
- Sometimes
- Often

11. Working hours per week

- 00 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- above 40



Figure 8: Questionnaire Analysis on Community (Co-nect)

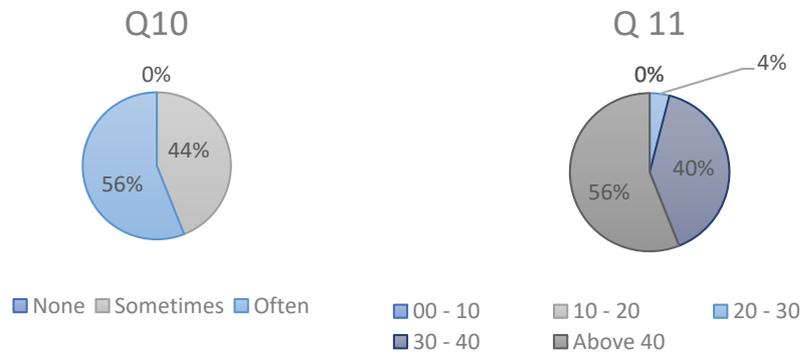


Figure 9: Questionnaire Analysis on Community (Likuid Spaces)

Openness - Results from both cases show that coworking community at both Co-nect and Likuid coworking places are quite open and like to be transparent, expansive, liberal, and inclusive in both moral and economic perspectives.

Collaboration - As per the finding, most of the coworkers who are visiting both cases like to interact and collaborate and grow as a team. Likuid Spaces shows more collaboration compared to Co-nect.

Ex: Question:

17. Interaction with other coworkers (mark only one option)

No interaction 1 2 3 4 5 Frequent interactions

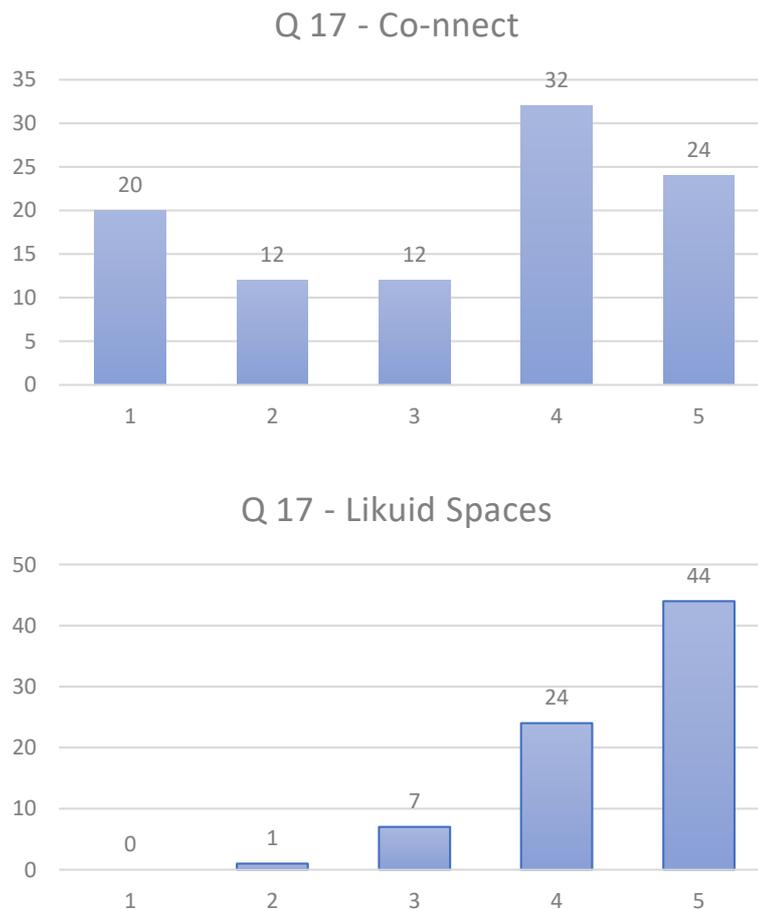


Figure 10: Interaction with other coworkers (Co-nnect & Likuid Spaces)

Accessibility - Co-nnect co-workers had more exposure to foreign coworking spaces. Moreover, the findings showed that most users in both cases prefer to work outside of the home and think coworking places are affordable as they can access the necessary infrastructure for their work.

Sustainability - both cases expressed that co-worker can be encouraged to come to such places by providing clean, flexible, supportive, friendly, and organized coworking spaces.

5.4 MANAGER'S INTERVIEW

Managers' insights on coworking give a general idea of their perceptions and insights on the coworking concept. It was noted that both managers are working as managers at a coworking for the first time in their lives. However, both have other background qualifications to be qualified for this post.

In the case of Co-nnect, it is significant as it described the regular users and users of private offices of Co-nnect started coming back when Co-nnect was re-opened after the 04/21 bomb incident at Shangri-La hotel. Their return to the Co-nnect right after the attack expresses that the regular users have developed a sense of belongingness with space.

Managers identified people tend to gather or work near natural sunlight, and some people tend to work alone, whereas some prefer to collaborate with others. It expressed that the interior environment is not the only factor that impacts human behavior in terms of interactions. Still, personalities and the nature of the business affect exchanges as well.

Further, both managers confirmed that some spaces were changed, and some facilities were introduced as per a few users' requirements.

6. Conclusion

Coworking is a new concept that was started and evolved in western countries. It is a part of the 'sharing economy concept,' which was based on 'sharing underutilized assets' such as spaces, knowledge, and services for monetary or non-monetary benefits.

Collaborative areas are the key in coworking spaces which can bring people together to interact and collaborate. However, in the pilot survey, it was identified that most of the coworking places in Sri Lanka have more fixed rentable spaces, such as private offices, where they can maintain a fixed income mode while having very few collaborative areas.

When the Sri Lankan context was being examined, it was noticed that the Sri Lankan coworking community still has not been fully adapted to this concept. Most of the co-workers are not fully understand the idea of knowledge sharing and collaborating. As it is a gradual process, it will require some time to accept this ideology within society.

The interior should be designed so that it encourages interaction within the space. When it comes to furniture arrangement, it needs to be flexible and comfortable so that the user can form their areas within the coworking space. It is advisable to create clusters within the interior environment considering circulation patterns, Lighting, and interior aesthetics.

This research was limited to two coworking spaces within the Colombo city limits to examine the impact on the interior environment of human behavior. There are a few more coworking spaces with different scales outside and within the city limits, such as Hatch and Business Hub, which can be considered other challenging cases. Therefore, it would be beneficial to examine such places to understand coworking in Sri Lanka.

Further, another important research area found during this research is the 'co-living' concept which is now being practiced at a few places down south and Jaffna, Sri Lanka.

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Moderating effect of age in the relationship between debt literacy and indebtedness of formal sector employees in Kenya.

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Abstract- This study examined the moderating effect of age in the relationship between debt literacy and indebtedness of formal sector employees in Kenya. The study showed that age has an effect on the amount of debt held by individuals. Research also found level of debt literacy particularly low among youth and elderly. The study using hierarchical moderated multiple regression (MMR) models found that the coefficients for interaction term for debt literacy and age of employees had significant moderating effect. Further, the study revealed the moderating effect of age was positive and significant for Debt Service Ratio (DSR) on one hand and negative and significant for Debt Income Ratio (DIR) on the other. The young and the elderly were found debt illiterate. The government and other institutions should roll out financial education programs

Index Terms- Debt literacy, Indebtedness, Debt Service Ratio, Debt Income Ratio

design. The study targeted about 2.4 million employees in the formal sector. Three stage sampling was done, first, cluster sampling and then, stratified sampling and finally random sampling. The study used primary data collected by use of self-administered questionnaires. 384 questionnaires were circulated. Of the returned 337, 292 questionnaires were considered usable. Cronbach's alpha for likert type items was found reliable (over 0.7). Data analysis used IBM SPSS statistics 21 for descriptive and correlation analysis. The relationship between age of employees and the two study variables was analysed using mean and ANOVA statistics. In this study, age was constructed as an eight category ordinal variable in the questionnaire (see 10). Further, hierarchical Multiple regression models were used to examine the moderating effect of age in the relationship between debt literacy and indebtedness. For easy of comparison with past studies, age was re-coded as 1 if young (<36 years), 2 if mid-aged (36-45 years) and 3 if elderly (> 45 years).

I. INTRODUCTION

Several studies relate financial literacy or debt literacy and indebtedness to several socioeconomic characteristics including age (e.g. Gathergood, 2012; Lusardi & Tufano, 2009). This study relates age of the employees to their debt literacy and indebtedness. And finally models age of the employees as a moderator.

II. RESEARCH OBJECTIVE

To assess the moderating effect of age of formal sector employees in Kenya on the relationship between debt literacy and indebtedness.

III. METHODOLOGY

Positivism paradigm was used in this study. The study adopted a cross sectional and correlational descriptive research

IV. DATA ANALYSIS, RESULTS AND DISCUSSION

In terms of response rate, the study is representative of the underlying population in terms of age because 51.2% of the respondents were aged less than 35 years (young employees) while 48.8% were aged more than 35 years (old employees). The mean age group was 31-40 years, median age group was 31-35 years and the modal age group was 25-30 years.

As revealed in this section, several authors have shown that age has an effect on the amount of debt held by individuals. They have also justified this relationship using theories such as the life cycle Theory. For example, Crawford et al. (2012) argues that the demand for credit will vary considerably across borrowers depending on their age among other socioeconomic characteristics. Crawford et al. continues to say that the willingness of the lenders to supply credit will also depend on age of the borrower among other socioeconomic characteristics. On the other hand, Legge and Heynes (2009) justify the relationship between age of the borrower and debt holding using the life cycle theory. Legge and Heynes argue that employees are increasingly

likely to borrow over the first half of their working life when they have few resources and many demands on those resources and are decreasingly likely to borrow over their second half of their working life. Therefore, age has a quadratic relationship with indebtedness.

Reviewing Figure 1 shows the profile for disposable income was typically hump-shaped; higher for middle aged and lower for young and elderly people. The figure supports the Modigliani's life cycle sociological thesis that income has a life cycle pattern

which is “inverted U”. Further and consistent with permanent income theory, there is evidence that younger people are over-indebted in their attempt to smooth consumption with future income growth. Reviewing results on Appendix 1 show the young employees had the least disposable income and F-test show that age groups were strongly significantly different, $F(2,289)=13.277$, $p=.000$, with respect to disposable income. However, there was an anomalous rise from age 50.

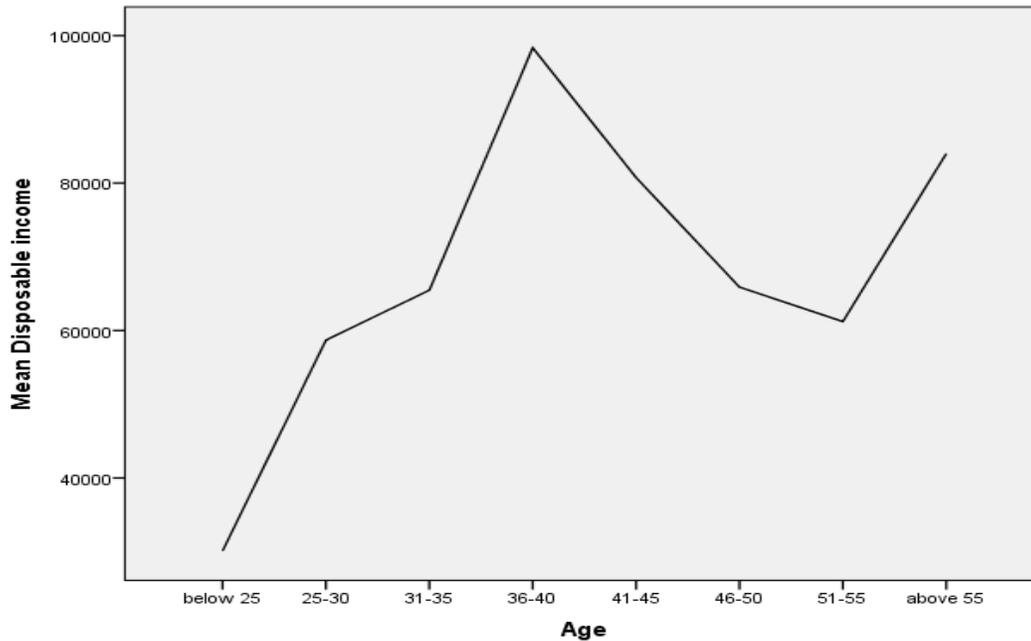


Figure 1: The profile for disposable income against age of respondents

Reviewing Appendix 1, the mid-aged employees had the largest loan balance followed by the elderly while the youth trailed. This is consistent with Herceg and Susic (2010) who concluded that the effect of age on the amount of debt depends on the individual's position in the life cycle. The effect according to Herceg and Susic is positive until the person reaches 50 years, afterwards it becomes negative. Indeed, the F-test results in Appendix 1 suggest there was statistically strong and significant difference, $F(2,289)=9.915$, $p=.000$, in loan balance outstanding within the age groups of the employees. This supports Fasianos et al. (2014) who found age the most significant determinant of debt holding. In the same line, Nguyen (2007) also found age of an individual has an increasing effect on the amount of loan received.

In line with this finding, Thachareon et al. (2004) argues that young people tend to accumulate debt until the age of 50.

Further, Figure 2 shows distribution of loan balances along the age groups. This is consistent with prior studies (Bicakova et al., 2011; Dey et al., 2008; Lusardi & Tufano, 2009) which found that debt burden usually increase among the younger population and reduce at old age. It is also consistent with the life cycle and permanent income hypotheses; that debt is for the young and that the curve for indebtedness against age is hump-shaped. According to Mwangi and Sichei (2010) the anomalous rise from age 50 is due to the respondents “topping up” so as to have their obligation terminate at the retirement date. Borrowers are usually afraid they will be credit excluded after retirement (Mwangi & Sichei, 2010).

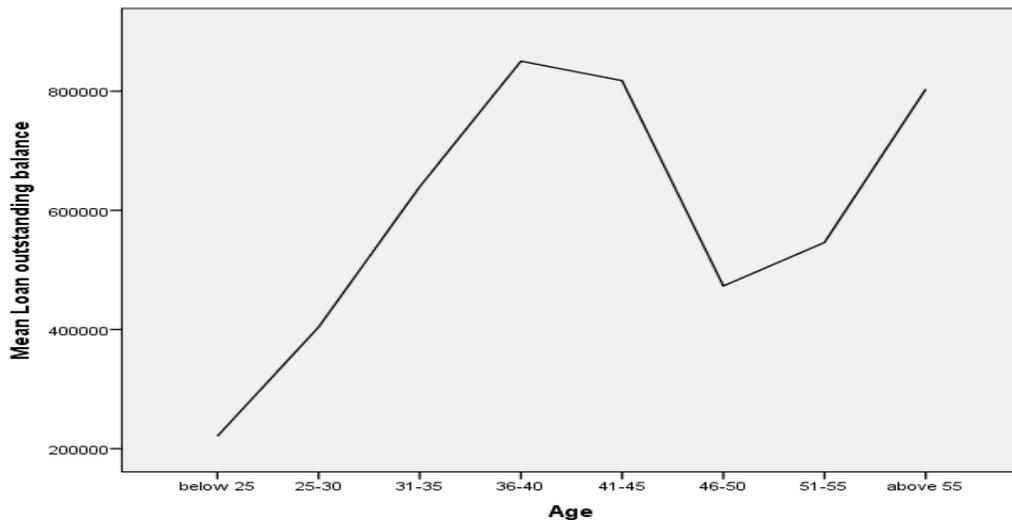


Figure 2: Graph of indebtedness against age of employees

Reviewing Appendix 1, the elderly employees had the largest score for DSR followed by the mid aged while the young trailed. Reviewing F-test results in Appendix 1 show DSR was significantly different along the three age groups, $F(2,289)=4.315$, $p=.014$, but DIR was insignificantly different ($p=.358$) across the

age groups. The graph for DSR against age was as shown in Figure 3. The finding in Figure 3 supports a regression model done by Thaichareon et al. (2004) who found a hump-shaped relationship between age and DIR.

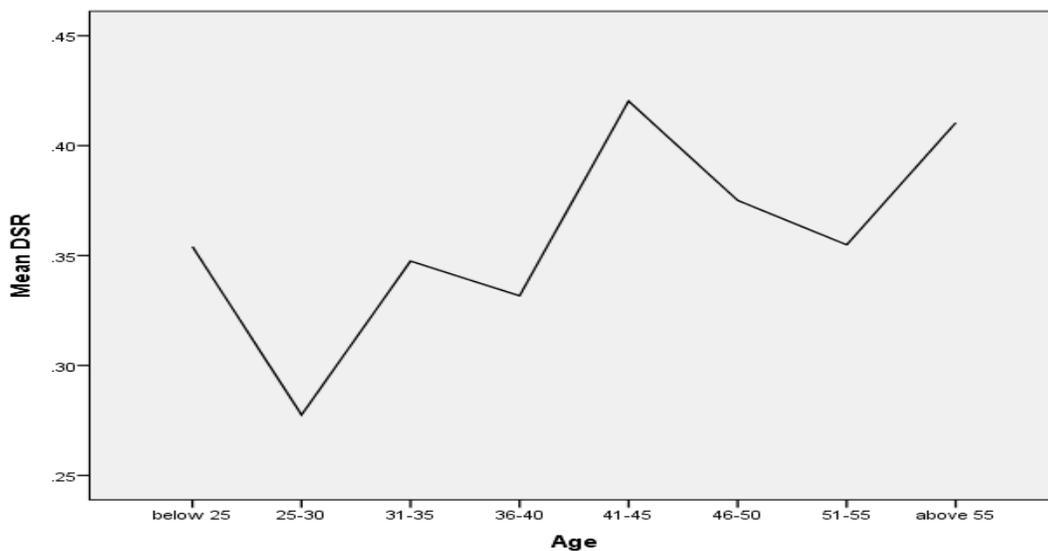


Figure 3: Graph for DSR against age of respondents

Reviewing Appendix 1, the mid age employees had the largest score for development loan followed by the young while the middle aged trailed. This supports the finding by Hurwitz and Luiz (2007) who found young people borrowed for short-term loan purpose, often consumption-oriented while older people used credit for income generation activities such as buying assets. Appendix 1 show the mid-age borrowed more for housing purpose while the young employees had car loans. This supports Bakar, Subramaniam and Tan (2013) who found that age has a significant effect on housing purpose but not on car ownership. Bakar et al. contend that the young in Malaysia prefer to drive to their work places. This phenomenon is apparently strange because many

workers in developed countries travel to work by public transport (Bakar et al., 2013). However, the F-test results suggest the three age groups of the employees are insignificantly different ($p>.05$) with respect to loan purpose except for housing loan where the age groups were significantly ($p=.000$) isolated.

Reviewing Appendix 1, the mid-aged employees had the largest number of loan followed by the elderly while the youth trailed. However, the F-test results suggest there was insignificant difference, $F(1,289)=1.013$, $p=.364$, in multiple loans uptake between the young and older employees. This supports the finding by Herceg and Sosic (2010) who found that the probability of having a loan increases with age upto age 50. This particular

finding also supports the life cycles quadratic pattern as shown by Figure 4. The increase of multiple loans after 50 years as well explains the anomolous increase of outstanding loan balances. The anomolous rise is due to fears confirmed by Mwangi and Sichei

(2010) who found probability of access to credit drops as one draws closer to the retirement age. The graph for multiple loans against age is shown as Figure 4.

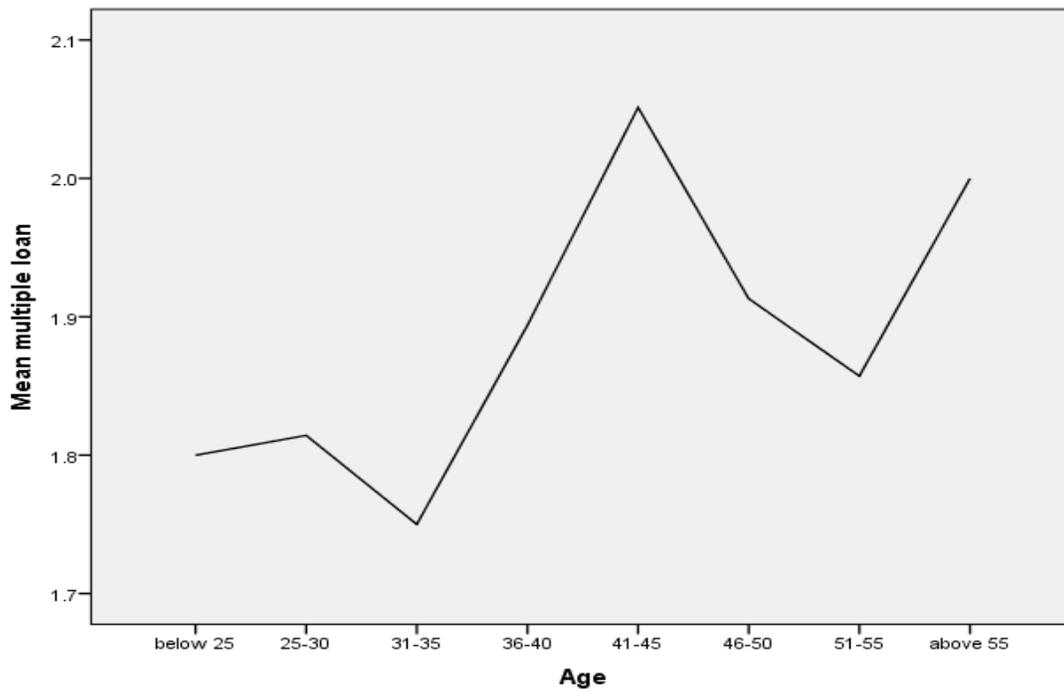


Figure 4: Graph of multiple loans against age of employees

Looking at Appendix 1, the young employees had the highest probability of having a bank loan followed by the mid-aged while the elderly trailed. This supports the finding by Herceg and Sosic (2010) who found that the probability of having a bank loan decrease with age. Similarly, Mwangi and Sichei (2010) found debt access in bank decline with age blaming this to the CAMPARI framework used by banks which ranks elderly applicants as less creditworthy. However, the F-test results in Appendix 1 suggest there was insignificant difference, $F(2,289)=2.745$, $p=.066$, in having a bank loan within the age groups of the employees. Results in Appendix 1 show the elderly employees had the highest number of SACCO loan followed by the mid-aged while the young employees trailed. On the other hand, the F-test results suggest there was a strong and significant difference, $F(2,289)=5.907$, $p=.003$, within the age groups of the employees with respect to having SACCO loan.

Reviewing Appendix 1, the young had borrowed more than the older employees without any security while the mid-aged had the highest score for borrowing with security. This supports Fasianos et al. (2014) who concluded that young people are most probable to have unsecured debt. In the same breath, Bryan et al. (2010) who found that the proportion of respondents with unsecured debt was high among the age group 25-34, and only 1% of those aged over 65 had any unsecured debt. However, the F-test results suggest insignificant difference ($p>.05$) in the distribution of secure or unsecured loan within the age groups of the employees. Mwangi and Sichei (2010) found age had a positive and significant relationship to access to credit from bank and SACCOs while age had a negative relationship with loans from

government. This is confirmed by Appendix 1 where F-test results show strong and significant difference, $F(2,289)=5.668$, $p=.004$, across the age groups of the employees with respect to having a HELB loan.

Results in Appendix 1 show that the mid-aged had higher SACCO membership score followed by the young and trailed by the older respondents. This finding support extant studies, (Gloukoviezoff, 2007; Mwangi & Sichei, 2010; Nguyen, 2007; Russell et al., 2011) that it is the young and the elderly who have the most limited access to credit services. The young and the old have increased risk of debt exclusion albeit for different reasons. For example, Nguyen (2007) found age of an individual has an increasing effect on the amount of loan received. In the same line, Mwangi and Sichei (2010) found that increase in age tend to enhance access to credit but the probability of access drops as one draws close to the retirement age. Generally, age of a person has a quadratic relationship with the mid-aged persons having the highest debt access. However, F-test results in Appendix 1 suggest there was insignificant difference, $F(2,289)=2.500$, $p=.084$, in SACCO membership among the age groups of the employees.

Reviewing Appendix 1, the young had highest debt advice score followed by the mid aged and trailed by the elderly respondents. This supports Dowling et al. (2009) who found most young people seek financial information more but they prefer non-professional to experts. Financial experts, argues Winchester (2011), might be particularly useful to individuals who are young. On the other hand, the F-test results in Appendix 1 suggest there was statistically significant difference, $F(2,289)=3.661$, $p=.027$, in debt advice score among the age groups of the employees. A

serious review of Appendix 1 show the young had highest debt counselling score followed by the middle-age and trailed by older respondents. This supports Disney et al. (2014) who found that the likelihood of seeking debt counsel decrease with age. However, the F-test results in Appendix 1 indicate the three age groups of the employees were insignificantly different, $F(2,429)=1.031$, $p=.358$, with respect to debt counselling score.

Results in Appendix 1 show the elderly employees had the highest aggregate debt experiences score followed by the middle aged while the young trailed. This supports Lusardi and Tufano (2009) who argue that age is positively correlated with debt experiences. Moreover, Lusardi (2009) found older people had better credit practices. In the same line, van Ooijen and van Rooij (2014) found the most experienced mortgagor had better debt contract understanding than first time homeowners. However, the F-test results in Appendix 1 suggest there was statistically insignificant difference, $F(2,289)=0.671$, $p=.512$, in debt experiences score within the age groups of the employees.

Reviewing Appendix 1, the oldest employees had the highest self-confidence score followed by the middle aged while the young trailed. This supports past studies (e.g. Agarwal et al., 2010; Chio, 2014; Finke, 2011) which found young respondents had the lowest financial confidence arguing that financial confidence is based on experience and it increases with age. Similarly, Disney and Gathergood (2008) found the young had the lowest financial confidence while Lusardi and Mitchell (2014) concluded that confidence increases with age. However, the F-test results in Appendix 1 suggest there was insignificant difference, $F(2,289)=1.699$, $p=.185$, in self-confidence score among the age groups of the employees.

Reviewing Appendix 1 show that the old employees had highest peer independence score followed by the youth while the mid aged employees trailed. This supports the finding by Gloukoviezoff (2007) who argue that the elderly tend to be highly resistant to change. Also supported was Fasianos et al. (2014) who found age the most significant determinant of debt and peer income effects. In the same line, Baddeley et al. (2012) found conformity to social influence an inverse function of age and concluded that age may moderate the susceptibility to social influence. However, the F-test results in Appendix 1 suggest there was insignificant difference, $F(2,289)=1.998$, $p=.138$, in peer influence score among the age groups of the employees.

Results in Appendix 1 show the older employees had lowest borrowing behaviours score. This supports the finding by

Cynamon and Fazzari (2008) that older people are more risk averse than younger cohorts when making financial decisions. This means risky borrowing behaviours decrease with age. However, F-test results in Appendix 1 suggest there is insignificant difference, $F(2,289)=1.432$, $p=.241$, in borrowing behaviours across the age groups of the employees. Agarwal et al. (2010) argues that financial mistakes decline with age until age 50 years when they begin to increase again. This argument by Agarwal et al. explains the anomolous rise in multiple loans and loan outstanding balances from 50 years.

Findings in Appendix 1 show the old employees had highest personal budgeting scores. This supports the finding by Krah et al. (2014) who found age of individuals had a significant relationship with budgeting behaviour. But F-test results in Appendix 1 suggest there was significant difference, $F(2,289)=1.115$, $p=.329$, in personal budgeting scores among the age groups of the employees. Results in Appendix 1 show the mid-aged employees had higher planning score than the young and the old denoting a hump shaped pattern. This supports the finding by Lusardi (2009) that lack of planning is not only common among young people but also among the elderly. Although it contradicts Locke and Latham (2013) who contend in their goal setting theory that elderly persons will show higher goal commitment than both medium aged and the young. However, F-test results in Appendix 1 suggest there was insignificant difference, $F(2,289)=1.181$, $p=.308$, in personal planning score within the age groups of the employees. The use of a written customised financial plan might be particularly useful to individuals who are young, argues Winchester (2011).

Results in Appendix 1 show that the old employees had the best debt capability score followed by the mid-age while the young employees trailed. This finding is consistent with a study by Bryan et al. (2010) which indicated that young people have less financial capability than older people and that financial management ability increases with age and experience. Yet a study by Ajzerle et al. (2013) found that those with low debt capability were more often elderly. Similarly, Finke (2011) found age is negatively related to decision making skills since advancement in age leads to predictable decline in cognitive ability. However, the F-test results in Appendix 1 suggest there was insignificant difference, $F(2,289)=0.033$, $p=.966$, in the debt capability scores among the age groups of the employees.

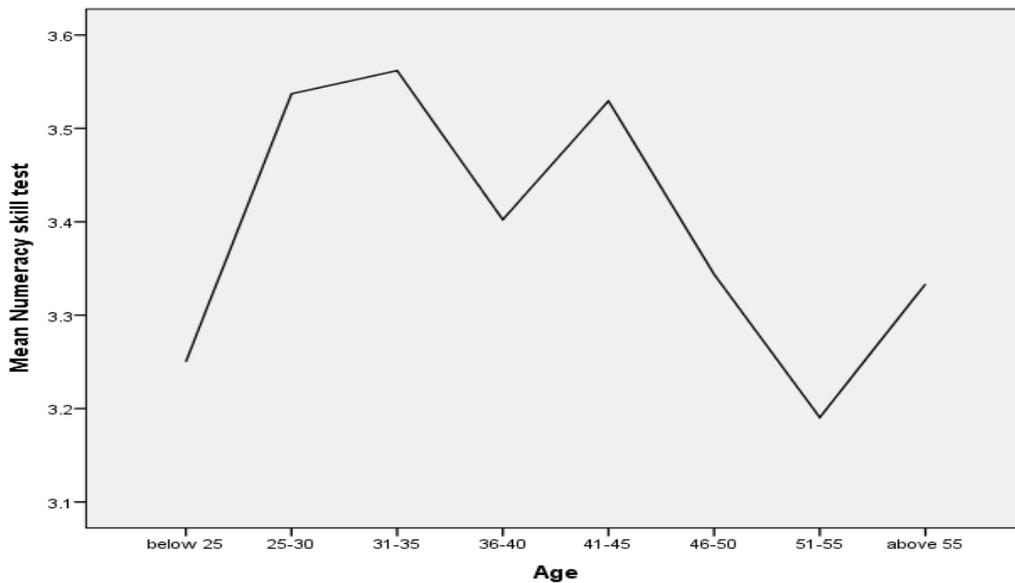


Figure 5: Graph of numeracy test score against age of employees

Similarly, Lusardi and Tufano (2009) also found older respondents displayed difficulty in numeracy test with the fraction of correct responses declining with age. However, F-test results in Appendix 1 suggest there was insignificant difference, $F(2,289)=1.110$, $p=.331$, in numeracy skills score among the age groups of the employees.

Mean results in Appendix 1 show the old employees had lowest numeracy test scores. This supports prior studies (e.g. Lusardi, 2009; van Ooijen & van Rooij, 2014) which found low rate of numeracy skills in the entire population but the most affected were the young and elderly. This was also confirmed by Figure 5. The numeracy test score follow a hump-shaped pattern; lowest for the young and older employees but peaking for the middle-aged employees. This finding is consistent with van Ooijen and van Rooij (2014) who found the relationship between

numeracy test score and age was an inverted “U” shaped. This pattern is therefore in line with the life cycle theory that knowledge rise with age but decay at old age safe for the anomalous rise after 55 years. In the same line, Brown and Graf (2013) found those aged 41-50 had higher numeracy score, followed by age group 20-30 while those aged 61-74 trailed.

Findings in Appendix 1 show the young employees had the highest self-assessment score yet the pattern in Figure 6 was hump shaped. Ambarkhane et al. (2015) argues that older people rate themselves higher but self-assessment by young people is nearer to the actual numeracy test score. However, F-test results in Appendix 1 show the three age groups of the employees were insignificantly different, $F(2,320)=0.840$, $p=.433$, in term of self-assessment score.

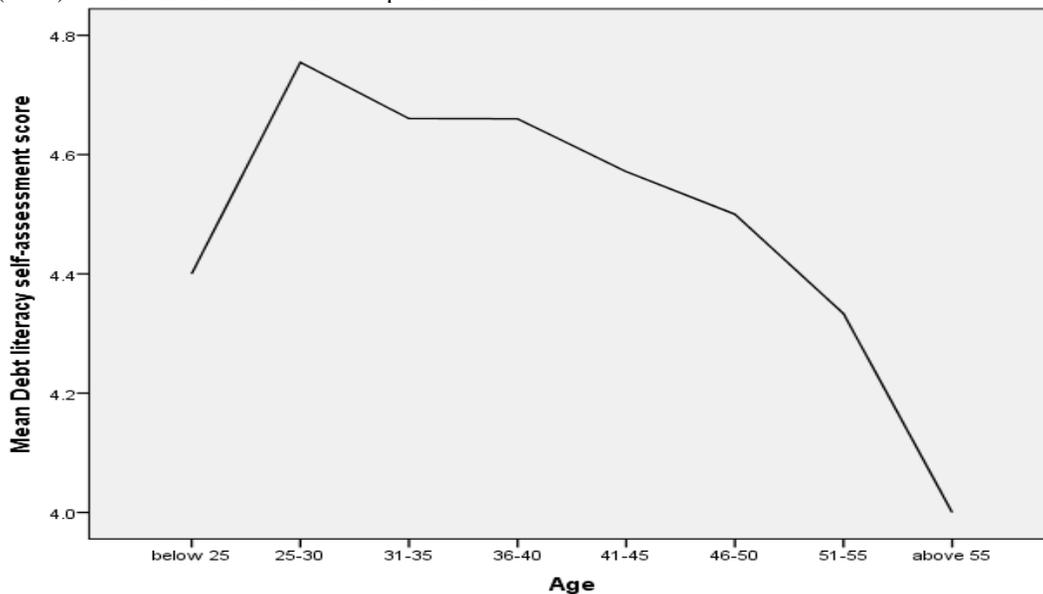


Figure 6: Graph of self-assessed debt knowledge against age

Reviewing Appendix 1, the young had higher aggregate debt knowledge score followed by the mid-aged and trailed by the older respondents. On the other hand, the F-test results suggest significant difference, $F(2,289)=5.756$, $p=.004$, in debt knowledge level across the age groups of the employees. Reviewing Figure 7, the debt literacy score for the young had an increasing slope while that for older respondents was declining safe for the anomalous rise after 55 years. On the other hand, the

F-test results in Appendix 1 suggest there was statistically significant difference, $F(2,289)=3.764$, $p=.024$, in debt literacy among the age groups of the employees. This finding supports Lusardi and Mitchell (2014) who found older people more knowledgeable than the young. On curve estimation using quadratic model, the graph for debt literacy against age was as shown in Figure 8

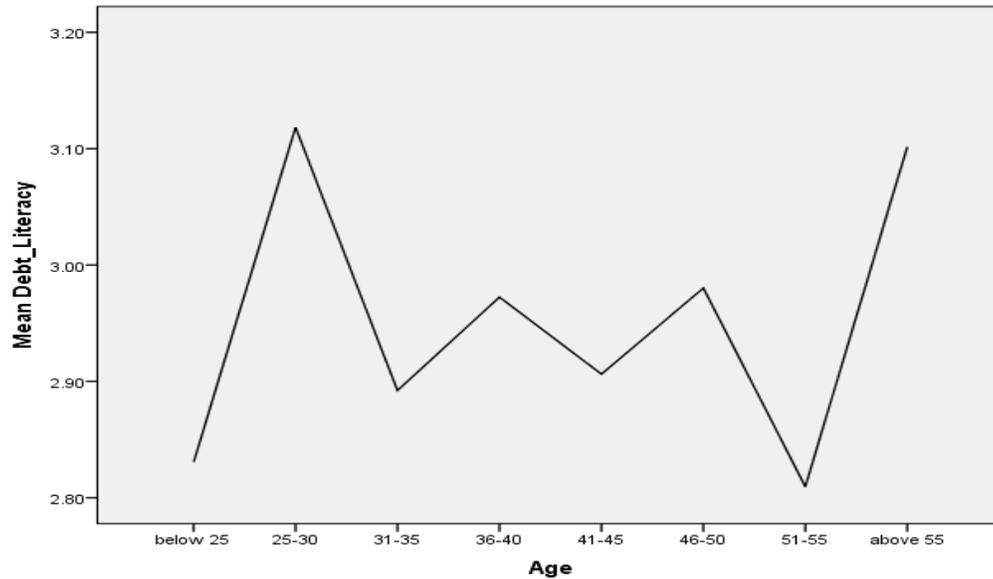


Figure 7: Graph of debt literacy against age of employees

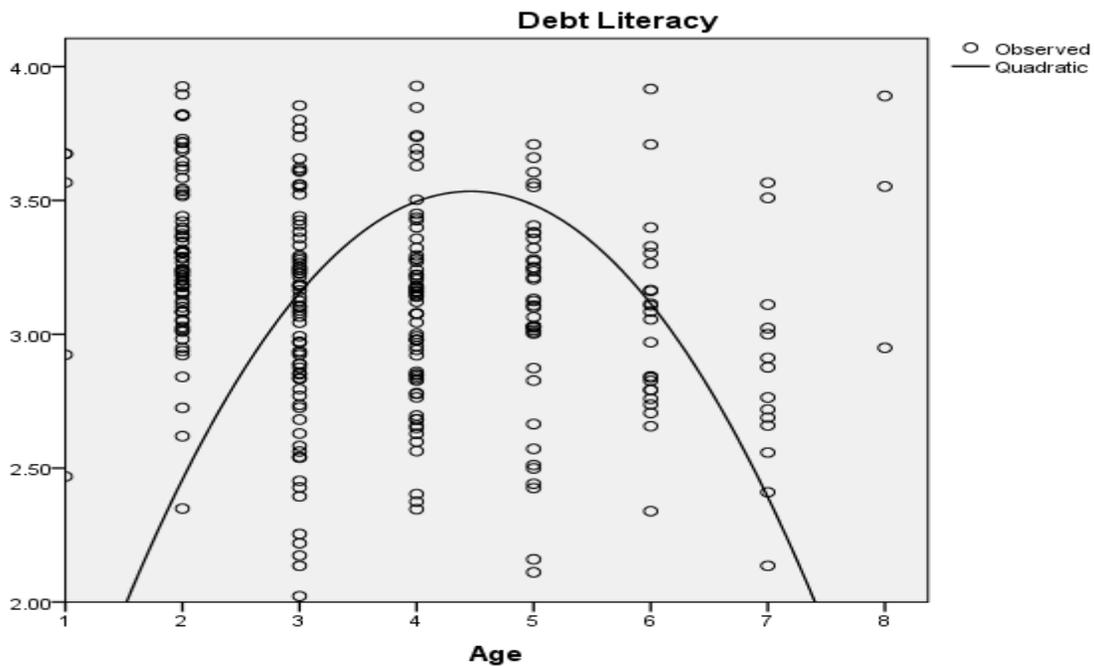


Figure 8: Curve estimation for debt literacy against age of employees

This finding confirms the hump-shaped relationship between age of respondent and financial literacy as documented by Brown and Graf (2013) for Switzerland and Lusardi and Tufano (2009), Lusardi and Mitchell (2014) and Lusardi et al. (2010) for America. For instance, Lusardi and Tufano (2009) found the young (<30 years) and the elderly (>65 years) had low levels of debt literacy. The declining slope of the debt literacy curve after 50 years supports the learning theory that there is terminal loss of intelligence due to weakening memory and recalling ability. Yet Bhushan and medury (2013) found financial literacy higher for those aged over 60, followed by those aged 51-60, and the lowest were those aged 20-30.

Moderating Effect of Age on the Relationship Between Debt Literacy and DSR

The MMR model in Equations 1 to 4 were adapted from Stone-Romero and Liakhovitski (2002). An interaction effect exists when the effect of the independent variable on the dependent variable differs significantly depending on the value of the moderator. The test for moderation relies on the variance in y_i that is explained by the product of $x_i \cdot z_i$ in the MMR model. The null hypothesis is that $b_3=0$ and has insignificant ($p>.05$) contribution to the dependent variable, y_i . Rejection of the null hypothesis [$H_0 : b_3 = 0, p > .05$] signals existence of a moderating effect (Field, 2013; Stone-Romero & Liakhovitski, 2002).

The MMR model used to test the moderating effect age of employees in the relationship between debt literacy and DSR was;

$$y_i = b_0 + b_1x_i + b_2z_i + b_3x_iz_i + \varepsilon$$

..... (1)

Where: y_i = Debt Service Ratio (DSR)

x_i = Aggregate debt literacy

z_i = Age of the employee (1 if less than 36 years; 2 if aged between 36-45 years, and 3 if aged over 45 years)

b_0 = Level of DSR in the absence of debt literacy, moderator variable and their interaction terms

b_1 = Intercepts for debt literacy

b_2 = Intercepts for the moderator variable

b_3 = Intercepts for the interaction term

ε_i = Error term

Baron and Kenny (1986) advises that it is desirable the moderator be uncorrelated with both variables (x_i and y_i) so that it can provide a clearly interpretable interaction term. This study found age of employees and debt literacy had weak, negative but significant correlation ($r=-.202, p=.001$) while it had weak, positive and significant correlation ($r=.210, p=.000$) with DSR. This means age of employees was not correlated with either debt literacy or DSR and hence absence of multicollinearity problem.

Table 1: MMR model summary of DSR against debt literacy

Model	R	R ²	Adj. R ²	SE	Change Statistics				
					ΔR ²	ΔF	df1	df2	ΔSig.F
1	.293	.086	.079	.14692	.086	13.536	2	289	.000
2	.423	.105	.096	.14559	.020	6.294	1	288	.013

*p<.05

MMR model 1 in Table 1 shows that R=.293, R²=.086 and F(2,289)=13.536, p=.000 implying the model is valid and explains DSR significantly. The value of R² indicates that 8.6% of the variance in the DSR can be accounted for by debt literacy and age of the employees. On the other hand, model 2 shows the results after the interaction term (x_iz_i) was added into the model. Table

4.76 also indicates that the inclusion of the interaction term resulted into R change of .020, F(1,288)=6.294, p=.013, showing significant moderating effect. Thus the study rejected the null hypothesis [$H_{05a}:b_3=0, p>.05$] that there is no moderating effect of age on the relationship between debt literacy and DSR of formal sector employees in Kenya.

Table 2: MMR model results of DSR against debt literacy

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	0.584	2	.292	13.536	.000
	Residual	6.238	289	.022		
	Total	6.823	291			
2	Regression	0.718	3	.239	11.287	.000
	Residual	6.105	288	.021		
	Total	6.823	291			

*p<.05

The MMR Models 1 and 2 shown in Table 2 were found to be valid, $F(2,289)=13.536$, $p=.000$ and $F(3,288)=11.287$, $p=.000$ respectively. The models in Table 2 show the value of F-ratio were

significant ($p=.000$). These results show both models significantly predict DSR but model 1 was better.

Table 3:MMR model coefficients of DSR against debt literacy

Model		Beta	SE	Beta	T	Sig.	Tolerance	VIF
1	b_0	0.605	0.076		7.945	.000		
	x_1	-0.098	0.022	-0.250	-4.382	.000	.975	1.026
	z_1	0.025	0.012	0.118	2.073	.039	.975	1.026
2	b_0	0.698	0.084		8.299	.000		
	x_1	-0.133	0.026	-0.339	-5.079	.000	.698	1.433
	z_1	-0.044	0.030	-0.207	1.463	.145	.156	6.420
	x_1, z_1	0.011	0.005	0.352	2.509	.013	.158	6.331

* $p<.05$

Based on MMR model 2 beta values shown in Table 3, debt literacy (x_1) had negative but significant ($p=.000$) effect on DSR while age of the employees (z_1) had negative and insignificant ($p=.145$) effect on DSR. Since the coefficient of the interaction term (x_1z_1) was significant ($p=.013$), the study rejected the null hypothesis that [$H_{05a}:b_3=0$, $p>.05$] that there is no moderating effect of age on the relationship between debt literacy and DSR of formal sector employees in Kenya. Finally, substituting the standardized beta coefficients in the OLS MMR model ($y_1 = b_0 + b_1x_1 + b_2z_1 + \epsilon$), the following DSR equation was obtained;

$$DSR = -0.339DL + 0.352 \text{ age} * DL \dots \dots \dots (2)$$

Equation 2 implies that for one point improvement in debt literacy (DL) the score of DSR would decrease by 0.339 points keeping the effect of the interaction term constant which is higher than 0.250 points in model 1 hence presence of the moderating effect.

Moderating Effects of Age on the Relationship Between Debt Literacy and DIR

The MMR model used to test the moderating effect age of employees in the relationship between debt literacy and DIR was;

$$y_2 = b_0 + b_1x_1 + b_2z_1 + b_3x_1z_1 + \epsilon \dots \dots \dots (3)$$

Where: y_2 = Debt Income Ratio (DIR)

x_1 = Aggregate debt literacy

z_1 = Age of the employees (1 if less than 36 years; 2 if aged between 36-45 years, and 3 if aged over 45 years)

b_0 = Level of DIR in the absence of debt literacy, moderator variable and their interaction terms

b_1 = Intercepts for debt literacy

b_2 = Intercepts for the moderator variable

b_3 = Intercepts for the interaction term

ϵ_i = Error term

Baron and Kenny (1986) advises that it is desirable the moderator be uncorrelated with both variables (x_1 and y_2) so that it can provide a clearly interpretable interaction term. This study found age of employees and debt literacy had weak, negative but significant correlation ($r=-.202$, $p=.001$) while it had weak, positive and insignificant correlation with age ($r=.085$, $p=.147$) with DIR. This means age of employees was not correlated with either debt literacy or DIR and hence absence of multicollinearity problem.

Table 4: MMR model summary of DIR against debt literacy

Model	R	R ²	Adj. R ²	SE	Change Statistics				
					ΔR^2	ΔF	df1	df2	$\Delta \text{Sig.F}$
1	.263	.069	.063	5.26110	.069	10.763	2	289	.000
2	.304	.093	.083	5.20417	.023	7.357	1	288	.007

* $p<.05$

From Table 4, Model 1 indicate that $R=.263$, $R^2=.069$ and $F(2,289)=10.763$, $p=.000$ implying the model can predict DIR significantly. The value of R^2 indicates that 6.9% of the variance in the DSR can be accounted for by debt literacy and age of the employees. Model 2 in Table 4, shows the results after the interaction term (x_1z_1) was added into the model. Table 4 also

indicates that the inclusion of the interaction term resulted into an R^2 change of .023 and $F(1,288)=7.357$, $p=.007$, showing significant moderating effect. Thus, the study rejected the null hypothesis [$H_{05b}:b_3=0$, $p>.05$] that there is no moderating effect of age on the relationship between debt literacy and DIR of formal sector employees in Kenya.

Table 5: MMR model results of DIR against debt literacy

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	595.839	2	297.919	10.763	.000
	Residual	7999.274	289	27.679		
	Total	8595.113	291			
2	Regression	795.099	3	265.033	9.786	.000
	Residual	7800.014	288	27.083		
	Total	8595.113	291			

* $p<.05$

The MMR Model 1 and 2 shown in Table 5 were found to be valid $F(2,289)=10.763$, $p=.000$ and $F(3,288)=9.786$, $p=.000$. The models in Table 5 show the value of F-ratio were significant

($p<.05$). These results show both models significantly predict DIR but model 1 was better.

Table 6:MMR model coefficients of DIR against debt literacy

Model		Beta	SE	Beta	T	sig	Tolerance	VIF
1	b_0	20.440	2.725		7.501	.000		
	x_1	-3.712	0.803	-0.266	-4.622	.000	.975	1.026
2	z_1	-0.144	0.438	-0.019	-0.329	.742	.975	1.026
	b_0	24.050	3.006		8.000	.000		
	x_1	-5.070	0.939	-0.363	-5.399	.000	.698	1.433
	z_1	-2.841	1.085	-0.373	-2,619	.009	.156	6.420
	$x_1.z_1$	0.441	0.163	0.383	-2.712	.007	.158	6.331

* $p<.05$

Based on MMR model 2 beta values shown in Table 6, debt literacy (x_1) and age of the employees (z_1) had negative but significant ($p<.05$) effect on DIR. On the other hand, the interaction term (x_1z_1) had positive and significant ($p=.007$) effect on DIR. Since the coefficient of the interaction term was significant ($p<.05$), the study rejected the null hypothesis [$H_{05b}:b_3=0$, $p>.05$] that there is no moderating effect of age on the relationship between debt literacy and DIR of formal sector employees in Kenya.

Finally, substituting the standardized beta coefficients in the OLS

MMR model ($y_2 = b_0 + b_1x_1 + b_2z_1 + \varepsilon$), the following DIR equation was obtained;

$$DIR = - 0.363DL - 0.373Age + 0.383Age*DL \dots\dots\dots (4)$$

Equation 4 imply that for one point rise in debt literacy (DL) the score of DIR would decrease by 0.363 points by keeping the effect of age of the employees and the interaction term constant which

is higher than 0.266 points in model 1. In addition, aging of employees had significant contribution to DIR, meaning age of employees had a reducing effect on DIR. This findings are similar to those by Gathergood (2012) who while examining the relationship between self control, financial literacy and over-indebtedness found age groups negatively and significantly related to over-indebtedness. In line with several studies (e.g. Dick & Jaroszek, 2013; Lusardi & Tufano, 2009), young people emerged vulnerable, at least by DIR.

In summary, the high residual sum of squares in the OLS linear regression models in the SPSS generated results indicates that the study's variables do not explain much of the variation in the indebtedness of the respondents. Other factors therefore account for a higher proportion of the variation. This is also collaborated by the low values of R, R^2 and adjusted R^2 reported in this chapter. On the other hand, the standard errors are indeed very small, showing that the beta values of the sample and that of the population are materially similar. Further, the low VIF values (less than 2) and tolerance values of almost 1 in the linear regression models show there was no multicollinearity. Finally, all

the regression models employed in this chapter satisfied the linearity test. This means there was no violation to the assumption of statistical tests.

V. SUMMARY OF THE FINDINGS

The effect of age was positive and significant for DSR on one hand and negative and significant for DIR on the other. This meant DSR increases with aging of employees while DIR decreases with aging of employees. This meant age of the respondents had a moderating effect on the relationship between debt literacy and indebtedness. In addition, young people emerged vulnerable, at least by DIR.

VI. CONCLUSIONS OF THE STUDY

The specific objective was to assess the moderating effect of age of formal sector employees in Kenya on the relationship between debt literacy and indebtedness. Results of this study indicated that age of the employees significantly moderated the relationship between debt literacy and indebtedness. The results provide information that deepened the understanding of the life cycle and permanent income theories. Essentially the life cycle theory is centred on age of the individual while permanent income is based on future (life) expectations.

VII. RECOMMENDATIONS OF THE STUDY

This study found that respondents' debt literacy was wanting especially for the young and elderly. The young people also emerged vulnerable to indebtedness. Therefore, the government should roll out financial education programs in schools, colleges, universities and at work places to target the young and the retiring cohorts.

VIII. CONTRIBUTIONS OF THE STUDY FINDINGS

A major contribution of this study is the testing of the moderating effect of age of formal sector employees on the relationship between debt literacy and indebtedness. Although some studies have looked at the relationship between socioeconomic characteristics and either debt literacy or indebtedness, none had introduced any socioeconomic characteristic as a moderator. The findings of this study show that age of the formal sector employees has a moderating effect on the relationship between debt literacy and indebtedness. This study found that respondents' debt literacy was wanting. Therefore, the government should roll out financial education programs in schools, colleges, universities and at work places.

IX. SUGGESTIONS FOR FURTHER RESEARCH

Future research need to consider the moderating role of other socioeconomic characteristics on the relationship between debt literacy and indebtedness. While employees in the informal sector need also to be studied.

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APPENDICES

Appendix 1: Mean and ANOVA results for age and study variables

Sub-constructs	Young	Mid-age	Elderly	F	Sig.
* Disposable income	61,038	91,804	65,608	13.277	.000
* Loan outstanding	513,161	838,214	523,375	9.915	.000
* DSR	0.3144	0.3646	0.3707	4.315	.014
DIR	8.3449	9.2559	8.1836	1.032	.358
Development loan	4.10	4.04	3.81	1.021	.361
Car loan	1.66	1.77	1.36	2.496	.084
Consumption loan	1.72	1.85	1.75	0.620	.539
Education loan	3.24	3.13	3.00	0.332	.718
* Housing loan	2.08	2.67	2.36	7.107	.001
Multiple loan	1.78	1.95	1.90	1.013	.364
* Loan from Sacco	0.81	1.08	1.20	5.907	.003
Loan from Bank	0.55	0.56	0.33	2.745	.066
* HELB Loan	0.16	0.06	0.00	5.668	.004
Unsecured credit	1.59	1.87	1.55	2.007	.136
Secured Credit	0.07	0.11	0.03	1.831	.162
SACCO membership	1.11	1.15	1.03	2.500	.084
Debt restructuring	2.09	2.04	2.10	0.067	.935
* Debt advice	2.48	2.26	2.17	3.661	.027
Debt counselling	2.23	2.09	2.07	1.031	.358
Debt experiences	2.04	2.08	2.14	0.671	.512
Self-control	3.89	3.83	3.60	1.653	.193
Self-confidence	2.99	3.15	3.28	1.699	.185
Peer influence	4.21	4.11	4.43	1.998	.138
Borrowing behaviours	3.80	3.69	3.67	1.432	.241
Budgeting	2.97	3.16	3.06	1.115	.329
Budgetary control	3.29	3,23	3.27	0.088	.916

Planning	3.31	3.33	3.29	1.181	.308
Debt capability	3.17	3.19	3.21	0.033	.966
Numeracy skill test	3.61	3.47	3.30	1.110	.331
Self-assessment test	4.69	4.63	4.41	0.840	.433
* Debt education	3.23	3.17	2.68	5.024	.007
Debt training	2.91	2.62	2.51	2.765	.065
* Debt knowledge	3.55	3.35	3.08	5.756	.004
* Debt literacy	3.17	3.08	3.00	3.764	.024

* $p < .05$; $df = 2,289$

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Analysis Of Tax Implementation On Income In Tax Harmonization Law.

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Abstract- The HPP Law is the Tax Harmonization Law which is part of the tax reform system with the aim of strengthening the economy and accelerating national development. . In the law there are new tax regulations that are considered more in favor of the interests of the general public. Included in the Tax Harmonization Law are changes to personal income taxes and micro, small and medium enterprises (MSMEs).

Administratively, the Law on the Harmonization of Tax Regulations serves to close gaps in tax regulations that still occur frequently and adapt to the times, one of which is the number of businesses with digital platforms. The Tax Harmonization Law is expected to be part of tax justice, especially in terms of the burden that must be borne by the community, including efforts to strengthen the Micro, Small and Medium Enterprises sector.) on October 7, 2021 ago. Then, President Joko Widodo officially promulgated the Draft Law on the Harmonization of Tax Regulations into Law Number 7 of 2021 on October 29, 2021. This law will take effect in the 2022 fiscal year.

This law also regulates the principles and objectives. The Law on the Harmonization of Tax Regulations is implemented based on the principles of justice, simplicity, efficiency, legal certainty, benefit, and the national interest.

Index Terms- income tax, Law on the Harmonization of Tax Regulations

I. BACKGROUND

One of the efforts to realize the independence of the nation (state) in terms of development financing is to explore sources of funds originating from within the country in the form of taxes. Taxes are used to finance development that is useful for the common good. Mardiasmo (2018) states that one of the functions of taxes is for the budget (budgetair), namely taxes are used to finance state expenditures. The expenditure is quite large, especially for state spending, the largest portion of which is personnel expenditure, spending on education, infrastructure development as well as transfers to regions and village funds. According to Yosep Poernomo (2020).

Tax is the dominant source of revenue in the structure of the State Revenue and Expenditure Budget (APBN), which exceeds 80% in the 2018-2020 State Budget and income tax is the largest component of domestic tax revenue among other domestic tax revenues. Although the government targets tax revenues to increase every year, for 2022 tax revenues are targeted at IDR 1,265 trillion, lower than the realization of tax revenues in 2021 amounting to IDR 1,277.5 trillion. to issue tax regulations (policies) that can lead to the achievement of these targets.

Accompanying these reforms, has several important points. In the structural sector, the Law on the Harmonization of Tax Regulations aims to improve the ease of doing business and the investment climate, expand employment opportunities, and accelerate economic growth. In the financial system sector, tax reform is expected to create a financial system that is inclusive, healthy, and able to efficiently serve the dynamics of social economic activity.

Then in the fiscal sector, this reform is expected to improve the quality of state spending for the protection of vulnerable people, be able to provide quality public facilities, and increase the effectiveness of economic growth. Finally, in the state governance sector, tax reform is expected to create a mature democratic system, an efficient and effective bureaucracy, and build constructive government and regional relations.

The Law on Harmonization of Tax Regulations covers General Provisions and Tax Procedures, Income Tax (PPh), Value Added Tax (PPN), Taxpayer Voluntary Disclosure Program, Carbon Tax, to Excise. This law also regulates the principles and objectives. The Law on the Harmonization of Tax Regulations is implemented based on the principles of justice, simplicity, efficiency, legal certainty, benefit, and the national interest.

The purpose of drafting this law is to increase sustainable economic growth and support the acceleration of economic recovery, optimize state revenues to finance national development independently towards a just, prosperous and prosperous Indonesian society, realize a tax system that is more just and legal with certainty, implement administrative reform, consolidated taxation policies, tax expansion, and increasing taxpayer compliance.

The concrete objectives of tax reform through the Law on Harmonization of Tax Regulations are to expand the tax base, increase compliance, strengthen tax administration, and create justice, equality, and legal certainty. In addition, tax reform is also intended to protect the lower middle income community and Micro, Small and Medium Enterprises.

Tax reform needs to be carried out to realize Indonesia as a developed country. This reform is an integral part of the agenda for Structural Reform (Real Sector), Fiscal Reform, Financial System Reform, and State Governance Reform.

The implementation of income tax in the Law on the Harmonization of Tax Regulations is interesting to discuss. The Directorate General of Taxes, as the Indonesian tax authority, can provide solutions to the tax revolution that applies in Indonesia for the future. In this research journal, the author will conduct an analysis of the Implementation of the Harmonization of Tax Regulations on Income Tax Regulations, Comparison of Income Tax Laws based on the Harmonization of Tax Regulations Law, and the government's strategy so that the Income Tax Tax Regulation Harmonization Law can be implemented. well received by taxpayers in the future.

b. Question

The questions in writing this research journal are as follows:

1. How is the Implementation of the Law on Harmonization of Tax Regulations on Income Tax Arrangements?
2. What are the Comparison of Income Tax Laws based on the Law on Harmonization of Tax Regulations?
3. What is the government's strategy so that the Law on Harmonization of Tax Regulations on Income Tax can be well received by taxpayers?

A. THEORETICAL BASIS

a. Definition of Income Tax.

Income Tax (PPh) according to Law No. 17 of 2000 Article 1 is a tax imposed on tax subjects on income received or earned in the tax year. What is meant by tax year in Income Tax Law no. 17 of 2000 is a calendar year, however, taxpayers may use a financial year that is not the same as the calendar year, as long as the financial year covers a period of 12 (twelve) months. Income tax is a direct tax levied by the central government or is a state tax. As a direct tax, the income tax is the responsibility of the taxpayer concerned, in the sense that the income tax may not be delegated to other parties or included in the calculation of the selling price or as a production cost.

b. Types of Subjects and Objects of Income Tax.

1. Income Tax Subject.

The subject of Income Tax is the person or party who is responsible for the income tax received or earned in the tax year or part of the tax year. The subject of income tax means a person who has to pay income tax and is referred to as a taxpayer (WP). The status as a Taxpayer is determined by the way the person concerned first registers with the Tax Service Office (KPP) to obtain a Taxpayer Identification Number (NPWP). Self-registration as a Taxpayer at the Tax Service Office must be in accordance with the domicile area concerned.

Income Tax Subject Type

Referring to the Income Tax Law, the subject of income tax is divided into several types, including:

- 1) Personal Income Tax Subject
 - Domestic Personal Income Tax Subject
 - Foreign Individual Income Tax Subject.
- 2) Undistributed Inheritance Income Tax Subject
- 3) Corporate Income Tax Subject
- 4) Permanent Business Entity Income Tax Subject (BUT)

2. Tax Object.

Included in the Objects of Income Tax are:

Income as a Tax Object

Income Tax Objects in the Income Tax Law are detailed as follows :

- 1) Reimbursement or remuneration in respect of work or services received or obtained including salaries, wages, allowances, honoraria, commissions, bonuses, gratuities, industrial money, or other forms of remuneration, unless otherwise provided for in this law .
- 2) Prizes from sweepstakes or work or activities, and awards
- 3) Operating profit.
- 4) Gains due to sale or transfer of property include:
 - Gains due to transfer of assets to companies, partnerships, and other entities in lieu of shares or equity participation.
 - Gains due to the transfer of assets to shareholders, partners, or members obtained by companies, partnerships and other entities.
 - Gains due to liquidation, merger, consolidation, expansion, split, takeover, or reorganization in any name and form.
 - Gains due to the transfer of assets in the form of grants, assistance, or donations, except for those given to blood relatives in a straight line of one degree and religious bodies, educational bodies, social institutions including industry, cooperatives, or private individuals who run micro and small businesses, the provisions of which are: further regulated by a Regulation of the Minister of Finance, as long as there is no relationship with the business, occupation, ownership, or control between the parties concerned.
 - Gains due to sale or transfer of part or all of mining rights, participation in financing, or capitalization in mining companies.
- 5) Receipt of tax payments that have been charged as fees and additional payment of tax refunds
- 6) Interest includes premiums, discounts, and rewards for guaranteed debt repayments
- 7) Dividends, in any name and form, including dividends from insurance companies to policyholders, and distribution of the remaining operating results of cooperatives.
- 8) Royalties or rewards for exercising rights
- 9) Rent and other income in connection with the use of property
- 10) Receiving or obtaining periodic payments
- 11) Gain due to debt relief, except up to a certain amount stipulated by Government Regulation
- 12) Gain on foreign exchange rate difference
- 13) More difference due to asset revaluation
- 14) Insurance premium
- 15) Contributions received or obtained by the association from its members consisting of Taxpayers who run a business or work independently;
- 16) Additional net assets originating from income that has not been taxed
- 17) Income from industry-based businesses
- 18) Interest payments as referred to in the Law which regulates general provisions and taxation procedures
- 19) Bank Indonesia surplus.

Income Subject to Final Income Tax:

- Income in the form of interest on deposits and other savings, interest on bonds and government bonds, and interest on deposits paid by cooperatives to individual cooperative members
- Income in the form of raffle prizes
- Income from stock and other securities transactions, industrial transactions traded on the exchange, and share sales transactions or transfers of equity participation in partner companies received by venture capital companies
- Income from property transfer transactions in the form of land and/or buildings, construction service businesses, real estate businesses, and land and/or building rentals
- Other certain income regulated by or based on Government Regulation.

c. Changes in Income Tax Rates in the Law on Harmonization of Tax Regulations (UU HPP).

1) Individual Income Tax (PPh)

In the context of Income Tax, the Law on Harmonization of Tax Regulations changes the Income Tax Law, namely Law no. 36 of 2008. Individual income tax is regulated in Article 17 regarding changes in Income Tax rates and the addition of a new bracket. Here's the comparison:

LayerTariff	Income Tax Act	Law on Harmonization of Tax Regulations (HPP)
I	0 - IDR 50 million subject to 5% tariff	0 - IDR 60 million subject to 5% tariff
II	> IDR 50 - 250 million subject to 15% tariff	> IDR 60 -250 million subject to 15% tariff
III	> IDR 250 - 500 million subject to 25% tariff	> IDR 250 - 500 million subject to 25% tariff
IV	> 500 million subject to 30% tariff	> 500 million - 5 billion subject to 30% tariff
V		> IDR 5 billion subject to 35% tariff

2) Natural Income Tax (PPh)

In the Law on the Harmonization of Tax Regulations, there is an additional paragraph regarding grants in kind by employers as employee income which is not included as a tax object. In accordance with article 4 paragraph 1 (d), which are included in the nature of non-tax objects are:

- food, food ingredients, beverage ingredients, and/or drinks for all employees
- nature and/or enjoyment due to assignment in an area
- in kind and/or enjoyment due to necessity in carrying out work, such as uniforms
- in kind and/or enjoyment financed by the State Budget (APBN)/Regional Revenue and Expenditure Budget (APBD)
- in kind and/or with certain types and limitations.

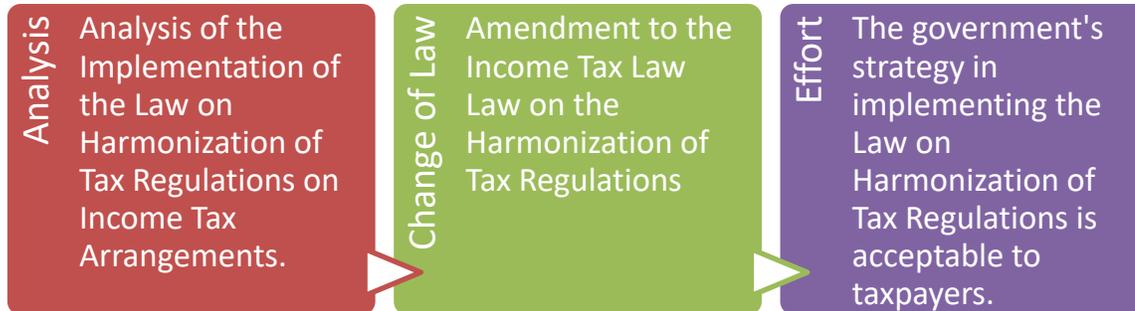
3) Income Tax (PPh) of Individual and Corporate Entrepreneurs

The Law on the Harmonization of Tax Regulations also changes the rules for corporate income tax (regulated in article 17 paragraph 1) and adds to the strengthening of regulations regarding income tax for micro, small and medium enterprises (regulated in article 7 paragraph 1 and 2a).

Taxpayer	Law on General Provisions of Taxation	Law on Harmonization of Tax Regulations
Individual Entrepreneurs (MSMEs)	not set yet (regulated in PP No. 23 of 2018)	final income tax calculation 0.5% rate for a maximum turnover of IDR 500 million is not subject to income tax
Body	Domestic corporate taxpayers and forms permanent business of 28% (twenty eight percent).	Domestic corporate taxpayers and forms fixed business by 22% (twenty two percent) which enters into force in the 2022 tax year.

d. Framework

The framework for writing this research journal. The author will conduct an analysis of the implementation of income tax in the Law on the Harmonization of Tax Regulations. From the results of the analysis of the implementation of income tax in the Law on the Harmonization of Tax Regulations, we will know the changes in income tax policies made by the government in the analysis. Furthermore, the author will try to provide the government's strategy for changes in tax regulation policies for Indonesian taxpayers to face future income tax tax policy reforms.



Picture
Framework Thought .

B. PROBLEM ANALYSIS

a. Research methods

1. Types of research

Study this is study qualitative .

2. Data collection technique

Technique data collection used in study this is studies bibliography . Writer To do analysis to books , journals scientific , and mass media coverage related Implementation of Income Tax in the HPP Law . Besides To do studies bibliography .

3. Technical Data Analysis

For answer problem research journal , author use technique qualitative data analysis for produce descriptive-analytical data . Analysis this chosen because very flexible and make it easy search for ideas and instruction about situation problem .

b. Discussion and Discussion.

1. Analysis of the Implementation of the Harmonization of Tax Regulations on Tax Regulations on Income

The latest tax regulations related to the types of personal income tax, in the Law on the Harmonization of Tax Regulations, the rates for personal income tax are set and the personal income tax bracket has changed. The latest Tax Law which regulates the personal income tax rate or Article 21 income tax rate is a revision of the income tax law in the Law on the Harmonization of Tax Regulations. Changes in personal income tax rates and layers in this Law on the Harmonization of Tax Regulations can make the calculation of Article 21 Personal income tax lower than when still using the calculation according to the Personal income tax rate in the Law on Harmonization of Tax Regulations.

Provisions regarding nature in the Tax Regulation Harmonization Law group are also regulated again in the Tax Regulation Harmonization Law. There are several meanings of Natura, as according to the Big Indonesian Dictionary (KBBI), the notion of Natura is actual goods and not in the form of money.

Meanwhile, according to the Circular Letter of the Director General of Taxes Number SE-03/PJ.03/1984, enjoyment in kind is any remuneration received or obtained by an employee, employee, or female employee and/or her family not in the form of money from the employer. Regarding the imposition of taxes on in-kind, in the Law on the Harmonization of Tax Regulations which regulates personal income taxes, it is stated that in-kind grants to employees can be paid for by the employer and is income for the employee. Meanwhile, certain Natura do not constitute income for the recipient, including:

- Provision of food/drink for all employees
- Nature in certain areas
- In nature due to work requirements, for example: work safety equipment or uniforms

- Natura sourced from APBN/APBD
- Nature with certain types and limitations

Individual entrepreneur income tax (MSME) is a change in the final tax rate from 0.5% (PP No.23/2018) to 0% or not subject to tax for a year's gross turnover of up to IDR 500 million Income tax for small and medium businesses with a turnover certain income tax is imposed in accordance with PP No. 23/2018 (Micro, Small and Medium Enterprises tax). In the Law on the Harmonization of Tax Regulations, provisions in the Income Tax Law are also regulated regarding Personal Entrepreneur taxpayers who are exempt from the imposition of income tax by stipulating that a gross turnover of up to Rp. 500,000,000 per year is not subject to income tax. With the existence of a gross turnover limit (similar to non-taxable income (PTKP) for individual taxpayers as employees) which is not subject to this income tax, this means that SMEs or individual taxpayers with income above the gross turnover limit are not subject to income tax, the amount of income tax paid will be smaller.

Latest Corporate Income Tax Rates in the Law on Harmonization of Tax Regulations. corporate income tax, namely there is a change in the rate for 2022 from 20% Back to 22%. As for the personal income tax, it is the Individual Tariff in the form of Changes in the layer of tax rates of Article 17 paragraph (1) letter a of the Income Tax Law Number 36 of 2008.

2. Comparison of Income Tax Laws based on the Law on Harmonization of Tax Regulations.

Law on the Harmonization of Consolidated Tax Regulations after the Job Creation Act	Law on Harmonization of Tax Regulations	Information
Article 4 (1) letter a : a. compensation or remuneration in respect of work or services received or obtained including salaries, wages, allowances, honoraria, commissions, bonuses, gratuities, pensions, or other forms of remuneration, unless otherwise provided for in this Law;	Article 4 (1) letter a : a. replacement or remuneration in connection with work or services received or obtained including salaries, wages, allowances, honoraria, commissions, bonuses, gratuities, pensions, or other forms of remuneration including in-kind and/or enjoyment, unless otherwise provided for in this Law.	Change
Article 4 (1) letter d No 4: 4. gains due to the transfer of assets in the form of grants, assistance, or donations, except for those given to blood relatives in a straight line of one degree and religious bodies, educational bodies, social institutions including foundations, cooperatives, or private individuals who run micro and small businesses, the provisions of which will be further regulated by a Regulation of the Minister of Finance, as long as there is no relationship with business, employment, ownership, or control between the parties concerned; and	Article 4 (1) letter d No 4: 4. gains due to the transfer of assets in the form of grants, assistance, or donations, except for those given to blood relatives in a straight line of one degree and religious bodies, educational bodies, social institutions including foundations, cooperatives, or private individuals who run micro and small businesses, as long as there is no relationship with business, employment, ownership, or control between the parties concerned; and	Change
Article 4 (1a): a. have certain skills; and	Article 4 (1a): a. have certain expertise in accordance with the provisions of the legislation ; and	Change
Article 4 (1d): Further provisions regarding certain skill criteria and procedures for imposing Income Tax for foreign nationals as referred to in paragraph (1a) shall be regulated in a Regulation of the Minister of Finance.	Article 4 (1d): 1d) Deleted.	Change
Article 4 (2) letter a :	Article 4 (2) letter a :	Change

<p>a. income in the form of interest on deposits and other savings, interest on bonds and state debt securities, and interest on deposits paid by cooperatives to individual cooperative members;</p>	<p>a. income in the form of interest on deposits and other savings, interest on bonds and government bonds, interest or discount on short-term securities traded on the money market, and interest on deposits paid by cooperatives to individual cooperative members;</p>	
<p>Article 4 (2) letter e: other certain income</p>	<p>Article 4 (2) letter e: other certain income, including income from business received or earned by the Taxpayer which has a certain gross turnover,</p>	<p>Change</p>
<p>Article 4 (3) letter a no. 1 & 2 : What is excluded from the tax object are: a. 1. assistance or donations, including zakat received by amil zakat bodies or amil zakat institutions established or approved by the government and received by entitled zakat recipients or religious contributions that are mandatory for believers recognized in Indonesia, received by the institution religions established or approved by the government and received by eligible recipients, the provisions of which are regulated by or based on Government Regulations; and 2. grant property received by blood relatives in a straight line of one degree, religious bodies, educational bodies, social bodies including foundations, cooperatives, or individuals running micro and small businesses, the provisions of which are regulated by or based on a Regulation of the Minister of Finance</p>	<p>Article 4 (3) letter a no. 1 & 2: Exempt from tax objects are: a. 1. assistance or donations, including zakat, infak, and alms received by amil zakat bodies or amil zakat institutions established or approved by the government and received by entitled zakat recipients or religious contributions that are mandatory for recognized religions in Indonesia , received by religious institutions established or authorized by the government and received by eligible recipients of donations, the provisions of which are regulated by or based on Government Regulations; and 2. grant property received by blood relatives in a straight line of descent of one degree, religious bodies, educational bodies, social bodies including foundations, cooperatives, or private persons running micro and small businesses,</p>	<p>Changes</p>
<p>Article 4 (3) letter d: compensation or compensation in connection with work or services received or obtained in kind and/or enjoyment from the Taxpayer or the Government, except for those given by non-Taxpayers, Taxpayers who are subject to final tax or Taxpayers who use special calculation norms (deemed profit) as referred to in Article 15;</p>	<p>Article 4 (3) letter d : reimbursement or remuneration in connection with work or services received or obtained nature and/or enjoyment, including: 1. food, food ingredients, beverage ingredients, and/or drinks for all employees; 2. in kind and/or enjoyment provided at certain areas; 3. nature and/or pleasure that must be provided by the giver work in the execution of work; 4. in kind and/or enjoyment sourced or financed by the State Revenue and Expenditure Budget, Regional Revenue and Expenditure Budget, and/or Village Revenue and Expenditure Budget; or 5. in kind and/or enjoyment with certain types and/or limitations;</p>	<p>Change</p>

<p>Article 4 (3) letter f no.10 : further provisions regarding: a) certain criteria, procedures and time period for investment as referred to in number 1, number 2, and number 7; b) procedures for exemption from the imposition of income tax as referred to in number 1, number 2, and number 7; and c) changes to the limit of dividends invested as referred to in number 4 and number 5, regulated in the Regulation of the Minister of Finance;</p>	<p>Article 3 letter f no.10 : deleted;</p>	<p>Change</p>
<p>Article 4 (3) letters g and h: g. contributions received or obtained by a pension fund whose establishment has been approved by the Minister of Finance, whether paid by the employer or employee; h. income from the capital invested by the pension fund as referred to in letter g, in certain fields stipulated by the Decree of the Minister of Finance;</p>	<p>Article 4 (3) letters g and h: g. contributions received or obtained by a pension fund whose establishment has been approved by the Financial Services Authority, whether paid by the employer or employee; h. income from the capital invested by the pension fund as referred to in letter g, in certain fields;</p>	<p>Change</p>
<p>Article 4 (3) letter k no. 1: 1. is a micro, small, medium-sized company, or which carries out activities in business sectors regulated by or based on a Regulation of the Minister of Finance; and</p>	<p>Article 4 (3) letter k no. 1: 1. is a micro, small and medium company, or which carries out activities in business sectors regulated by or based on a Regulation of the Minister of Finance; and</p>	<p>Change</p>
<p>Article 4 (3) letter l : l. scholarships that meet certain requirements whose provisions will be further regulated by or based on a Regulation of the Minister of Finance;</p>	<p>Article 4 (3) letter l : l. scholarships that meet certain requirements;</p>	<p>Change</p>
<p>Article 4 (3) letters m, n, o, p : m. the excess that is received or obtained by a non-profit agency or institution engaged in education and/or research and development, which has been registered with the agency in charge of it, is reinvested in the form of facilities and infrastructure for educational and/or research and development activities, within a short period of time. not later than 4 (four) years since the excess is obtained, the provisions of which are further regulated by or based on the Regulation of the Minister of Finance; n. assistance or compensation paid by the Social Security Administering Body to certain Taxpayers, the provisions of which are further regulated by or based on a Ministerial Regulation</p>	<p>Article 4 (3) letters m, n, o, p : m. the excess that is received or obtained by a non-profit agency or institution engaged in education and/or research and development, which has been registered with the agency in charge of it, is reinvested in the form of facilities and infrastructure for educational and/or research and development activities, within a short period of time. a maximum period of 4 (four) years since the excess is obtained; n. assistance or compensation paid by the Social Security Administrative Body to certain Taxpayers ; o. funds for the deposit of Hajj Organizing Fees (BPIH) and/or special BPIH, and income from the development of Hajj finance in certain financial fields or instruments, received by the Hajj Financial Management Agency (BPKH); and</p>	<p>Change</p>

<p>Finance; o. funds for the deposit of the Hajj Organizing Fee (BPIH) and/or special BPIH, and income from the development of Hajj finance in certain financial fields or instruments, are received by the Hajj Financial Management Agency (BPKH) whose provisions are regulated by or based on a Ministerial Regulation Finance; and p. surplus received/obtained by social and religious bodies or institutions registered with the agency in charge of them, which is reinvested in the form of social and religious facilities and infrastructure within a maximum period of 4 (four) years from the receipt of said excess, or placed as funds perpetual, whose provisions are further regulated by or based on the Regulation of the Minister of Finance. not later than 4 (four) years since the excess is obtained, or placed as an endowment fund, the provisions of which are further regulated by or based on the Regulation of the Minister of Finance.</p>	<p>p. surplus received/obtained by a social and /or religious agency or institution registered with the agency in charge of it, which is reinvested in the form of social and religious facilities and infrastructure within a maximum period of 4 (four) years from the date the excess was obtained, or placed as an endowment .</p>	
<p>Article 6 (1) letter a no 7 : 7. promotion and sales costs regulated by or based on a Regulation of the Minister of Finance;</p>	<p>Article 6 (1) letter a no 7 : 7. promotion and sales costs ;</p>	<p>Change</p>
<p>Article 6 (1) letter c : c. contributions to pension funds whose establishment has been approved by the Minister of Finance;</p>	<p>Article 6 (1) letter c : c. contributions to pension funds whose establishment has been approved by the Financial Services Authority;</p>	<p>Change</p>
<p>Article 6 (1) letter h no. 4: h. receivables that clearly cannot be collected on the following conditions: 4. the conditions as referred to in number 3 do not apply to the write-off of bad debts from small debtors as referred to in Article 4 paragraph (1) letter k; whose implementation is further regulated by or based on a Regulation of the Minister of Finance;</p>	<p>Article 6 (1) letter h no. 4: 4. the conditions as referred to in number 3 do not apply to the write-off of bad debts from small debtors as referred to in Article 4 paragraph (1) letter k;</p>	<p>Change</p>
<p>Article 6 (1) letter l, m, : l. donation of educational facilities whose provisions are regulated by a Government Regulation; and m. donations in the framework of sports development whose provisions are regulated by Government Regulations.</p>	<p>Article 6 (1) letter l, m, n : l. donation of educational facilities whose provisions are regulated by a Government Regulation; m. donations in the framework of sports development whose provisions are regulated by Government Regulations; and n. replacement costs or benefits provided in kind and/or enjoyment.</p>	<p>Change Addition</p>
<p>Article 7 (1) : Non-Taxable Income per year is given at least slightly as big as:</p>	<p>Article 7 (1) : Non-Taxable Income per year is given at least:</p>	<p>Change</p>

<p>a. Rp.15,840,000.00 (fifteen million eight hundred and forty thousand rupiah) for an individual Taxpayer; b. IDR 1,320,000.00 (one million three hundred and twenty thousand rupiahs) additional for married Taxpayers; c. Rp15,840,000.00 (fifteen million eight hundred and forty thousand rupiahs) additional for a wife whose income is combined with the husband's income as referred to in Article 8 paragraph (1); and d. IDR 1,320,000.00 (one million three hundred and twenty thousand rupiahs) additional for each blood family member and family by marriage in a straight line and adopted children, who are fully dependent, for a maximum of 3 (three) person for each family.</p>	<p>a. Rp54,000,000.00 (fifty-four million rupiah) for an individual Taxpayer; b. IDR 4,500,000.00 (four million five hundred thousand rupiahs) additional for married Taxpayers; c. IDR 54,000,000.00 (fifty four million rupiahs) additional for a wife whose income is combined with the husband's income as referred to in Article 8 paragraph (1); and d. IDR 4,500,000.00 (four million five hundred thousand rupiahs) additional for each blood family member and family by marriage in a straight line as well as adopted children, who are fully dependent, for a maximum of 3 (three) people every family.</p>	
<p>Article 7 (2a): There isn't any</p>	<p>Article 7 (2a): (2a) Individual Taxpayers who have a certain gross turnover as referred to in Article 4 paragraph (2) letter e are not subject to Income Tax on the share of gross turnover up to Rp. 500,000,000.00 (five hundred million rupiahs) in 1 (one) year tax.</p>	<p>Addition</p>
<p>Article 7 (3) : The adjustment of the amount of Non-Taxable Income as referred to in paragraph (1) shall be stipulated by a Regulation of the Minister of Finance after consultation with the House of Representatives.</p>	<p>Article 7 (3) : Size adjustment: a. Non-Taxable Income as referred to in paragraph (1); and b. The limit on gross turnover is not subject to Income Tax as referred to in paragraph (2a), determined by a Regulation of the Minister of Finance after consultation with the House of Representatives of the Republic of Indonesia.</p>	<p>Change</p>
<p>Article 9 (1) letter c no. 1 and 6: c. formation or accumulation of reserve funds, except: 1. reserve for bad debts for businesses of banks and other business entities that provide credit, leases with option rights, consumer finance companies, and factoring companies; 6. reserve costs for closing and maintaining industrial waste disposal sites for industrial waste treatment businesses,</p>	<p>Article 9 (1) letter c no. 1 and 6: c. formation or accumulation of reserve funds, except: 1. reserve for bad debts for businesses of banks and other business entities that provide credit, leases with option rights, consumer finance companies, and factoring companies calculated based on applicable financial accounting standards with certain limits after coordinating with the Financial Services Authority; 6. reserve costs for closing and maintaining industrial waste disposal sites for industrial waste treatment businesses, that meet certain requirements;</p>	<p>Change</p>
<p>Article 9 (1) letters d and e: d. health insurance premiums, accident insurance, life insurance, endowment insurance, and scholarship insurance, which are paid by individual taxpayers, unless paid by the employer and premiums</p>	<p>Article 9 (1) letters d and e: d. premiums for health insurance, accident insurance, life insurance, endowment insurance, and scholarship insurance , which are paid by individual taxpayers, unless paid by the employer and</p>	<p>Change</p>

<p>it is calculated as income for the relevant Taxpayer; e. replacement or compensation in connection with work or services provided in kind and enjoyment, except for the provision of food and drinks for all employees as well as reimbursement or compensation in kind and enjoyment in certain areas and related to the implementation of work regulated by or based on regulations. Minister of Finance;</p>	<p>the premium is calculated as income for the relevant Taxpayer; e. deleted;</p>	<p>Change</p>
<p>Article 9 (1) letter k : k. administrative sanctions in the form of interest, fines, and increases as well as criminal sanctions in the form of fines relating to the implementation of legislation. invitation in the field of taxation.</p>	<p>Article 9 (1) letter k : k. administrative sanctions in the form of interest, fines, and increases as well as criminal sanctions in the form of fines relating to the implementation of the provisions of laws and regulations in the field of taxation.</p>	<p>Change</p>
<p>Article 11 (6a): There isn't any</p>	<p>Article 11 (6a): (6a) If the permanent building as referred to in paragraph (6) has a useful life of more than 20 (twenty) years, the depreciation as referred to in paragraph (1) shall be carried out in equal parts, in accordance with the useful life as referred to in paragraph (1). (6) or according to the actual useful life based on the Taxpayer's books.</p>	<p>Addition</p>
<p>Article 11 (7) : Further provisions regarding depreciation on tangible assets owned and used in certain business fields shall be regulated by a Ministerial Regulation Finance.</p>	<p>Article 11 (7) : Shrinkage on tangible assets owned and used in certain business fields can be regulated separately .</p>	<p>Change</p>
<p>Article 11 (11) : Further provisions regarding the group of tangible assets according to the useful life as referred to in paragraph (6) shall be regulated by a Ministerial Regulation Finance</p>	<p>Article 11 (11) : Removed</p>	<p>Change</p>
<p>Article 11 (1a): Amortization begins in the month the expenditure is made, except for certain business fields which are further regulated by a Regulation of the Minister of Finance.</p>	<p>Article 11 (1a): Amortization begins in the month the expenditure is made, except for certain business fields .</p>	<p>Change</p>
<p>Article 11 (2a): There isn't any</p>	<p>Article 11 (2a): (2a) If the intangible assets as referred to in paragraph (2) have a useful life exceeding 20 (twenty) years, the amortization as referred to in paragraph (1) is carried out in accordance with the useful life as referred to in paragraph (2) for group intangible assets. 4 or according to the useful life which is actually based on the Taxpayer's books.</p>	<p>Addition</p>

<p>Article 17 (1) letters a and b: a. Domestic individual taxpayers are as follows:</p> <table border="1"> <thead> <tr> <th>Layers of Taxable Income</th> <th>Rates Tax</th> </tr> </thead> <tbody> <tr> <td>up to Rp.50,000,000.00 (fifty million rupiah)</td> <td>5%</td> </tr> <tr> <td>above Rp.50,000,000.00 (fifty million rupiah) up to Rp.250,000,000.00 (two hundred and fifty million rupiah) million rupiah)</td> <td>15%</td> </tr> <tr> <td>above Rp.250,000,000.00 (two hundred and fifty million rupiah) up to Rp.500,000,000.00 (five hundred million rupiah)</td> <td>25%</td> </tr> <tr> <td>above IDR 500,000,000.00 (five hundred million rupiah)</td> <td>30%</td> </tr> </tbody> </table> <p>b. Domestic corporate taxpayers and permanent establishments are 28% (twenty eight percent).</p>	Layers of Taxable Income	Rates Tax	up to Rp.50,000,000.00 (fifty million rupiah)	5%	above Rp.50,000,000.00 (fifty million rupiah) up to Rp.250,000,000.00 (two hundred and fifty million rupiah) million rupiah)	15%	above Rp.250,000,000.00 (two hundred and fifty million rupiah) up to Rp.500,000,000.00 (five hundred million rupiah)	25%	above IDR 500,000,000.00 (five hundred million rupiah)	30%	<p>Article 17 (1) letters a and b: a. Domestic individual taxpayers are as follows:</p> <table border="1"> <thead> <tr> <th>Layers of Taxable Income</th> <th>Rates Tax</th> </tr> </thead> <tbody> <tr> <td>up to Rp 60,000,000.00 (sixty million rupiah)</td> <td>5%</td> </tr> <tr> <td>above IDR 60,000,000.00 (sixty million rupiah) up to IDR 250,000,000.00 (two hundred and fifty million rupiahs) million rupiah)</td> <td>15%</td> </tr> <tr> <td>above Rp.250,000,000.00 (two hundred and fifty million rupiah) up to Rp.500,000,000.00 (five hundred million rupiah)</td> <td>25%</td> </tr> <tr> <td>above IDR 500,000,000.00 (five hundred million rupiah) up to Rp5,000,000,000.00 (five billion rupiah)</td> <td>30%</td> </tr> <tr> <td>above IDR 5,000,000,000.00 (five billion rupiah)</td> <td>35%</td> </tr> </tbody> </table> <p>b. Domestic corporate taxpayers and permanent establishments of 22% (twenty two percent) which will come into effect in the fiscal year 2022 .</p>	Layers of Taxable Income	Rates Tax	up to Rp 60,000,000.00 (sixty million rupiah)	5%	above IDR 60,000,000.00 (sixty million rupiah) up to IDR 250,000,000.00 (two hundred and fifty million rupiahs) million rupiah)	15%	above Rp.250,000,000.00 (two hundred and fifty million rupiah) up to Rp.500,000,000.00 (five hundred million rupiah)	25%	above IDR 500,000,000.00 (five hundred million rupiah) up to Rp5,000,000,000.00 (five billion rupiah)	30%	above IDR 5,000,000,000.00 (five billion rupiah)	35%	<p>Change</p>
Layers of Taxable Income	Rates Tax																							
up to Rp.50,000,000.00 (fifty million rupiah)	5%																							
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above IDR 5,000,000,000.00 (five billion rupiah)	35%																							
<p>Article 17 (2) and (2a), (2b): (2) The highest tariff as referred to in paragraph (1) letter a may be reduced to a minimum of 25% (twenty five percent) which is regulated by a Government Regulation. (2a) The rate as referred to in paragraph (1) letter b will be 25% (twenty five percent) which will come into effect since the 2010 fiscal year. (2b) Domestic corporate taxpayers in the form of a public company that are at least 40% (forty percent) of the total number of paid-up shares traded on the stock exchange in Indonesia and fulfill certain other requirements may receive a rate of 5% (five percent) more lower than the tariff as referred to in paragraph (1) letter b and paragraph (2a) which is regulated by or based on a Government Regulation.</p>	<p>Article 17 (2) and (2a): (2) The tariff as referred to in paragraph (1) letter a can be changed by a Government Regulation after being submitted by the government to the House of Representatives of the Republic of Indonesia to be discussed and agreed upon in the preparation of the Draft State Revenue and Expenditure Budget. (2a) deleted (2b) Domestic corporate taxpayers: a. in the form of a public company; b. with the total number of paid-up shares traded on the stock exchange in Indonesia at least 40% (forty percent); and c. meet certain requirements, may obtain a tariff of 3% (three percent) lower than the tariff as referred to in paragraph (1) letter b .</p>	<p>Change</p>																						
<p>Article 17 (2e): There isn't any</p>	<p>Article 17 (2e): Further provisions regarding certain requirements</p>	<p>Addition</p>																						

	as referred to in paragraph (2b) letter c shall be regulated by or based on a Government Regulation.	
Article 17 (3) : The amount of the layer of Taxable Income as referred to in paragraph (1) letter a can be changed by: Decree of the Minister of Finance.	Article 17 (3) : The amount of the layer of Taxable Income as referred to in paragraph (1) letter a can be changed by: Minister of Finance Regulation .	Change
Article 18 (1) : The Minister of Finance has the authority to issue a decision regarding the ratio between debt and company capital for the purpose of calculating taxes under this Act.	Article 18 (1) : The Minister of Finance has the authority to set limits on the amount of borrowing costs which can be charged for the purposes of calculating taxes based on this Law.	Change
Article 18 (3e): Implementation of the provisions as referred to in paragraph (3b), paragraph (3c), and paragraph (3d) shall be further regulated by or based on a Regulation of the Minister of Finance.	Article 18 (3e): Removed	Change
Article 32A : The government is authorized to enter into agreements with the governments of other countries in the context of avoiding double taxation and preventing tax evasion.	Article 32A : The government is authorized to form and/or implement agreements and/or agreements in the field of taxation with the governments of partner countries or partner jurisdictions, both bilaterally and multilaterally in the context of: a. avoidance of double taxation and prevention of tax evasion; b. prevention of erosion of the taxation base and shifting of profits; c. exchange of tax information; d. tax collection assistance; and e. other tax cooperation.	Change
CHAPTER VIIA DELEGATION OF AUTHORITY : Article 32C There isn't any	CHAPTER VIIA DELEGATION OF AUTHORITY: Article 32C Further provisions regarding: a. income in the form of gains due to the transfer of assets in the form of grants, assistance, or donations that are excluded from the object of taxation because they are given to blood relatives in a straight line of one degree and religious bodies, educational bodies, social institutions including foundations, cooperatives, or individuals who run micro-enterprises and small, as long as there is no relationship with business, work, ownership, or control between the parties concerned as referred to in Article 4 paragraph (1) letter d number 4; b. certain skill criteria and the imposition of Income Tax for foreign nationals as follows: referred to in Article 4 paragraph (1a);	addition

	<p>c. donated assets received by blood relatives in a straight line of one degree, religious bodies, educational bodies, social institutions including foundations, cooperatives, or private individuals who run micro and small businesses, as long as they are not related to business, work, ownership, or control between the parties concerned, who are excluded from the tax object as intended in Article 4 paragraph (3) letter a number 2;</p> <p>d. replacement or remuneration in connection with work or services received or obtained in kind and/or enjoyment that is excluded from the tax object as referred to in Article 4 paragraph (3) letter d;</p> <p>e. criteria, period, and changes to the limits on dividends invested, as well as provisions for exemption from Income Tax on dividends or other income as referred to in Article 4 paragraph (3) letter f;</p> <p>f. income from investment in certain fields received by the pension fund, which is excluded from the tax object as intended in Article 4 paragraph (3) letter h;</p> <p>g. scholarships that meet certain requirements that are excluded from the tax object as intended in Article 4 paragraph (3) letter l;</p> <p>h. the excess that is received or obtained by a non-profit agency or institution engaged in education and/or research and development, which is excluded from the tax object as intended in Article 4 paragraph (3) letter m;</p> <p>i. assistance or compensation paid by the Social Security Administering Body to certain Taxpayers, which are excluded from the tax object as follows: referred to in Article 4 paragraph (3) letter n;</p> <p>j. deposit funds for Hajj Organizing Fees (BPIH) and/or special BPIH, and income from the development of Hajj finance in certain financial fields or instruments received by the Hajj Financial Management Agency (BPKH), which are excluded from the tax object as referred to in Article 4 paragraph (3) letter o;</p> <p>k. the excess that is received/obtained by social and religious bodies or institutions, which is excluded from the tax object as referred to in Article 4 paragraph (3) letter p;</p>	
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	<p>l. promotion and sales expenses which can be deducted from gross income as referred to in Article 6 paragraph (1) letter a number 7;</p> <p>m. receivables that are clearly uncollectible which can be deducted from gross income as referred to in Article 6 paragraph (1) letter h;</p> <p>n. replacement cost or compensation provided in kind and/or enjoyment which can be deducted from gross income as referred to in paragraph (1) referred to in Article 6 paragraph (1) letter n;</p> <p>o. the formation or accumulation of reserve funds that can be deducted from gross income as referred to in Article 9 paragraph (1) letter c;</p> <p>p. group of tangible assets, useful lives, and calculation of depreciation as referred to in Article 11 paragraph (6) and paragraph (6a);</p> <p>q. depreciation on tangible assets owned and used in certain business fields as referred to in Article 11 paragraph (7);</p> <p>r. at the commencement of amortization for certain business fields as referred to in Article 11A paragraph (1a);</p> <p>s. calculation of amortization as referred to in Article 11A paragraph (2) and paragraph (2a);</p> <p>t. limit on the amount of borrowing fees that can be charged for the purposes of calculating taxes as referred to in Article 18 paragraph (1);</p> <p>u. determination of the time when dividends are obtained by a resident Taxpayer for equity participation in a foreign business entity other than the business entity that sells its shares in stock exchange as referred to in Article 18 paragraph (2);</p> <p>v. application of the principle of fairness and business practice in the context of calculating the amount of Taxable Income for Taxpayers who have a special relationship with other Taxpayers as referred to in paragraph (1) referred to in Article 18 paragraph (3);</p> <p>w. implementation of the agreement to establish transaction prices between parties who have a special relationship as referred to in Article 18 paragraph (3a);</p> <p>x. determination of the party who actually purchases the company's shares or</p>	
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	<p>assets through another party or an entity formed for such a purpose (special purpose company) as referred to in Article 18 paragraphs (3b);</p> <p>y. stipulation on the sale of the transfer of shares of an entity established or domiciled in Indonesia or a permanent establishment in Indonesia as referred to in Article 18 paragraph (3c);</p> <p>z. re-determination of the amount of income earned by a domestic individual Taxpayer from an employer who has a special relationship with another company that is not established and is not located position in Indonesia as referred to in Article 18 paragraph (3d);</p> <p>a A. special relationship criteria as intended in Article 18 paragraph (4);</p> <p>bb. the formation and/or implementation of the agreement and/or agreement in the field of taxation as referred to in Article 32A, regulated by or based on a Government Regulation.</p>	
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3. The government's strategy is to ensure that the Law on the Harmonization of Tax Regulations on Income Tax can be well received by taxpayers.

The reform strategy adopted through the Law on the Harmonization of Tax Regulations is so that the implementation of this policy regulation can be accepted by government taxpayers through several things, namely:

- strengthen tax administration General Provisions and Tax Procedures (KUP),
- taxpayer voluntary disclosure program Voluntary Disclosure Program (PPS),
- and expansion of the tax base aimed at creating justice and equity through policy improvements in Income Tax, Value Added Tax, excise duty and the introduction of a carbon tax.
- Realizing a Fair and Legal Taxation System
- Increasing the tax ratio in a sustainable manner as a driver of resilience (APBN) is due to an increase in spending productivity.
- Provide counseling to taxpayers.

C. CONCLUSION

As for things that can concluded from paper this is as following :

1. The Law on Harmonization of Tax Regulations is the Law on Tax Harmonization which is part of the tax reform system with the aim of strengthening the economy and accelerating national development.
2. The Law on Harmonization of Tax Regulations serves to close gaps in tax regulations that still often occur and adapt to the times, one of which is the number of businesses with digital platforms.
3. Income Tax (PPh) according to Law No. 17 of 2000 Article 1 is a tax imposed on tax subjects on income received or earned in the tax year.
4. The subject of income tax is the person or party who is responsible for the income tax received or earned in the tax year or part of the tax year
5. Tax objects are divided into 2, namely: Income as a tax object and Income Subject to Final PPh
6. The Law on Harmonization of Tax Regulations amends the Income Tax Law (PPh), namely Law no. 36 of 2008. Individual income tax is regulated in Article 17 related to changes in income tax rates and the addition of a new bracket.

7. In the Law on the Harmonization of Tax Regulations, there is an additional paragraph regarding grants in kind by employers as employee income which is not included as a tax object. In accordance with article 4 paragraph 1 (d) which is included in nature and is not a tax object
8. The Law on Harmonization of Tax Regulations, amends corporate Income Tax (PPh) regulations (regulated in Article 17 paragraph 1) and adds strengthening of regulations regarding Income Tax (PPh) for Micro, Small and Medium Enterprises (regulated in Article 7 paragraphs 1 and 2a).
9. The Directorate General of Taxes expands the tax base with the aim of creating justice and equality through policy improvements in Income Tax

The Directorate General of Taxes implements a Fair and Legal Taxation System

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Convolutional neural network-based Face Mask Detection

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Abstract- The Covid-19 pandemic has adversely affected our lives. Movements and trading activities have been paralyzed. People have been forced to normalize into the new normal. The pandemic has shaped the way we live. In an attempt to fight against the pandemic, governments and other health organizations have fostered restrictive measures to reduce the spread of Covid-19. Some of these restrictions include but are not limited to total lockdown, limited social gatherings and the use of face masks. The use of face masks called for the need to have facial detection machines which can be developed from Keras, Scikit-learn and OpenCV. This paper examines the Convolutional Neural Network (CNN), which is utilized for detecting and classifying an individual wearing a mask.

Index Terms- Convolutional Neural Network (CNN), OpenCV, Keras.

I. INTRODUCTION

The pandemic, since its onset, has been considered among the most threatening viruses in the history of humankind. According to statistics, the virus spreads faster simply by getting exposed to contaminated surfaces. Social interactions are ranked top as means of spreading the virus. From the onset of the pandemic, lack of consciousness contributed to increased cases. Covid-19 was a new phenomenon ever reported in many parts of the world. In this case, many people were not well prepared and had little knowledge about the virus—this paralyzed efforts against the pandemic. As a result, we had to adapt to the situation and develop appropriate measures to minimize the adverse effects of Covid-19. One of the key measures was putting on face masks during social interactions. This literature review provides a better understanding of the Convolutional Neural Network while efforts to protect against Covid-19 remain a priority. Convolutional Neural Network is mainly utilized to recognize people's faces putting on their masks as far as safety measures are concerned (Upadhyay & Rudra, 2021).

Deep learning methods have created a significant background for artificial intelligence. The literature review shows that the Convolutional Neural Network is effective for face masks detection. The mechanism can be vital in critical areas such as railway stations, airports and other crowded social places. The Convolutional Neural Network has helped create a safer

environment for populations in the current scenario. Face mask detection mainly involve locating the face and stating whether a mask covers the face or not. This process using the Convolutional Neural Network is suitable for proving the identity of individuals while wearing face masks. The process is essential for surveillance, education and autonomous driving purposes. Farman et al. (2022) suggest machine learning and deep learning to detect faces among individuals wearing face masks. The study reveals excellent results regarding the effectiveness of ML and DL. Also, it is reported that DL-based mechanisms are typical amid the crisis to detect individuals without masks. This has helped control the spread of the virus.

II. LITERATURE REVIEW

Amid Covid-19, various studies have proposed several hybrid designs that utilize the DL to detect individuals without masks. The hybrid design is said to have two major sections; Resnet50 and the Vector support machine. The first design is utilized for extraction, while the other ensembles decision trees and algorithms intended for recording and classifying the accuracy of tests. However, other studies reveal that wearing face masks modifies the faces of individuals, thus interfering with the face resonance. Furthermore, for actual face recognition, Ramachandra et al. propose using a 3D silicone mask. Based on the visual refractive analysis, Li et al. suggest a 3D face mask to measure the image reflectance.

Notably, Keras is an open-source machine that renders a Python interface for man-made neural networks. Keras operates as a Tensor Flow interface. The models and layers are considered core data structures. Keras provides a site for the implementation of the CNN model. On the other hand, Tensor flow is mainly utilized for a wide range of activities but specifically on the interface and training of the deep neural networks. Besides, Tensor Flow reshapes the image within image processing amid facial detection. CNN network reveals the relationship between raw image pixels and their rating classification. CNN is primarily a deep neural network which treats images as input. This input goes through processes involving convolution layers, kernels, fully connected layers and pooling layers in an effort to provide a definition of an image in terms of stochastic values ranging between zero to one. The convolution is the crucial layer where data is first obtained from the input image. The pooling layers optimize the parameter

counts, especially when the images are extra-large in size (Farman et al., 2022).

CNN has proved to be effective in facilitating face mask detection through surveillance. This has significantly helped reduce the spread of Covid-19 through social interactions as individuals without masks are encouraged to wear them. According to various studies, it is revealed that the Convolutional Neural Network is accurate enough in detecting faces without masks in critical areas such as airports, railway stations and other public domains. In workplaces with vast numbers of workers, the Convolutional Neural Network can be implemented for face mask detection. The Convolutional Neural Network attains an accuracy of 93.9 percent (Upadhyay & Rudra, 2021). Currently, there are many uses inclined to Convolutional Neural networks in preventing damage and loss of lives. The facility can be utilized in fire disasters, analysis of facial features, and health care, among other fields. Since more emphasis on this literature is directed towards Covid-19 and prevention measures, CNN has helped address the Covid-19 situation by detecting and establishing the identity of faces wearing masks. The studies provide more significant insights into how individuals without masks can be placed in public to emphasize the use of face masks in preventing the spread of the pandemic.

III. PROPOSED WORKS

The proposed paper will detail the use of convolutional neural system model for face masking among people in public places. The system will help to detect if people are wearing their face mask properly. It will also help detect those who are wearing their masks wrongly or do not have a mask. The paper discusses the processes that will be involved in the system as well as the technology that will be used to help prevent the spread of covid-19. The process starts with data preparation and processing, which finally ends with the possible outcomes of the real-time face mask prediction. The figure below shows the process involved.

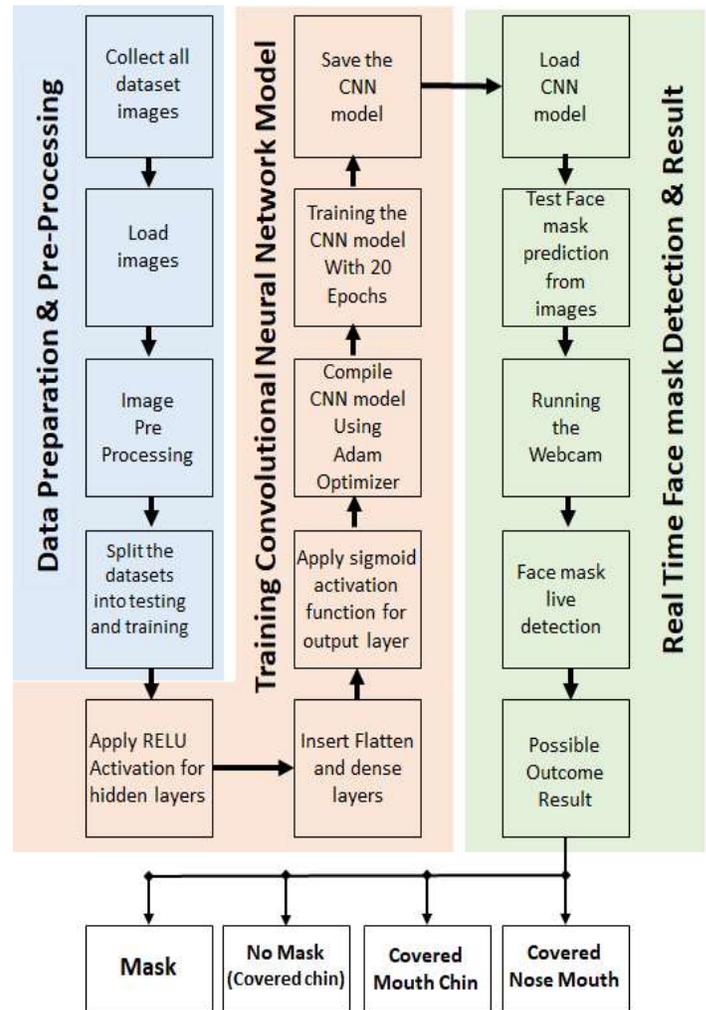


Figure 1 'Facemask Detection System Block Diagram'

IV. DATA PREPARATION

Different proper ways of putting on mask pictures were taken, as well as the improper ways of putting on a mask. The system was then trained on these different masking ways for better accurate results of how people are wearing their masks. Fifteen thousand pictures of the data were used on the system. The used data was gotten from (P. Bhandary) "MaskedFace-Net (<https://github.com/cabani/MaskedFace-Net>)".

The used data had different categories, which included "Correctly Masked Face Dataset (CMFD)," which contained the data for proper ways of masking, and the "Incorrectly Masked Face Dataset (IMFD)" for wrong masking ways. The wrong masking ways were further divided into sections of the position of the mask where these categories include:

- ❖ No mask.
- ❖ Covered mouth chin
- ❖ Covered nose mouth.

The collected image data was labeled into the different masking ways, which consisted of about 3500 pictures for each category in proper masking, without a mask, covering only the mouth chin, and nose mouth covered.

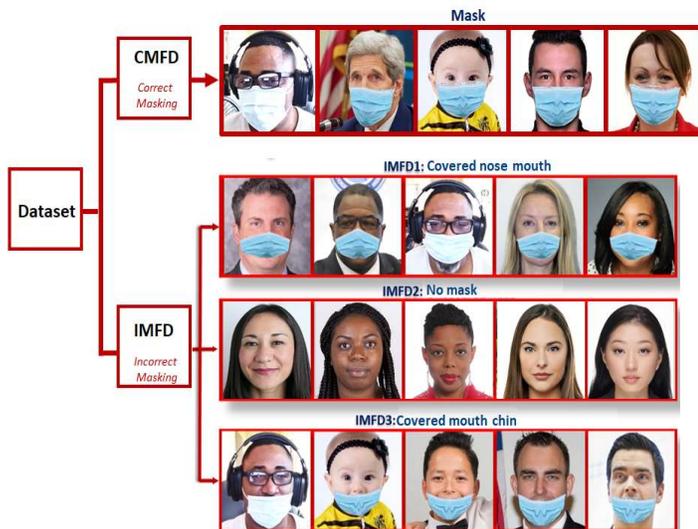


Figure 2 Masking Categories

V. DATA PREPROCESSING

The quality of the data pictures into the system will determine the accurateness of the model. In this section, the data is cleaned to remove defective pictures so wrong predictions would not be made. Secondly, the images are sized 100 by 100 for optimum result. High-sized photos and low hardware resources may result to memory errors and poor accuracy. The array of images is then transformed to a Numpy array for quicker computation.

The image processing involves techniques such as face detection, cropping, and blob from the images which facilitate the data processing. For any specific image detected, ‘Single Short MultiBox Detector (SSD) framework’ is applied to detect the location of the face using pre-trained deep neural network model in OpenCV called Floating-point 16 version (res10_300x300_ssd_iter_140000_fp16.caffemodel). The model may be downloaded from GitHub (https://github.com/opencv/opencv_3rdparty/raw/19512576c112aa2c7b6328cb0e8d589a4a90a26d/res10_300x300_ssd_iter_140000_fp16.caffemodel). The images within Single Short MultiBox Detector (SSD) will be cropped and resize using blob from image (Bhadani & Sinha 2020) as shown in figure 3.

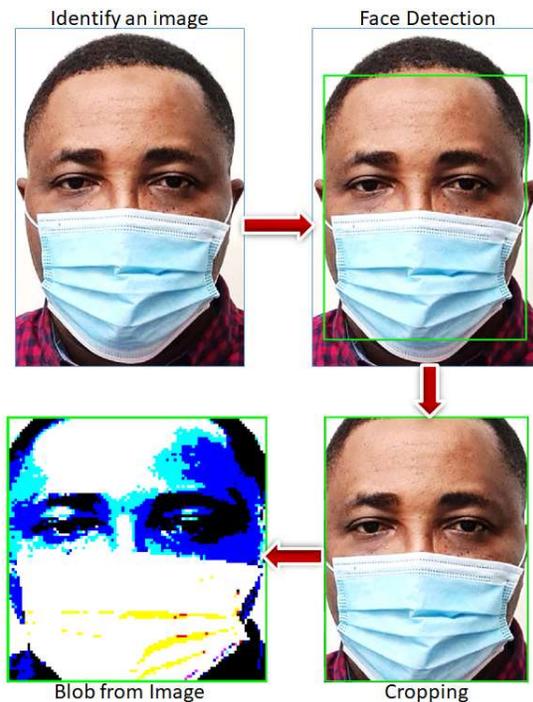


Figure 3: Image preprocessing

VI. SPLITTING DATA FOR MODEL TRAINING

The collected data of 15 000 were used for the proposed model. The model must be trained precisely using a certain dataset and tested alongside different data using the Scikit-learn. The splitting of data during training is mainly used to set the machine into the learning model, and testing is used to calculate the accuracy of the machine. 80% (12,000) of the data were used for the model's training, while the rest for testing.

VII. MODEL ARCHITECTURE AND TRAINING

The organization of a managed learning CNN system is done after its process of training to categorize the proficient images to their particular classes by knowing important pictorial patterns by the use of “TensorFlow” as the main building blocks for the model proposed. The study used 80%, equivalent to 12,000 image data for training and the rest for testing. The input image is preprocessed and augmented. The model architecture illustrated in figure 4 below is a consecutive model established with ‘TensorFlow.keras’ and compiled with ‘Adam optimizer.’ More optimizers will be discussed in the following section.

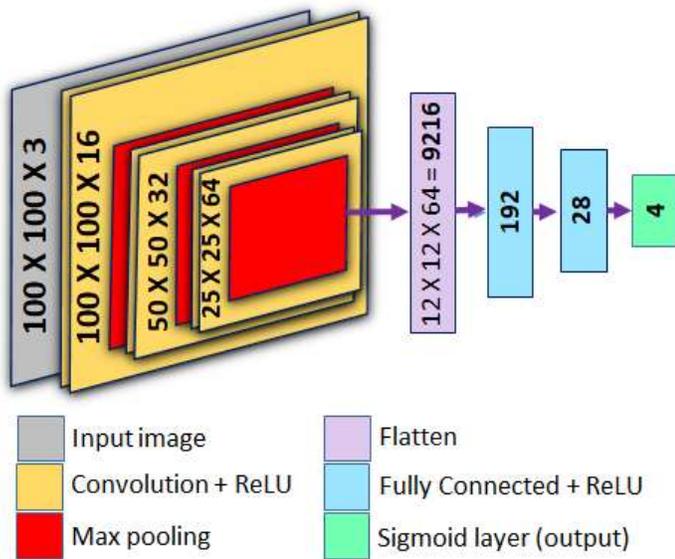


Figure 4. Proposed Facemask Detection CNN Model Architecture

```
# convolution neural network
model = Sequential([
    layers.Conv2D(16,3,padding='same',input_shape=(100,100,3),activation='relu'),
    layers.MaxPool2D(),
    layers.Conv2D(32,3,padding='same',activation='relu'),
    layers.MaxPool2D(),
    layers.Conv2D(64,3,padding='same',activation='relu'),
    layers.MaxPool2D(),
    layers.Flatten(),
    layers.Dense(192,activation='relu'),
    layers.Dense(28,activation='relu'),
    layers.Dense(4,activation='sigmoid')
])
# compiling CNN
model.compile(optimizer=tf.keras.optimizers.Adam(learning_rate=0.001),
              loss=tf.keras.losses.categorical_crossentropy,metrics=['accuracy'])
```

Table 1: Illustrate the python code used to develop the sequential CNN model for proposed Facemask detection described in figure 4

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 100, 100, 16)	448
max_pooling2d (MaxPooling2D)	(None, 50, 50, 16)	0
conv2d_1 (Conv2D)	(None, 50, 50, 32)	4640
max_pooling2d_1 (MaxPooling2D)	(None, 25, 25, 32)	0
conv2d_2 (Conv2D)	(None, 25, 25, 64)	18496
max_pooling2d_2 (MaxPooling2D)	(None, 12, 12, 64)	0
flatten (Flatten)	(None, 9216)	0
dense (Dense)	(None, 192)	1769664
dense_1 (Dense)	(None, 28)	5404
dense_2 (Dense)	(None, 4)	116

Table 2: Illustrate the proposed sequential CNN model parameters described in figure 4

The above model is separated into convolutional part (feature abstraction) and fully connected part (classifier). The convolutional part is used to separate and identify the numerous features of the pictorial for investigation in the Feature Extraction process. In contrast, the fully connected part utilizes the convolution method’s results and predicts the image category according to the extracted features.

The proposed model is created when convolutional parts extract the features of the input image, pooling layers reduce the magnitude of the convolved map feature, which helps to reduce the computational costs, and lastly, fully-connected layers connecting the neurons between the hidden layers are connected. The Kernel size is fixed to 3 x 3, which stipulates the height and breadth of the 2D convolution gap, the stride is established to 1, and padding is fixed to 1 for all convolution arranged layers. The filter dimensions differ from the first, with 16 and 32 for the second, while the third layer has 64. The input image dimension to the planned model is 100 x 100 x 3. The activation function used for the system are “Rectified Linear Unit (ReLU) and Sigmoid for the output layer.” After the convolutional process, all the image dimensions are flattened and serve as the input to fully connected (FC) two hidden neural network layers, where the number of neurons in each layer is calculated using the pyramidal rule formula given below.

$$\text{Number of neurons} = \sqrt{m * m}$$

Where m = number of inputs
 n = number of outputs

VIII. OPTIMIZERS COMPARISON ON THE PROPOSED MODEL

The optimization algorithm discovers the value of the weights that reduces the error in planning inputs to outputs. These algorithms or optimizers largely affect the deep learning model’s correctness, accuracy and computation time.

This segment emphasizes various optimizers examples such as Adam, SGD, Adagrad and RMSProp, which were practically analyzed using 20 epochs. The optimizers are used as part of compiler to build the face mask detection model, increase the system’s accuracy, and improve speed and efficiency.

After running the proposed model with 15,000 images data on different optimizers, the accuracy, the loss and the computation time at 20 epochs are shown in the tables and figures below.

Optimizers Comparison For Training Accuracy				
Epochs	Adam	Adagrad	RMSprop	SGD
0	0.929977	0.654584	0.890758	0.445503
1	0.972659	0.855499	0.969071	0.745763
2	0.982927	0.905604	0.981814	0.822219
3	0.986762	0.923667	0.987999	0.865396
4	0.990103	0.939626	0.992824	0.889274
5	0.993567	0.945565	0.994309	0.90746
6	0.99666	0.949524	0.996412	0.919213
7	0.998392	0.953977	0.996412	0.926884
8	0.998763	0.955833	0.996907	0.932575
9	0.99233	0.95806	0.998021	0.938018
10	0.995917	0.96004	0.997897	0.944699
11	0.998021	0.960782	0.999381	0.943833
12	0.99901	0.964493	0.998639	0.947915
13	1	0.964493	0.99901	0.950019
14	1	0.965731	0.999505	0.95274
15	1	0.968205	0.999505	0.952864
16	1	0.969442	0.999134	0.954101
17	1	0.970927	0.998763	0.955215
18	1	0.969937	0.999134	0.957442
19	1	0.973772	0.999381	0.96004

Table 3: Illustrate the optimizers comparison for training accuracy

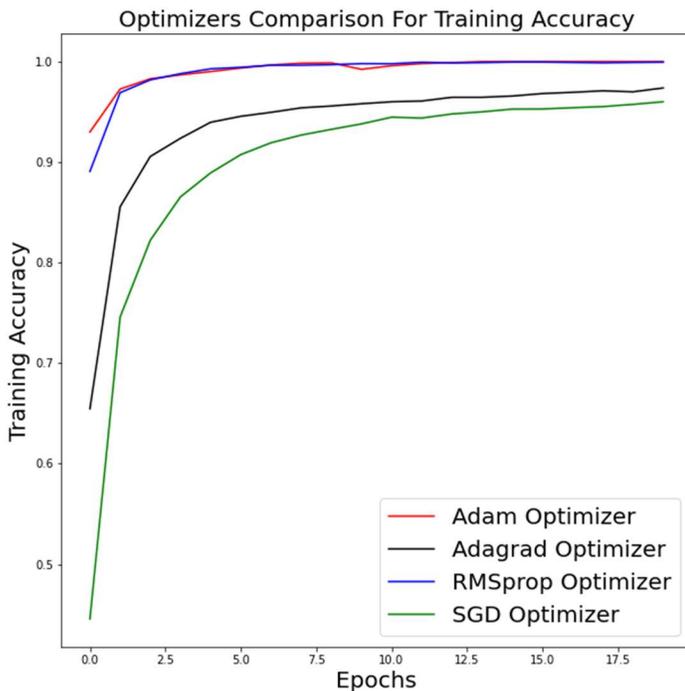


Figure 5: Optimizers comparison for Training Accuracy

Optimizers Comparison For Training Loss				
Epochs	Adam	Adagrad	RMSprop	SGD
0	0.201516	1.121326	0.292194	1.332685
1	0.083347	0.455191	0.089989	1.040651
2	0.048756	0.29924	0.053115	0.590936
3	0.041646	0.234404	0.034416	0.417159
4	0.029594	0.198728	0.024695	0.337263
5	0.018105	0.176975	0.018567	0.287963
6	0.010293	0.162949	0.014283	0.252783
7	0.006416	0.15128	0.01127	0.226847
8	0.004085	0.142037	0.009095	0.205373
9	0.021839	0.134393	0.004859	0.189497
10	0.013739	0.128492	0.007395	0.17883
11	0.006947	0.121764	0.001783	0.168239
12	0.003946	0.117135	0.007724	0.159153
13	0.000534	0.112864	0.006504	0.152785
14	0.000056	0.107878	0.002752	0.145528
15	0.000019	0.105696	0.001607	0.139719
16	0.000014	0.099987	0.003633	0.135576
17	0.00001	0.095878	0.009058	0.13027
18	0.000008	0.095213	0.001745	0.125534
19	0.000007	0.08977	0.002389	0.122385

Table 4: Illustrate the optimizers comparison for training loss

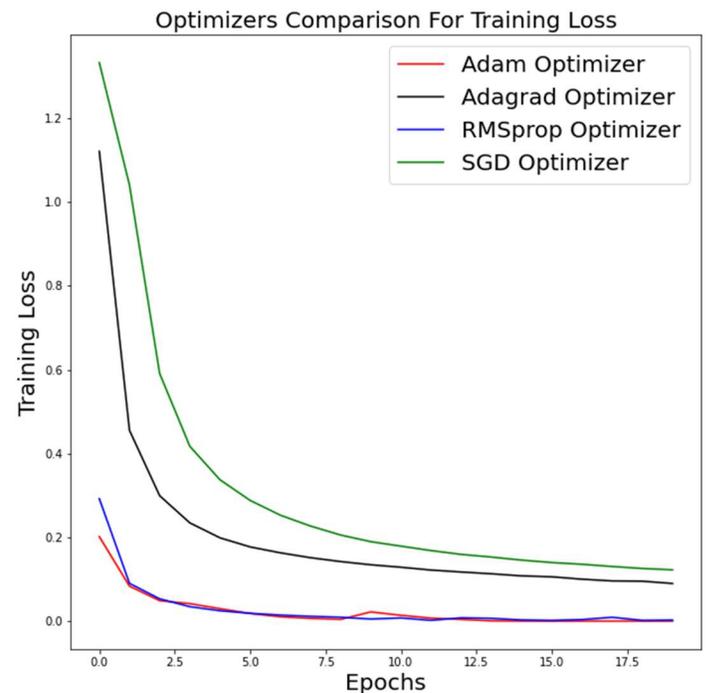


Figure 6: Optimizers comparison for Training Loss

Computation Time	
Adam	14.30 min
Adagrad	14.59 min
RMSprop	15:33 min
SGD	14.05 min

Table 5: Illustrate computation time for optimizers

From the results above, Adam optimizer proved the best result regarding training accuracy of 1 and training loss of 0.000007. RMSprop displays similar accuracy to Adam's, but with comparatively much longer computation time, and lastly, SGD contains lowest accuracy and computation time. From the above result, the Adam optimizer was selected in this research paper as an optimizer for the proposed face mask detection CNN model for the best probability of getting the best result.

IX. RESULT AND ANALYSIS

The model was executed with 20 epochs and compiled with Adam optimizer, resulting in high accuracy. The model accuracy increased and the loss decreased as the epochs reached maximum count.

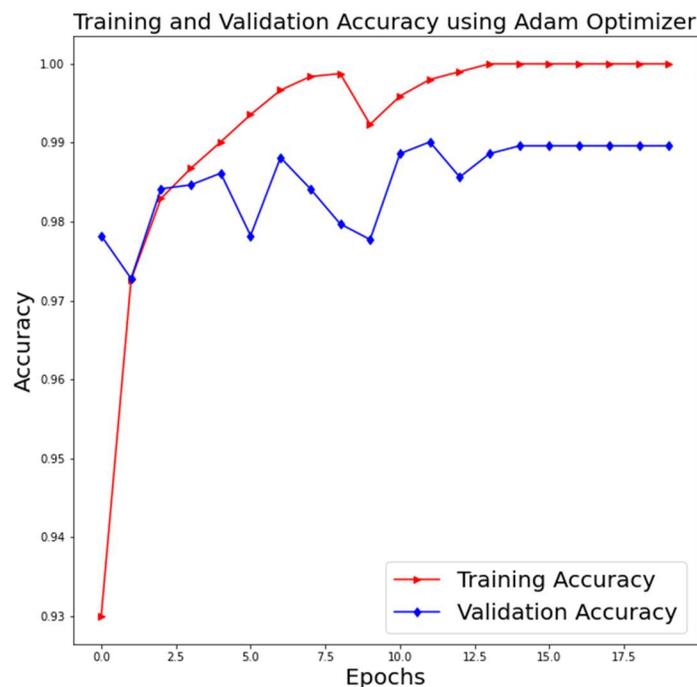


Figure 7: Training and Validation Accuracy using Adam optimizer

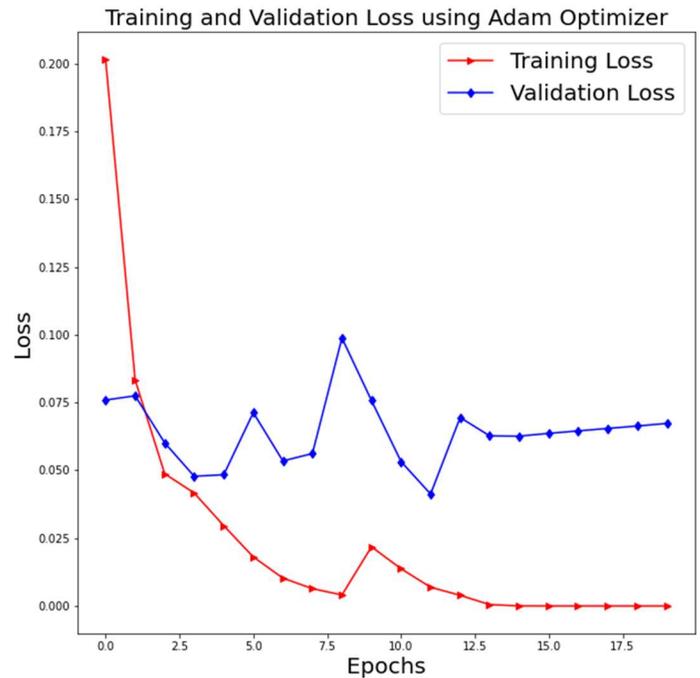


Figure 8: Training and Validation Loss using Adam optimizer

Finally, the proposed model was integrated with live webcam to recognize the real-time facial mask status and then predict the result based on the four possible different output categories as mentioned in section IV. Figure 7 and figure 8 illustrate that the model achieved high level of training accuracy of 100% and least training loss of 0.0007% at the end of 20 epochs, which implies that the proposed model achieved high level of accuracy of getting the best prediction and result as demonstrated in figure 9.

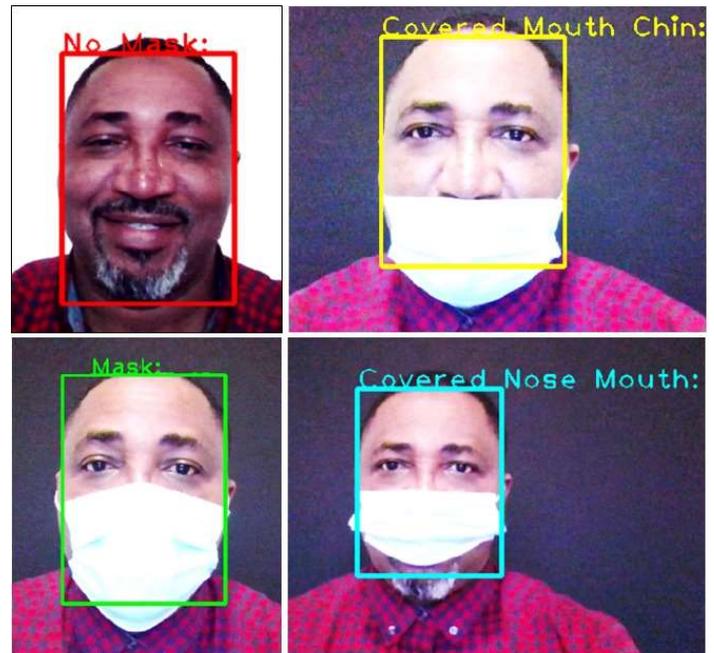


Figure 9: Proposed facemask model final output result

X. FUTURE IMPROVEMENT

This model can be developed and integrated onto neuromorphic hardware (chip) like IBM TrueNorth that uses spiking neural networks for better computation, energy efficiency, execution speed, robustness and ability to learn from computation to produce more accurate result and performance. Also, the integration of an improved facial recognition system to support the identification of a person while on a mask.

XI. CONCLUSION

To control COVID-19 pandemic in the societies, this publication suggests a face mask identification system using CNN to detect people's faces and the state of wearing face masks in the public domains. The proposed model can determine whether a face mask is present or not using Keras, OpenCV, and CNN, and the model provides accurate and prompt result. In workplaces where many workers are, employers and companies are encouraged to use this proposed model to improve the safety and reduce the risk of related to COVID-19 exposure.

The trained model produces a training accuracy of 100% as discussed in section VIII and IX which implies that the proposed model achieved high level of accuracy of getting the best prediction and result. Because of its accuracy and processing effectiveness, this proposed model is a strong contender for a real-time face mask detection monitoring system.

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Taxation of Income Tax on Instagram Celebrities Endorsement Service in Indonesia

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Abstract- This writing is based on legal issues regarding the juridical review of the imposition of income tax from endorsement service activities in the world of social media. The purpose of this paper is to analyze the rules governing the imposition of income tax from endorsement service activities and to analyze the object and subject standards of the endorsement tax. The research method used in normative legal research is conducting research from primary and secondary legal sources related to this writing. Tax is a very important income for a country because it can provide a balance. Activities from endorsement services can be taxed because people who offer endorsement services can generate fairly large profits. Therefore, endorsement activities become a place of livelihood for celebtgrams or influencers. Endorsement activities are subject to income tax (PPh) due to using the services of individuals. Income tax rules are contained in Article 4 of Law No. 36 of 2008 concerning income tax and provides an explanation of the object of income tax is income earned or obtained by taxpayers, whether generated in Indonesia or abroad, whose income is used to add wealth and to fulfill income tax obligations. the needs of the taxpayer, in any form. The conclusion is that the activities of endorsement services on social media need to be collected for taxes. In collecting income tax from endorsement activities, socialization and clear legal provisions are needed in order to realize justice.

Index Terms- Income Tax, Instagram, Commercial Activities, Taxation

I. INTRODUCTION

A hallmark of technology advancement is the expanding field of communication and information technologies. With the passage of time and the creation of new technology, there is also a rapid increase in the global economy, which is supported by a variety of media in advertising and direct offers to consumers of a variety of goods and services made available through traditional or online channels such as social media. In essence, social media is an illustration of how technological advancements have impacted society. Its primary goal is to connect people from different locations who are otherwise unreachable with one another so they can interact socially in real-time using online application platforms. One of the social media platforms that is currently being used to carry out commercial activities is Instagram. The Instagram app is a photography-based social networking service. Instagram ultimately raises parties who want to take advantage to make money using social media, one way is to provide endorsement services. Endorsement services are promotions that are carried out by someone on social media, especially Instagram to provide testimony of a service or an item. Endorsement services have a system where there is an agreement between the business owner and the parties who will promote the business owner's services or products on their social media account after paying a certain amount of money in advance. Endorsements are usually done by people whose Instagram accounts have many followers, such as artists, actors, actress or internet celebrities known as influencers.

In recent years, using endorsement services has grown in popularity. According to Anymindgroup (2020), in Indonesia there is 94 percent of internet users (175.4 million individuals, or 64% of the population of the nation) own a smartphone, and daily usage of social media is on average 3 hours 26 minutes, with 95% of users actively engaging with or contributing to material there. Furthermore, the data from Tesalonica (2020) which demonstrates that 2,552 new creators register as creators on SociaBuzz each month, supports this. The number of artists that profit from their personal brands and material is as high as 45.94 percent. Therefore the Directorate General of Taxes (DGT) in Indonesia has started to notice the prospect for significant tax revenues and start undertaking a study of taxation in this sector because the tax imposition on endorsement service activities is only in the form of submitting an Annual Tax Return (SPT).

According to the tax code, an individual with existing income might be the subject of taxation. Because taxpayers calculate their own tax responsibilities under Indonesia's self-assessment system, tax collection is nonetheless inefficient and unfair to taxpayers (Devano & Rahayu, 2006). As of right now, the Directorate General of Taxes (DGT) has developed a system called SONETA or

Social Network Analytics. that is used to analyze data that can be incorporated into every social media for every taxpayer, be it Value Added Tax (VAT) or Income Tax. The technology, which has been in operation since 2018, is still operated manually, and it hasn't been adopted by all tax service offices. Conditions would be very different if Director General of Taxes could make the most of SONETA and readily keep track of celebrities taxes (Vikansari & Parsa, 2019).

Although the endorsement tax is mentioned in Law No. 36 of 2008 regarding income tax, its implementation is challenging because few people are aware of their duty to pay taxes. Therefore, the government needs to increase human resources and produce strict law enforcers in the application of taxes and what is important for taxpayers is to know when to pay taxes and when their obligations end (Supramono & SE, 2010). By merely offering an Annual Tax Return (SPT), the government has made things simple and easier. Unfortunately, many people still fail to satisfy their tax duties on time and few people who actively strive to avoid doing so.

This study aims to investigate the income tax imposition mechanism for Indonesian celebrities that engage in online endorsement activities via the Instagram Social Media application. This is expected to provide insight to the literature regarding tax income on Instagram endorsement activities. As a result, it can raise actors understanding of taxes, and tax authorities can enhance current regulations to accommodate the evolving nature of business in the digital era.

II. RESEARCH METHOD

The purpose of this research is to examine the need for taxation of endorsement service operating on the Instagram platform and to determine how further regulations to do so might be implemented. The form of research used is normative legal research, which entails examining primary and secondary legal sources that are connected to the subject of the research. In order to ascertain the facts regarding the necessity of regulating taxation of endorsement service on Instagram Platforms, this research was carried out by searching, and carefully examining the relevant literature and legal precedents. A real explanation of the legal and non-legal propositions and conditions is utilized as the analytical technique, which is a descriptive technique. Additionally, this study employs an argumentative writing style that is founded on legal reasoning.

III. RESULTS

1. Regulation of the Imposition of Income Tax on Endorsement Activities on Instagram

Taxes are necessary contributions to the State that are owing by organizations or people whose nature is coercive according to the law, do not receive direct remuneration, and are utilized for the State's purposes for the welfare of the people. According to Soeparman Soemahamidjaja, tax is a required payment that is gathered by the government in accordance with legal requirements to pay for the costs of producing goods or services for the wellbeing of the populace (Djafar, 2011). "Taxes and other collections that have a coercive nature to support the needs of the State are governed in law," declares Article 23A of the 1945 Constitution of the Republic of Indonesia. This means that all taxes imposed by the State on its citizens (taxpayers) that have a coercive nature and are intended to meet the requirements of the State must be governed by the Law.

In Indonesia, many mechanisms, including the Official Assessment System, a tax collecting system that provides the government the power to assess how much tax debt is owed to taxpayers, are used to collect local and central taxes. There are two types of tax collecting system, self-assessment system and the withholding system. Self-assessment system is a method of tax collection that enables taxpayers to estimate their own out-of-pocket tax obligations. While the withholding system is a tax collecting method that grants authority to parties other than the government or taxpaying citizens to decide how much tax must be paid.

Income tax is a state tax imposed on taxpayers who get income whether it is earned or received, this applies to Indonesian citizens who are in the country or outside Indonesia. The law governing income tax is found in Article 4 of Law No. 36 of 2008 concerning income tax, which states that the object of tax is income, i.e., any income, whether it is earned or received by the taxpayer, and that this rule applies to Indonesian citizens both at home and abroad, as well as whether it is used to meet taxpayers' needs or add to their wealth. If a person satisfies the objective and subjective standards, such as having an NPWP (Taxpayer Identification Number) and earning more than nontaxable income, they are considered to be a taxpayer. According to formal teachings, the debt law appears when a tax assessment letter is issued (Pudyatmoko, 2008). On the other hand, the material teaching states that the tax debt is determined by law and the objective and subjective requirements have been met. It can be concluded that the emergence of debt requires intervention by tax officials and in accordance with the requirements of the law (Soemitro, 1991).

Stated by the Directorate General of Taxes of Indonesia, celebrities who promote services or products on social media accounts including Instagram will be subject to tax. Because doing endorsements will result in extremely high earnings or income, the government imposes taxes on artists and celebrities who do them. Instagram use has become quite appealing due to the current state of highly developed technology and the introduction of the internet. People can gain notoriety through Instagram, and many businesses use it to advertise their goods and services. Celebrities and artists who offer endorsement services earn income from the company or business owner whose goods they advertise.

Instagram celeb endorsement activities are tied to Indonesia's ITE Law, which serves as the framework for the country's implementation of cyberspace. The ITE Law's goal is to advance trade and the economy for the benefit of the populace, according to Article 4 letter b. The ITE Law attempts to govern business models that are only starting to grow quickly, such celebrity endorsement service activities on social media. According to ITE Law article 1 number 2, electronic transactions are considered legal acts. As a

result, celebrities are seen as legal subjects and their social media endorsement actions are legal acts. According to the ITE Law, endorsement activities performed by celebrities on social media are considered electronic transactions, and as such, they must abide by the ITE Law's rules.

In theory, the endorsement activities performed by celebrities on Instagram are classified advertisements electronic transactions; however, circulars from the Directorate General of Taxes cannot be utilized as references because the circulars are not equivalent to the regulations of the Act. In general, circulars are not enforceable by law.

Celebrities generates the same amount of money from endorsement deals as other companies; the only distinction is the method of distribution, which is using Instagram. Despite the fact that the money earned by celebrities from its endorsement services is not set and is conducted via Instagram, as previously indicated, celeb's income is nevertheless subject to income tax and is not exempt from it. This is due to the fact that an individual will be subject to income tax if their income enables them to engage in economic activity. Celebrities will therefore be required to pay income tax on any income they receive from doing endorsement work.

2. Criteria in the Application of Tax Objects and Subjects in Endorsement Activities

Income tax is a tax that controls the income tax that a person or entity owns. A taxpayer is the object and subject of income tax. In relation to income earned or received within a year, the subject of Income Tax is levied on ;

- Inheritance that has not been distributed supplants the legitimate taxpayer and is the subject of income tax.
- Private individual.
- Permanent Establishment
- Entities

Tax subjects are further divided into three, namely domestic tax, foreign tax, and those who are not part of the tax subject (Mardiasmo, 2009). Domestic tax subjects are:

- a. Entities established in Indonesia, this includes Limited Liability Companies, State and Regional Owned Enterprises with any form and name, Joint Ventures, Firms, Pension Funds, Cooperatives, Associations, Fellowships, Mass Organizations, Foundations, Political or social organizations or the like, Mutual Funds and institutions. Business entities from the government have exceptions if they meet these criteria:
 - Financing sourced from the Regional Budget Revenues and Expenditures (APBD) or State Budget Revenue and Expenditure (APBN)
 - Establishment based on the provisions of the Act.
 - The revenue is included in the budget of the Regional Government or the State Government.
 - In the audit the books are supervised by the State supervisory apparatus.
- b. An individual who lives in Indonesia or who is staying in Indonesia for 183 days in a year and who has the intention to stay in Indonesia.
- c. Inheritance that has not been distributed, replaces the rightful taxpayer.

Foreign tax subjects include:

- a. Individuals who do not live in Indonesia or stay in Indonesia for less than 183 days, entities that are not located in Indonesia who can earn or receive income from Indonesia through business or permanent establishment activities in Indonesia.
- b. Individuals who do not live in Indonesia or stay in Indonesia for less than 183 days within 12 months as well as the established entity is not located in Indonesia and runs and performs permanent establishment in Indonesia.

Meanwhile, the object of tax is income earned by taxpayers from Indonesia or from abroad whose income can be used to meet the needs or increase the wealth of the taxpayer, whether in any form. According to the Law, the objects of income tax are:

- Prizes from sweepstakes
- Gaining profit from the operator or transfer of property
- Retrieval
- Rewards
- Dividends, rent, interest and rent
- Receive from periodic payments
- Benefit from debt relief
- Insurance premium
- Profits from foreign exchange differences
- Profit from sharia business
- Interest
- Profit of Bank Indonesia

Income earned both inside and outside of Indonesia is the subject of taxation for taxpayers. The criteria for determining tax subjects are whether an individual or a full-fledged business entity receives money from the goods they produce and makes a profit.

Celebrities are those who must pay taxes, according to the law. The program is independent and not counted as part of the workforce because it is administered solely by one person. Celebrities are independent hence they are not bound to any particular organizations. The program must determine its own tax liability and pay it to the Directorate General of Taxes based on the previously mentioned facts. The threshold for evaluating tax objects on endorsement activities is set by those who earn money for which they must pay taxes; as a result, celebrities who earn income from endorsement activities are obliged to pay taxes, this is in accordance with the rules stated in the Law (Damopolii, 2017).

3. Instagram Celebrities Tax Obligation Compliance

Tax compliance is the readiness of taxpayers to abide by a nation's tax laws. Tax compliance also refers to the timely filing of tax returns and accurate reporting of income. Because tax evasion can result in losses for the state, paying attention to taxpayer compliance is important (Fidel, 2010). The decrease in tax compliance may affect government initiatives to enhance welfare for citizens (Chau & Leung, 2009). According to Ersania & Merkusiwati (2018), tax compliance is split into two categories: formal compliance and material compliance. Formally speaking, compliance is defined as a taxpayer administrative duty that is carried out in conformity with the relevant tax laws. Technical duties to complete and precisely calculate taxes are part of material compliance. Essentially, accurate and thorough SPT reporting can be used to identify taxpayer compliance. The Indonesian tax authorities are still grappling with the issue of noncompliance by taxpayers (Jusikusuma & Wijaya, 2022).

Since there is still no clear regulation that will leave openings for celebrities to avoid paying taxes, there is often no law that particularly governs income tax involving endorsement activities. Given that many celebrities now believe endorsement services are exempt from income tax, it is important to make clear to celebrities who provide endorsement services that they are liable to income tax. Legal certainty is required to prevent conflicting social interpretations.

The compliance rate for creative non-employees like artists and celebrities is still below 50%, according to CORE's Executive Director Faisal. The money received from celebrity or public figure endorsement deals is essentially self-declared revenue. Calculating, paying, and reporting tax obligations must be done through Instagram Celebrities. Understanding the program's accountability and integrity in meeting its tax obligations is necessary for the self-assessment system's adoption (Roria & Sari, 2021). Referring to the Executive Director of the Center of Indonesia Taxation Analysis (CITA) Yustinus Prastowo, the lack of taxpayer compliance in reporting tax obligations is influenced by several factors. First, ignorance in fulfilling their tax responsibilities, the complexity of the tax system is the reason why Instagram celebrities are reluctant to report their income. The second reason is that Instagram celebrities deliberately evade taxes that should be their responsibility (Situmorang, 2019). However, for the first factor, it is necessary to note that the laws and regulations that have been ratified by the government and promulgated in the State Gazette of the Republic of Indonesia genuinely need to be understood by everyone. In this case, the participation of the Indonesian people is very much needed to actively seek knowledge related to the latest regulations issued by the government. Taing & Chang (2021) argues that the level of complexity of the taxation system has an important correlation with the level of non-compliance. In addition, the complexity of the tax provisions provides the possibility that taxpayers can misinterpret. Meanwhile, the justice factor is also one of the factors that affect taxpayer compliance. Sania & Yudianto (2018) found that the justice factor also influences to services and the final results provided by the government do not meet public satisfaction standards. The justice factor given by the government is still being questioned by the public. The public feels that the distribution of public facilities has not been used optimally.

Meanwhile, DGT is reportedly dealing with a number of issues, according to Nasrullah & Amalia (2020). First, the challenge of managing online stores. Although the taxation of endorsement activities is carried out in accordance with the current tax legislation, the DGT asserts that monitoring requires a different model because it is simpler to do where there is physical evidence. In order to fulfill their tax duties based on self-assessment, celebrities sometimes lack knowledge or literacy. According to the applicable Income Tax Law, celebrities who actively participate in fulfilling their duties are considered to be self-declaring their income from endorsement activities. Third, whether the income reported by the celebrities in the SPT is accurate or not, DGT finds it challenging to locate comparable statistics. This occurs because the actions of the internet promotion model differ from those of the traditional promotion strategy. Because celebrities are increasingly being used to promote items online, gathering comparison data is thought to be particularly challenging. Furthermore, online transactions can be very difficult to track down, and there is a chance that the information supplied is false or that information on transactions for endorsement activities between celebrities and online commercial partners is lost.

Because endorsement service activities take place online, a technology strategy is required. Directorate General of Taxes must release an update so that the government can examine the celeb data and identify the celebrities that might be subject to taxation. The Income Tax Law and the ITE Law, which explicitly govern the collection of income tax endorsements, both need to be amended by the government. And Indonesia's tax authority, must collaborate with other organizations in order to assist in and maximize income tax collection on services-providing programs. Income from endorsement activities is treated the same as other types of income under the Income Tax Regulation.

The Directorate General of Taxes also needs to actively educate the celebrities about the self-assessment method. As a result, Instagram celebrities needs to be aware of their tax duties and proactive in filing, depositing, and reporting them. The Directorate General of Taxes can explain the penalties that may be incurred if the program does not comply with its tax requirements in addition to persuading socialization on the program. Socialization is provided to internet business owners as well, who of course frequently use the marketing services provided by Instagram celebrities in order to achieve their goals. The Directorate General of Taxes sets income tax bases for activities that can be utilized as an object of revenue, such as endorsements. Example, Singapore has a law

stating that anyone who runs an internet promotion and earns more than \$100 USD as a result of their efforts must report their revenue to the SPT. There is no need to record your income if it is less than \$100 USD. This helps bring flavors of justice and clarity in line with the ideas of equality and assurance.

However, in order to prevent conflicting interpretations in the society, there still has to be clear regulations regarding the imposition of endorsement income tax. To promote compliance and raise awareness for celebrities as endorsement service providers, it is envisaged that there will be a thorough explanation of the parties involved as well as tax aspects relating to income tax on celebrities who earn from endorsement.

IV. CONCLUSION

In Indonesia, celebrity endorsement activities on the Instagram platform are one of the potential tax revenues, according to the findings of the discussion that has been conducted. Law No. 36 of 2008 addressing income tax contains rules about how income tax from endorsement activities is determined. Directorate General of Taxes finds it difficult to tax endorsement activities. The study's findings have implications, particularly for celebrities who use Instagram for endorsement purposes. The income received or earned by Instagram celebrities is high because the celebrities itself can set rates as freely as possible. It depends on the number of followers, and what brand endorsed them. The large number of celebrities on Instagram social media should be able to increase revenue in terms of Income Tax. However, in reality, there are still many celebrities who are not aware of their obligations and it is still challenging to collect endorsement income taxes.

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Analysis Of Factors Affecting Risk Management Disclosure

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Abstract- The goal of this study was to identify the factors that influence risk management disclosure (RMD) in companies listed on the Indonesia Stock Exchange (IDX) in the manufacturing sector between 2018 and 2020. This study uses managerial ownership, public ownership, board of commissioners size, auditor reputation, leverage, company size, and risk management committee as independent variables. The sample for this study was selected using the purposive sampling method. This study uses secondary data in the form of annual financial statements of companies listed on the Indonesia Stock Exchange. Hypothesis testing in this study shows that the size of the board of commissioners and the size of the company affect risk management disclosure, while the variables of managerial ownership, public ownership, auditor reputation, leverage, and risk management committee have no effect on risk management disclosure.

Index Terms- Risk Management Disclosure, Multiple Regression Analysis, Risk Management Committee, Managerial Ownership, Public Managerial, Board of Commissioners Size, Auditor Reputation, Leverage, Company Size.

I. INTRODUCTION

The role of risk management the term disclosure is often interpreted as an understanding to reveal the risks managed by the company or how the company manages future risks (Sulistyaningsih, S., Gunawan, 2016). Disclosure of corporate risk is the basis of accounting and investment practices. From here emerged the regulations regarding risk disclosure in companies contained in PSAK 50 revision 2010.. This regulation is made so that companies in the process of reporting financial statements do not only report financial-related information but also disclose factors that can affect risk management disclosure (Sulistyaningsih, S., Gunawan, 2016). Several factors that influence risk management disclosure are: First, managerial ownership. Management plays an important role in the company and bears a great deal of responsibility in the disclosure of financial statements. The risk of management disclosure increases as a percentage of managerial share ownership in a corporation increases since management has more decision-making responsibilities. Second, Public ownership is the percentage of shares that are owned by the general public at the end of the year. The general public, who have shares in the company, really need information related to risks and finances that occur as a responsibility to investors. Third, the board of commissioners is responsible for supervising and advising the board of directors. Based on the general guidelines for good corporate governance in Indonesia, complexity and effectiveness in making a decision are important factors in determining the number of commissioners. Fourth, the reputation of the auditor is an auditor who has a good image and a KAP is able to help disclosure of corporate risk management, especially KAPs that are included in the Big Four, because Big Four auditors can help internal auditors review and enhance the efficacy of risk management to raise

the standard of evaluation and corporate risk monitoring. Fifth, leverage is a method used as a measure of the size of the use of debt in financing investments (Wardhana & Cahyonowati, 2013). In running a business, there is a phase where the company is faced with the problem of lack of capital. To overcome this problem, the company can choose an alternative path, namely corporate funding in the form of debt (Sevira, D. F. R., & Achyani, F., 2018). The sixth is the size of the company. In the size of the company, there are many stakeholders who take part in the company (Amran et al., 2009). The seventh is the risk management committee. The establishment of a risk management committee, often called an RMC in companies, is one of the solutions carried out by the committee board to help improve ERM disclosure. RMC is becoming popular as an important risk monitoring mechanism for companies (Subramaniam et al., 2009).

Several studies on risk management disclosure have been carried out but show different findings. The cause of this difference in results may be due to the different observation periods taken. The current study uses the 2018-2020 observation period to confirm the findings of previous studies by adding a risk management committee variable. The purpose of this study is to analyze the factors that influence risk management disclosure in manufacturing companies listed on the Indonesia Stock Exchange in 2018–2020.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

Agency Theory

The interaction between agents (company management) and shareholders is referred to as agency theory (Jensen dan Meckling, 1976). The relationship between agents and shareholders allows agency conflicts to occur, which are characterized by different interests and incomplete information. This can happen because the management assigned by the shareholders to manage the company does not work in the interests of the shareholders. Agency theory has various mechanisms to align the interests of managers and shareholders, such as good corporate governance and can be achieved through risk management disclosure. With risk management disclosure, the quality of the company's financial statements will increase because the information will be more transparent.

Teori Signalling

Signaling theory is one of the theories that causes the problem of incomplete information. Management provides information and issues related to the company's risk disclosure through financial reports, which means that management is transparent to financial statements so as to avoid fraud. Businesses that use the signaling theory to disclose the use of excellent corporate governance in order to build a positive reputation and boost business value. One of the signals in the implementation of good corporate governance given by the company is risk management disclosure. Disclosure of risk management, which indicates that the company has carried out transparency regarding financial reporting.

Teori Stake Holder

Companies operate not only for their own interests but must also pay attention to the interests and benefits of stakeholders (Freeman & McVea, 1984). Shareholders, creditors, customers, suppliers, governments, communities, and other persons involved in attaining business objectives are considered stakeholders. This notion is burdensome because stakeholders have a right to learn about the company's operations, and one method to do so is by using the risk management disclosure process. When stakeholders provide support by controlling important economic resources, the company will make better and more transparent disclosures to encourage financial performance and company value and minimize losses. (Devi et al., 2017). Based on these theories, the hypothesis:

Managerial ownership of risk management disclosure

Since the company's management owns shares through managerial ownership, external shareholders today ask the company for information on its interests and risks in order for management to be held accountable for all business operations by disclosing them in the financial

statements. The higher the managerial ownership, the higher the responsibility regarding decision making so that the risk management disclosure is higher.

Managerial ownership has an impact on risk management disclosure, according to research by Taufani, M. T., Askandar, N. S., & Mahsuni, (2017). However, research conducted by Khumairoh et al. (2017) and Sulistyaningsih, S., Gunawan (2016) demonstrates how managerial ownership has no impact on risk management disclosure. Based on this description, the proposed hypothesis is:

H1: Managerial ownership affects risk management disclosure

Public ownership of risk management disclosure

Shares owned by the public or the general public are said to be subject to public ownership. More information was shared by the corporation to satisfy the needs of shareholders the more shares the general public owns (Sulistyaningsih, S., Gunawan, 2016).

Research conducted by Sulistyaningsih, S., Gunawan, (2016) shows that public ownership has an effect on risk management disclosure. However, research according to Khumairoh et al. (2017) shows that public ownership has no effect on risk management disclosure. Thus, the proposed hypothesis is :

H2: Public ownership affects risk management disclosure.

The size of the board of commissioners on risk management disclosure

The size of the board of commissioners is a body that examines and advises the board of directors so that the business operates in accordance with corporate objectives. The additional board of commissioners members have the advantage of monitoring and providing more information, therefore it is anticipated that the quality of risk management disclosure would improve. This is because the large number of members of the board of commissioners allows the company to carry out its role effectively.

Research conducted by Ode et al. (2014), Sulistyaningsih, S., Gunawan (2016) and Surya et al. (2021) shows that the size of the board of commissioners has an effect on risk management disclosure. However, research conducted by Gunawan, B., & Zakiyah (2017) shows that the size of the board of commissioners has no effect on risk management disclosure. Based on this description, the hypothesis proposed is:

H3: The size of the board of commissioners affects the risk management disclosure

Auditor reputation of risk management disclosure

The reputation of auditors is what encourages the disclosure of corporate risk management, particularly the Big Four KAP, because they may help internal auditors review and boost the efficacy of risk management to enhance the quality of the company's risk analysis and supervision. Risk management disclosure will be more effective as the quality of risk assessment and supervision improves.

Research conducted by Sulistyaningsih, S., Gunawan (2016) and Gunawan, B., & Zakiyah (2017) shows that auditor reputation has an effect on risk management disclosure. However, research conducted by Magda Kumalasari, Subowo (2014) shows that auditor reputation has no effect on risk management disclosure. Based on this description, the hypothesis proposed is:

H4: Auditor reputation affects risk management disclosure.

Leverage of risk management disclosure

According to agency theory, businesses with a lot of leverage will disclose more specific company information. The greater the level of corporate debt, the greater the obligation of management to disclose company information. The corporation will always be more thorough in its disclosures since creditors need to know about the company's financial situation to make sure the debtor or company will pay its debts when they are due.

Research conducted by Golshan et al. (2012) and Magda Kumalasari, Subowo (2014) shows that leverage has an effect on risk

management disclosure. However, research conducted by Khumairoh et al. (2017) and Gunawan, B., & Zakiyah (2017) shows that leverage has no effect on risk management disclosure. Based on this description, the hypothesis proposed is:

H5: Leverage has an effect on risk management disclosure

Company size on risk management disclosure

The bigger the company, the more investors will invest in it. Therefore, the bigger the company, the greater the risk management disclosure, so that the information provided to investors is more accurate and detailed because it is a form of accountability from the management to investors.

Research conducted by Gunawan, B., & Zakiyah (2017), Ode et al. (2014) and Surya et al. (2021) shows that company size affects risk management disclosure. However, research conducted by Magda Kumalasari, Subowo (2014), Sulistyaningsih, S., Gunawan (2016) shows that company size has no effect on risk management disclosure. Based on this description, the hypothesis proposed is:

H6: Company size has an effect on risk management disclosure.

Risk Management Committee on risk management disclosure

An organization forms a risk management committee to demonstrate its responsibility for good corporate governance as well as to increase the quality and value of the company; after forming a risk management committee, it allows transparency of company risk management to be more detailed. Companies that have a risk management committee may have greater risk management disclosures.

Research conducted by Sari et al. (2019) shows that the risk management committee has an effect on risk management disclosure. However, research conducted by Cindy et al. (2022) and Surya et al. (2021) shows that the risk management committee has no effect on risk management disclosure. Based on this description, the hypothesis proposed is:

H7: The risk management committee influences the final risk management disclosure.

III. Research Methods

3.1 Population and sample

The companies used in this study are those listed on the Indonesia Stock Exchange (IDX) in the 2018-2020 period. The sampling method used is the purposive sampling technique method. A purposive sampling technique is a sampling technique that uses certain criteria. The sample criteria used in this study are (1) manufacturing companies listed on the Indonesia Stock Exchange for the 2018-2020 period; (2) manufacturing companies that publish financial reports and annual reports consistently; (3) manufacturing companies that present financial reports in rupiah values; and (4) manufacturing companies that have the data needed in this study.

3.2. Research Methods

Testing the hypothesis of this study using multiple linear regression. Multiple linear regression analysis serves to measure the effect of the independent variables on the dependent variable. The following is a regression model for this study:

$$\text{RMD} = \alpha + \beta_1 \text{KM} + \beta_2 \text{KP} + \beta_3 \text{COM_SIZE} + \beta_4 \text{AUD_REP} + \beta_5 \text{LEV} + \beta_6 \text{FIRM_SIZE} + \beta_7 \text{FIRM_RMC} + \alpha$$

Variabel Measurement

Dependent variable

Risk management disclosure is calculated using enterprise risk management (ERM) issued by COSO. In the disclosure using ERM, it contains 108 items which are divided into 8 dimensions, namely the internal environment, goal setting, risk response, monitoring and communication activities, and monitoring. The formula used is:

$$\text{Indeks ERM} = \frac{\text{Number of items disclosed}}{108}$$

Variabel Independen

Managerial ownership

Managerial ownership is the percentage of shares owned by management, for example, the directors, the board of commissioners, and those who are directly involved in making company decisions. The formula used in calculating managerial ownership is:

$$\text{Managerial Ownership} = \frac{\text{Total manager shares}}{\text{Total shares outstanding}}$$

Public Ownership

Public ownership is the percentage of shares owned by the public or outsiders. The formula used to calculate public ownership is:

$$\text{Public Ownership} = \frac{\text{Number of public shares}}{\text{Total number of outstanding shares}}$$

Board of Commissioners size

If the number of members of the board of commissioners is large, it will make it easier to carry out the control and supervision process more optimally. The size of the board of commissioners in this study was calculated using the number of members of the board of commissioners in the company.

Auditor reputation

The Big Four is a guideline for implementing good corporate governance, which can help a company's internal audit improve management efficiency and assessment, thereby increasing the quality of supervision and risk assessment (Magda Kumalasari, Subowo, 2014). For auditor reputation in this study, we used a dummy. If the company uses KAP Big Four, then it is given a value of 1, and vice versa, it is given a value of 0.

Leverage

Leverage is a measure of the amount of assets financed by debt (Murdoko Sudarmadji, A., & Sularto, 2007). The level of leverage shows how the company bears debt risk (Sulistyaningsih, S., Gunawan, 2016). In this study, the formula used for leverage is:

$$\text{Leverage level} = \frac{\text{Total Liabilities}}{\text{Total Asset}}$$

Company size

Company size is the size of the company that can be seen based on total assets, total sales, average total sales, and average total assets. In this study, the size of the company is measured using the natural logarithm of total assets, then with the formula:

$$\text{Company Size} = \text{LN}(\text{total asset})$$

Risk Management Committee

The risk management committee is tasked with implementing policies and strategies and implementing risk management practices (KNKG, 2014). Pada penelitian ini komite manajemen risiko diukur menggunakan dummy, In this study, the risk management committee is measured using a dummy. If the company has a separate RMC from the audit committee, it is given 1 point, and vice versa, 0 points are given.

IV. Result and Discussion

Descriptive statistics

Variabel	N	Minimum	Maximum	Mean	Std Dev
Risk Management Disclosure	74	0,102	0,352	0,238	0,072
Managerial ownership	74	0	94,44	7,096	19,526
Public Ownership	74	2	77	22,63	16,557
Board of Commissioners Size	74	2	8	4,54	1,546
Auditor Reputation	74	0	1	0,22	0,414
Leverage	74	0	2	0,43	0,237
Company Size	74	25,45	31,57	28,974	1,459
Risk Management Committee	74	0	1	0,238	0,440

The following information is obtained from descriptive statistics:

Managerial ownership has the lowest value of 0 percent and the highest value of 94.44 percent, and has an average value of 7.096 percent with a deviation value of 19.526 percent. Therefore, the company has a managerial ownership level of 7.096 percent.

Public ownership has a minimum value of 2 percent and a maximum value of 77 percent, and public ownership has an average value of 22.63 percent, with a standard deviation of 16.557 percent. This shows that the company has a public ownership level of 22.63 percent.

The size of the board of commissioners has a minimum value of 2 and a maximum value of 8, and has an average value of 4.54 with a standard deviation of 1.546. This shows that the average company has a board of commissioners of five people.

The reputation of the auditor ranges from a minimum of 0 to a high of 1, with an average value of 0.22 and a standard deviation of 0.414. This shows that the sample companies that use the big four KAPs are 22 percent.

Leverage has a minimum value of 0 and a maximum value of 2, and has an average value of 0.43 with a standard deviation of 0.237. According to the average value, each manufacturing company receives funds from third parties equal to 43 percent of its total assets.

Company size has a minimum value of 25.45 percent and a maximum value of 31.57 percent. The size of the company has an average value of 28. With an average value of 28.974 percent, it can be said that the assets owned by manufacturing companies are classified as large companies.

The risk management committee has the lowest score of 0 and the highest score of 1, and has an average value of 0.238 and a standard deviation of 0.440. The average value of 23.8 percent indicates that there tend to be fewer manufacturing companies in this research sample that have a separate risk management committee with an audit management committee.

The linear regression statistical test in this study requires classical assumption testing. The data from this study passed the classical assumption test, which consisted of the data normality test, heteroscedasticity test, multicollinearity test, and autocorrelation test. The regression equation has $F = 2,973$ and a significance value of 0.009. The coefficient of determination (Adjusted R²) shows the number 0.159.

Hypothesis test

T test hypothesis table

Variable	Unstandarized Coefficients		Standarized Coefficients	t	Sig
	B	Std. Error	Beta		
Constant	-0,658	0,224		-2,934	0,005
Managerial ownership	0,001	0,000	0,224	1,879	0,065
Public ownership	0,001	0,001	0,119	1,029	0,307
Board of commissioners size	-0,017	0,008	-0,372	-2,131	0,037
Auditor reputation	-0,012	0,020	-0,072	-0,622	0,536
Leverage	-0,040	0,036	-0,130	-1,085	0,282
Company Size	0,034	0,009	0,685	3,884	0,000
Risk Management Committee	0,012	0,018	-0,018	-0,652	0,516

Effect of Managerial ownership on risk management disclosure

The regression coefficient value of managerial ownership is 0.001, which means that managerial ownership has a positive relationship with risk management disclosure. The managerial ownership variable test has a significance value of 0.065, more than 5 percent, or 0.05, so H1 is rejected.

Managerial ownership has no effect because it still has a low level of share ownership. Low managerial ownership causes management to not have full power to make decisions and affects the level of risk management disclosure. These results are in line with research conducted by Kristiono, Zulfahridar A (2014) and Sulistyaningsih, S., Gunawan (2016).

Effect of public ownership on risk management disclosure

Public ownership has a regression coefficient value of 0.001, which means that it has a positive relationship to risk management disclosure. The significance value of 0.307 is greater than 5 percent or 0.05, indicating that H2 is rejected. Disclosure of risk management is unaffected by public ownership. The higher the level of public ownership, the more management is required to report financial information to satisfy stakeholder interests, thus putting the company under pressure. Therefore, companies must be more careful in reporting their information because it avoids public concerns about investing in companies. The results of this study are in line with research conducted by Ode et al. (2014) and Tarantika & Solikhah (2019).

The effect of the size of the board of commissioners on risk management disclosure

The size of the board of commissioners has a regression coefficient value of -0.017 and a significance value of 0.037, which is less than 5 percent, or 0.05, which indicates that H3 is accepted.

The size of the board of commissioners does affect the risk management disclosure. The greater the number of the board of commissioners, the more the provision of information in risk management disclosure can increase. Because if the number is large, it is possible that the company is not dominated by management so that it can carry out its duties effectively. The findings of this study are consistent with studies conducted by Ode et al. (2014) and Sulistyaningsih, S., Gunawan (2016).

Effect of auditor reputation on risk management disclosure

The reputation of the auditor has a regression coefficient of -0.012 and has a significance value of 0.536, which is greater than 5 percent or 0.05, which indicates that H4 is rejected.

Auditor reputation does not affect risk management disclosure. Companies that use KAP Big Four are usually given a higher level of trust by stakeholders or the public so that companies only make disclosures in accordance with the provisions of BAPEPAM LK Magda Kumalasari, Subowo (2014). Meanwhile, companies that have not used the Big Four KAPs disclose risk management more broadly with the aim of increasing stakeholder or community trust. The findings of this study are consistent with studies done by Magda Kumalasari, Subowo (2014) and Sulistyaningsih, S., Gunawan (2016).

Effect of leverage on risk management disclosure

Leverage has a regression coefficient of -0.40. Leverage has a significance value of 0.282, greater than 5 percent, or 0.05, which means that H5 is rejected. Leverage does not affect risk management disclosure. The higher the leverage indicates that the company is mostly funded by creditors, which causes the company to tend to disclose less risk. If the leverage is high, it is feared that investors will hesitate to invest in the company. The research findings are consistent with studies done by Sulistyaningsih, S., Gunawan (2016) and Gunawan, B., & Zakiyah (2017).

The effect of company size on risk management disclosure

Company size has a coefficient value of 0.034 and has a significance value of 0.0001, which is smaller than 5 percent, or 0.05, which means that H6 is accepted. Company size has an effect on risk management disclosure. Based on the stakeholder theory regarding the magnitude of the company's responsibility to stakeholders, large companies apply good corporate governance practices. This allows the company to be more extensive in disclosing risk management information because it is included in the transparency principle of good corporate governance. The research findings are consistent with studies done by Ode et al. (2014), Tarantika & Solikhah (2019) and Rujiin (2020).

Effect of the risk management committee on risk management disclosure

The risk management committee has a regression coefficient value of 0.012 and a significance value of 0.516, which is greater than 5 percent or 0.05, which means that H7 is rejected. The risk management committee has no effect on risk management disclosure. The results of this study are not in accordance with stakeholder theory, which states that the effectiveness of risk management will increase company profits. The data in this research sample shows that the average company has risk management, but many also believe that the company's image will be damaged if it discloses risk information widely. If it is too broad in disclosing risk information, it is feared that it can make it easier for competitors to beat or bring down the company in managing the business. The results of this study are in line with research conducted by Fayola, D. N. W. B., & Nurbaiti (2020) and Cindy et al. (2022)

V. Conclusion

The goal of this study is to know the risk management disclosure elements that affect manufacturing companies listed on the Indonesian stock exchange for the 2018–2020 period. For testing, this research uses 74 samples of data that have been collected based on the criteria that are met. It can be concluded that the size of the board of commissioners has a significant positive

impact on risk management disclosure, and the size of the company also has a significant positive impact on risk management disclosure. However, this study has limitations because it only uses manufacturing companies listed on the IDX. Therefore, for further research, it is expected to increase the research sample size by adding the variables.

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Farmer Led Irrigation Initiatives And Its Impact On The Livelihoods Of Smallholder Farmers Under Redistributed Lands: A Case Study Of Mazowe District A1 Resettled Farmers, Zimbabwe

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Abstract: Farmer led irrigation farming (FLI) is a vital strategy in the livelihoods of smallholder farmers especially the A1 model resettled farmers in Zimbabwe who now operate in an unpredictable natural and economic environment which has become more and more volatile especially under the prevailing climate changing environment and more recently global epidemics like COVID 19. FLI is now a revolutionary agricultural intensification approach which is already in progress and has the magnitude to significantly transform the living standards of smallholder farmers. However a rigorous assessment of its impact of A1 resettled under its Fast Track Land Reform (FTLRP) is lacking. This study bridges the gap by assessing role of FLI farming initiatives on the livelihoods of resettled farmers under redistributed lands in Mazowe District in Mashonaland Central Province in Zimbabwe. The sample size for the study for quantitative data was 310 A1 farmers practicing FLI in Mazowe District while 5 public officers were for qualitative data. A questionnaire was used to collect household data. Processing of data was done using the Structural Equation Model (STEM). This study found out that smallholder farmer led irrigation had a positive impact on the socio economic aspects of the livelihoods of A1 resettled farmers under Mazowe District of Mashonaland Central Province of Zimbabwe. The study, therefore, recommended ICT development for extension officers who in turn are expected to assist A1 farmers as they embark on FLI farming while improving level of education will help farmers acquire the necessary information needed for decision making under the FLI. Government subsidy interventions will help farmers acquire FLI hardware at affordable costs while enhanced female participation is also envisaged to help stabilize household food security situations. The study also recommends further studies to establish other factors that might provide further insights into the effect of farmer led irrigation farming on livelihoods of farmers.

Key Words: Farmer-Led Irrigation, Livelihoods, A1 Resettled Farmers, Fast Track land Reform,

I INTRODUCTION

Land reforms world over have been noted as an approach to redressing inequalities in access to productive resources including land ownership (Mandizadza, 2010). Zimbabwe's land reform programme offers an interesting case study. At independence in 1980, Zimbabwe had inherited a skewed land ownership structure where 80 percent of all the arable land was owned by only a minority of white commercial farmers who only constituted less than 2 percent of the population (Munyoro et al., 2015). As a result, the new government of President Robert Mugabe embarked on the first land reform programme to re allocate land rights from the few minority white farmers to the majority previously marginalized black indigenous settlers in Zimbabwe. Land reform in Zimbabwe has been seen as a very powerful strategy in the promotion and transformation of the economy and livelihoods of smallholder farmers (Mukodzongi et al., 2017). This is also supported by Munyoro et al. (2015) who also posit that land reform has an important bearing upon livelihoods of people when used as a vehicle to address issues of equity and productivity.

Zimbabwe's Fast track Land reform Program (FTLRP) of 2000 generated intense debate that has polarized views between those in favour of redressing the colonial land imbalance in favour of black farmers and those against the purpose and the approach to land reform (Mukodzongi et al., 2017). In Zimbabwe in the past two decades before the FTLRP, debates focused on the contribution of agriculture to overall economic development (Njaya, 2015). Studies of the impact of irrigation especially by smallholder farmers in Zimbabwe was mainly in the communal areas where the block scheme type was dominant (Manzungu, 1999; Rukuni et al., 2006; Zawe, 2006). In the new agrarian context, in Zimbabwe, the strategy of adoption of farmer led irrigation by smallholder farmers describes

strategies and initiatives by the farmers to improve productivity and profitability where agriculture is the bedrock of livelihoods and incomes (Gebrehiwot, et al., 2015). Thus, the impact of farmer led irrigation initiatives has not been highly researched on, with most researchers concentrating on land reform outcomes from land redistribution and ignoring the impact of farmer initiatives in the area of farmer led irrigation and crop productivity (Mukodzongi et al., 2017; Scoones et al., 2010). This is regardless of the existence of vast global empirical indications of achievements in small-scale irrigation agriculture in countries like Japan, China, Taiwan, Mexico and Colombia and Kenya (Woodhouse et al., 2017). This study investigated the impact of farmer led irrigation on the livelihoods of smallholder farmers focusing on model A1 farmers in Mazowe District of Zimbabwe.

II PROBLEM STATEMENT

Zimbabwe's Fast Track Land Reform Programme (FTLRP) of 2000 has been noted to have had varied progress in terms of outcomes (Njaya, 2015). The programme is widely credited with addressing the colonial land imbalances and widened the base of economic participation of indigenous farmers (Mukodzongi, 2017). Despite being credited with the overhauling the skewed nature in inequalities in land ownership in Zimbabwe, the programme is associated with a decline in agriculture production and economic collapse (Richardson, 2004). The negative impacts often highlighted create a negative picture of the FTLRP. However, there has been lack of solid empirical research on how such an extensive land redistributive programme has impacted on the livelihoods of smallholder farmers especially those that have gone on to engage in farmer-led irrigation (FLI) farming (Njaya, 2016). To date, not much is known, in the context of Zimbabwe, about the nature of the relationship that exists between smallholder farmer led irrigation and crop production in the country, and how such practices impact on A1 settlement farmers' efforts towards improving their rural livelihoods (Scoones et al., 2019).. Therefore, this study sought to investigate the role of smallholder farmer led farmer led irrigation on the livelihoods of A1 resettled farmers in Mazowe District.

III REVIEW OF RELATED LITERATURE

A Farmer led irrigation initiatives defined

Farmer led irrigation development is defined by Woodhouse et al. (2017) as a process where smallholder farmers assume a driving role in improving their water use for their agriculture in the process bringing about changes in knowledge production, technology use, investment patterns, market linkages and governance over land and water resources. The development of smallholder farmer led irrigation has been noted across developing nations as being of highly significant value in mitigating the effects of drought and being a catalyst to sustainable long term agricultural and national development (Chisango and Maphosa, 2016). Farmer-led irrigation is also defined as an irrigation practice initiated, managed and financed by farmers themselves (Lefore, et al., 2019). The irrigated areas are typically small (less than 2 ha), the technologies are generally low-cost (Lefore, et al., 2019), and the farmers produce both horticultural crops and staple crops (Otoo et al., 2018). In the Zimbabwean context, the FTLRP resettled programme has availed more land to smallholder farmers. A1 farmers under the FTLRP command up to 6 hectares of arable land compared to their counterparts in SSA who have small plots usually less than 2 hectares.

B Smallholder Farmer led irrigation initiatives and productivity

According to Nhundu and Mushunje (2013), successful smallholder farmer led irrigation schemes the world over have resulted in increased productivity. They further note that increased productivity results in better incomes, employment creation, food security, nutrition, and reduced food imports to cover food deficits by government and aim to attain food security. Food security as defined by FAO (2020) is seen as a situation that exists when all people, at all times have physical, social and economic access to sufficient, safe and nutritious food that meet their dietary needs and food preferences for an active and healthy life. This definition gives a comprehensive narrative of food security which comprises five dimensions of food security which are food availability, economic, physical access to food, food utilization, and food stability over time and food safety (FAO, 2020).

The strategy of adopting these farmer led irrigation initiatives is essential in the improvement in livelihoods rural communities where agriculture remains the foundation of livelihoods and incomes (Gebrehiwot, et al., 2015). Despite such evidence the world over and persistent recurrence of mid-season dry spells and droughts in A1 settlement schemes in Zimbabwe, farmer led irrigation seems to be challenged and thus fails to be a source of sustainable livelihoods. As noted by Moyo (2016), access to irrigation would allow smallholder farmers in this case A1 model farmers to improve their crop production and simultaneously increasing their incomes and diversify opportunities to generate more income.

The fact that large numbers of the world's poor depend directly or indirectly on agriculture for their livelihoods reflects the significance of farming (INMI, 2016). In Zimbabwe, approximately 10 million people are directly or indirectly dependent on agriculture as a source of income and employment (ZIMVAC, 2021). The blueprint of the Government of Zimbabwean (GoZ), the National Development Strategy 1 (NDS 1), identified the agricultural sector as one of the major sectors with substantial potential of creating jobs (Government of Zimbabwe, 2020). The complexities in rural livelihoods and the levels of poverty in less developed nations has resulted in the need for in-depth research on the role of smallholder farmer led irrigation farming on the lives of the poor (Moyo, 2016). An understanding of the role of farmer led irrigation farming on livelihoods in Zimbabwe's A1 settlement schemes is important to enable interventions at policy, financing and programmatic levels in order to improve agricultural productivity and transform livelihoods.

C Smallholder farmer led irrigation under A1 schemes and farmers' livelihoods

This paper as a result, explored the role that smallholder farmer led initiatives plays on A1 resettled farmers' livelihoods. The FTLRP drastically reduced the land within the white dominated large-scale commercial sector and expanded the black dominated small-scale farming sector (Njaya, 2015). The Government of Zimbabwe adopted two model variants. These were the A1 variant and the A2 variant (Ministry of Lands, 2020). Regarding the A1 variant, it was mainly for the generality of landless people meant to decongest the communal areas of Zimbabwe while the A2 variant was meant for the commercial settlement schemes (Ministry of Lands, Agriculture, Fisheries, Water and Rural Development, 2020). Under the A1 model a total of 180 000 households were resettled while 9600 households were allocated land under the A2 model (GoZ, 2020).

In general, there has been progress of the FTLRP from 2000 to date in terms improving farming methods, decongestion of rural areas and redressing of land inequality. The causes and the subsequent consequences of the FTLRP have been widely debated and there is a significant contribution to academic literature regarding this program (Deininger et al., 2002; Matondi, 2012; Masiwa, 2004; Moyo, 2004; Mukodzongi, 2017) To its credit, FTLRP addressed the Zimbabwean land question, that is, the land ownership dispute between the white minority and the black majority (Munyoro et al. 2015). The FTLRP has been associated with loss in agricultural productivity and economic collapse and violence in the manner in which it was implemented (Munyoro et al., 2015). These narratives have created a picture of pessimism about the FTLRP. These negative impacts, often overly highlighted, overlook the positives that such a massive programme can have on the livelihoods of the resettled small-scale farmers. Some pertinent questions that arise are: Have there been any welfare and income gains for smallholder farmers under the A1 scheme of the FTLRP?; What are the perceptions of A1 farmers with regards to productivity under the FTLRP?; How have smallholder farmer livelihoods changed under A1 scheme when there are farmer led irrigation initiatives?

Previous studies on smallholder irrigation in Zimbabwe focused on examining the association between smallholder irrigation and livelihoods but did not quantify the farmer led irrigation farming contribution to household livelihoods of settlers in Zimbabwe's A1 settlement schemes. The previous studies went on to establish some positive association between smallholder irrigation farming in communal areas of Zimbabwe (Mhembwe and Dube, 2017; Tshuma, 2015). The level of farmer led irrigation is not documented, ii) the contribution of farmer led irrigation to productivity and consequently their livelihoods is poorly understood, iii) their level of technical knowledge on farmer led irrigation is not documented, iv) what are their major sources of income, how does their knowledge affect their ability to engage in farmer led irrigation, v) how does their knowledge affect their ability to derive income from farmer led irrigation practice. This paper therefore, makes some contributions to fill such gaps in knowledge.

D Support to resettled farmers under FTLRP

After the onset of the land reform programme, commercial banks in Zimbabwe were not willing to provide credit to A1, A2 and even to large scale commercial farmers because of lack of secure collateral and risks associated with insecure tenure and selective law enforcement (Chazovachii, 2016). Banks did not accept the 99 year leases given to the new occupants as they were not secure and transferrable (Moyo, 2016). The same applied to the A1 settlement permits issued by the Government of Zimbabwe.

IV. METHODOLOGY

This study utilized a mixed method research design with a target population of 3441 Smallholder A1 irrigation farmers in Mazowe District. The sample size for the study for quantitative data was 310 smallholder farmer practicing farmer led irrigation while 5 public officers were for qualitative data. For purposes of quantitative data stratified random sampling and convenience sampling were used while purposive sampling was employed for the 5 key informants (qualitative data). Data collection instruments used were a questionnaire for quantitative data, interview guide for key informant interviews and focus group discussions while observation was applied on transect walks. Processing of data was done using iNvivo version 12, SPSS version 20 before being analyzed by the researcher in line with the research objective.

V RESULTS

The study utilized the opinion of the A1 farmers on how they viewed the improvements in their livelihoods as a result of the engaged in farmer led irrigation initiatives. Table 1 below presents the sample’s views on livelihoods of A1 model farmers in Mazowe District.

Table 1 Summary of numerical descriptive statistics of opinions of eight key characteristics on a five point Likert scale for A1 smallholder farmers sampled from Mazowe District in Mazowe District in 2021.

Improvements on:		Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
Lifestyle	310	1	5	2.85	1.487	.168	-1.415
Housing	310	1	5	2.85	1.494	.144	-1.444
Education for kids	310	1	5	2.84	1.469	.159	-1.390
Health status	310	1	5	2.76	1.489	.255	-1.391
Food security	310	1	5	2.89	1.483	.124	-1.412
Infrastructure	310	1	5	2.79	1.478	.178	-1.410
Assets	310	1	5	2.89	1.480	.117	-1.414
Sustainable use of natural resources	310	1	6	2.83	1.460	.186	-1.330
Measurement tool ^a		1	5	3.00			
Valid N (listwise)	310						

a – This is the mean of the 5 point Likert scale

b = The five point Likert scale: Strongly agree (1), Agree (2), Neutral (3), Disagree (4), Strongly disagree (5)

Normality test: Table 1 above confirms the existence of normality in data set given the kurtosis and skewness scores for all the variables of crop production construct are within the normality range Shukla (2008).

Improvements on lifestyle: The item scored an arithmetic mean of 2.85 (Table 1). The results lean toward agreeing and strongly agreeing indicating that respondents felt that there were major improvements on their lifestyles after they had engaged in farmer led irrigation initiatives. The majority of the respondents had some positive attitude towards improvements on lifestyle in smallholder farmer led irrigation farming in the A1 resettlement areas of Mazowe District.

Improvements on housing: The item scored an arithmetic mean of 2.85 (Table 1). The results lean toward agreeing and strongly agreeing indicating that respondents felt that there were major improvements on their housing.

Improvements on education for kids: The item scored an arithmetic mean of 2.84 (Table 1). The results lean toward agreeing and strongly agreeing and indicate that respondents felt that there were major improvements on education for kids. These results indicate that respondents had some positive attitude towards improvements on education for their children where smallholder farmer led irrigation farming was practised under the A1 schemes in Mazowe District.

Improvements on health status: The item scored an arithmetic mean of 2.76 (Table 1) above the results lean toward agreeing and strongly agreeing. These results indicated that respondents felt that there were major improvements on their health status since the adoption of farmer led irrigation initiatives.

Improvements on food security: The item scored an arithmetic mean of 2.89 (Table 1) The results lean toward agreeing and strongly agreeing and this showed that respondents felt that there were major improvements on their food security situation since they adopted farmer led irrigation.

Improvements on infrastructure: This item scored an arithmetic mean of 2.79 (Table 1). The results lean toward agreeing and strongly agreeing indicating that respondents felt that there were major improvements on their farm infrastructure as well as residential infrastructure under the A1 scheme of Mazowe District where farmer led irrigation was been practised.

Improvements on household assets: The item scored an arithmetic mean of 2.89 (Table 1). The results lean toward agreeing and strongly agreeing showing that respondents felt that there were major improvements on their household assets from the time they started practising farmer led irrigation under the A1 scheme model in Mazowe District.

Improvements on sustainable use of natural resources: The item scored an arithmetic mean of 2.83 (Table 1) The results lean toward agreeing and strongly agreeing and this showed that respondents felt that there were major improvements on sustainable use of natural resources in areas practising farmer led irrigation.

Hypotheses testing was also conducted at a significance level of $\alpha=0.05$ level and the results are presented in Table 2.

Table 2 Structural Equation Model (STEM) Output regarding hypothesized relationships between farmer led irrigation, crop production and livelihoods under the A1 model of Mazowe District in 2021.

Hypotheses	Path	SEM Output			Results*
		Estimate	S.E.	P	
Ha1 Smallholder irrigation has a positive and significant impact on the livelihoods of A1 model farmers	Irrigation →Livelihoods	.870	.036	.000	Supported

*Supported at significance level $p \leq 0.001$. (SEM = Structural Equation Model)

Irrigation refers to Farmer led irrigation.

Farmer led irrigation farming (Irrigation) estimated coefficient of the path β value .870 with $p < .001$, in the model, therefore has a significant and positive influence on livelihoods of A1 model farmers (Livelihoods). This infers that the Ha1 is concluded.

Data from quantitative analysis was triangulated with qualitative data. The following is the qualitative data analysis outcomes.

Farmer led irrigation farming and livelihoods of A1 model farmers-Qualitative analysis

A question was posed to the participants on how farmer led irrigation farming contributed to livelihoods of A1 model farmers and the themes are shown Table 3 below.

Table 3 Summary of emerging codes and resultant themes in response to how farmer led irrigation farming affected livelihoods of A1 model farmers in Mazowe District in 2021.

OPEN CODES	AXIAL CODES	SELECTIVE THEMES
1. Procurement of TV		
2. Car		
3. Bicycle		
4. Scotch cart		
5. Housing	1. Lifestyle	
6. Education for kids	2. social status	1. Livelihoods outcomes
7. Health status	3. farm implements	2. Livelihood assets
8. Food security	4. Other assets	
9. Infrastructure	5. Land use	
10. Household assets		

11. Natural resources
 12. High sales
 13. Cash liquidity
-

The analysis of key informant interviews reports on farmer led irrigation farming contribution to livelihoods of A1 model farmers through open coding had thirteen, axial coding five and finally two main themes. Participants (irrigating A1 farmers) view the major farmer led irrigation farming contribution to livelihoods of A1 model farmers in their contexts as through results on increased livelihoods outcomes and livelihood assets.

Results from the qualitative analysis confirmed quantitative results that farmer led irrigation had a positive impact on the livelihoods of A1 resettled farmers,

Presentation and analysis of the qualitative data – transect walks

Two types of household were observed which included the household beneficiaries of the FTLRP and farm worker households. Some former farm workers left behind by former commercial white farmers had been allocated A1 plots although of smaller sizes compared to their counter parts who had invaded the farmers. Some farm workers had small horticultural gardens where they grew horticultural crops from water drawn from rivers and wells constructed in the farm compound areas. This has resulted in sustained source of livelihoods in the absence of bigger pieces of land (Figure 1).



Figure 1 Former farm workers horticultural gardens

The same trend to marginalize former farm workers has also been observed in Namibia and South Africa where former farm workers were side lined in the allocation of acquired state land (Marongwe, 2008). This subsequently affected their livelihoods.

During Focus Group Discussions, crop production figures from farmer led irrigation farming compared to dry land farming were recorded and the following figures were noted.

Table 4. Potential Yield improvement from investments in farmer led irrigation in Mazowe District in 2021

Crop	Rain –fed yield (t/ha)	Smallholder farmer led irrigation yield increase (%)
Maize	0.8	140 – 200
Soya beans	1.5	100 – 175
Potatoes	4.0	190 – 210
Tomato	20	70 – 75
Tobacco	1.5	250 – 300
Groundnuts	0.5	138 – 151
Cabbages	10	210-250

Farmer led irrigation had led to an increase in yields in all crops grown under the A1 schemes. The percentage increase ranged from 70% in tomatoes to a high of 300 % in tobacco.

The transect walks further sought to investigate the impacts of crop production and the resultant changes in the livelihoods of the resettled smallholder A1 farmers in Mazowe District in 2021. The observation results therefore showed that crop production under farmer led irrigation farming had a high positive influence on the livelihoods of A1 resettled farmers under study (Figure 2)



Figure 2 Crop production under farmer led irrigation farming

The next section deals with the discussion of results

DISCUSSION

Sample opinion on Improvements in livelihoods of A1 model farmers as a result of farmer led irrigation

Summary results on improvements in livelihoods of A1 model farmers are shown in Tables 1. As shown in Table 1 the results lean towards agreeing and strongly agreeing. The means (2.76 – 2.89) and standard deviations (1.460 -1.494) revealed significant improvements in livelihoods of A1 model farmers. The following gives a discussion on livelihood variables that were enhanced by farmer led irrigation farming initiatives.

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Improvement of life styles

The respondents of this study indicated that there had a positive attitude towards the improvements in their life styles. Most respondents had changed their diets to include regular drinking of tea and regular meat consumption. Observations during field visits indicated that most families practising farmer led irrigation had acquired assets and built new houses. These results confirm to results by Moyo (2016) where irrigating farmers in Polokwane, South Africa had tremendously changed their life styles compared to non-irrigators in the same area. This is also supported by studies in Mutambara area of Manicaland, Zimbabwe (Makombe. 1996) which found out that smallholder irrigation enabled irrigators to earn an income which enabled them to meet most of their basic needs. In so doing this improved the irrigators' life style and livelihoods.

Improvement in Housing

Results from this research further indicated that the respondents had a positive attitude towards improvements on housing in smallholder farmer led irrigation. Transect walks and questionnaire analysis revealed that most of the respondents had built new houses which were bricks under asbestos or metal roofing sheets. The study by Chenje et al. (1998) supported the findings of this study. Chenje et al. (1998) in their study in Chakuda village in Gambia small irrigation schemes resulted in increased income which translated into wealth which manifested in the construction of farmers houses, a village clinic and a mosque. Farmer led irrigation is a strategy that can improve crop productivity in resettlement schemes and subsequent increase in wealth creation.

Improvements on education for kids

Findings of this study indicated that the respondents had a positive attitude towards improvements on education for kids in farmer led irrigation. This study found out that respondents with their income from farming especially from farmer led irrigation farming had built primary and secondary schools and teachers houses under the A1 model scheme in Mazowe District. Observations indicated that more blocks were built to accommodate more children under the new Covid-19 protocols which required children to practise social distancing while in class. Respondents also indicated that they had sent their children to boarding schools, colleges and universities from income gained from farmer led irrigation initiatives under the A1 scheme model in Mazowe District. Mpala (2016) findings in his study in Tshongokwe irrigation scheme in Lupane District, Zimbabwe support the findings of this study. Mpala found out that 60% of children of irrigators were in school while 40% of children of non-irrigators were out of school. 11% of children of irrigators were in boarding schools such as Fatima and Mabhikwa high schools.

Improvement of Health Status

Results of this study indicated that respondents had a positive attitude towards improvements on health status in smallholder farmer led irrigation. The respondents from this study indicated that income from farmer led irrigation enabled them to seek treatment from nearby district hospitals in Mvurwi and Concession. They were also able to seek specialist treatments in Harare. In farms like Gregen Gower and Glendale farms which are irrigating farms, farmers had built clinics to serve them and the surrounding farms. These results also concur with the studies from Chokuda village, Gambia where Chenje et al. (1998) found out that smallholder irrigators had built a clinic from proceeds of their irrigation farming enterprises. Scoones et al. (2019) from their studies on farmer led irrigation initiatives in Masvingo Province, Zimbabwe under the A1 model found out that irrigators were able to seek specialist treatment in the nearby town of Masvingo town and as far as the capital city, Harare.

Improvement on food security status

Most respondents had some positive attitude towards improved food security in farmer led irrigation. Farmer led irrigation farming was found to increase crop productivity in the crops that were grown in the resettlement areas of Mazowe District. Respondents indicated increases in maize yields, soya beans yields, wheat yields and tobacco yields for the field crops. The same also applied for the horticultural crops. On transect walks during field visits, it was observed that the crop stand was different between farmer led irrigation plots and those under dry land farming. Farmers under farmer led irrigation indicated that since they started farmer led irrigation they had enough food for home consumption and sold excess produce to Grain Marketing Board (GMB) and to other farmers. Tobacco and horticulture were sold for income.

The findings in this research are also supported by Mhembwe et al. (2019) on smallholder farmers in Zimbabwe. Mhembwe et al. (2019) found that small-scale rural irrigation schemes could meaningfully change rural farmers' lives by improving the sustainability of earnings from farming. Furthermore, they established that small-scale irrigation schemes could remedy food security challenges in rural households.

Improvements on infrastructure

The outcome of this study showed that the respondents had a positive attitude towards improvement on infrastructure in smallholder farmer led irrigation farming. The respondents in this study engaged in dam maintenance works, installation of electricity and road maintenance on their farms. This concurs with farmer led irrigation studies in Masvingo Province, Zimbabwe where A1 resettled farmers engaged in farmer led irrigation especially the aspiring irrigators and the commercial irrigators using the typology developed by Scoones et al. (2019), had developed substantial infrastructure on their plots and farms.

Improvement of household assets

The results that were found from this study indicated that respondents had a positive attitude towards improvements on household assets in smallholder farmer led irrigation farming. The quantitative analysis found out that irrigating farmers under the A1 model scheme had acquired livestock, cars, Lorries, tractors and bicycles. The irrigating farmers had also acquired scotch carts, cultivators and ox drawn ploughs. The respondents had also acquired household assets like chairs, beds, TV sets, radios and sofa seats. These findings are also supported by Woodhouse et al. (2017) in their studies on farmer led irrigation in Ghana. The smallholder farmers indicated that they did not have these assets before they started engaging in farmer led irrigation farming under the A1 resettlement model of Mazowe District.

Improvements on sustainable use of natural resources

Findings from this study indicate that respondents had some positive attitude towards improvements on sustainable use natural resources in farmer led irrigation farming in Mazowe District A1 model. The respondents indicated that the farmers were using water transmission pipes which were secure and buckets for watering to conserve water. Fields which were on slopes of more than 2% were protected using infield conservational works to reduce soil erosion. This study also found out that due to farm level irrigation constitutions, control of stream bank cultivation has been reinforced where farmers were practising farmer led irrigation.

The outcomes of this research are also supported by studies on dambo farming on different sites in Zimbabwe by Nyamadzawo et al. (2013) which showed that farmers practising farmer led irrigation in Dambo areas were using motorized pumps to minimize water losses and conservational works had been constructed in their dambo plots. Discussion on the hypothesis informing this study was also done.

Ha1: Farmer-led irrigation positively and significantly impacted on A1 model farmers' livelihoods.

The direct path shown in Table 2 between farmer led irrigation farming and livelihoods of A1 model farmers is validated. The estimated standardised β value .870 with $p = .000$ in the proposed model, reveal support to hypothesis Ha1. The results support the argument that farmer led irrigation farming is the root of success in livelihoods of A1 model farmers. This means farmer led irrigation farming is one of the significant factors in livelihoods of A1 model farmers. Thus, the finding regarding the effect of farmer led irrigation farming on livelihoods of A1 model farmers increased the generalizability from a different and seldom context.

The results of the model estimates for farmer led irrigation farming and livelihoods of A1 model farmers in Table 2 indicate a positive and significant association between farmer led irrigation farming and livelihoods of A1 model farmers.

The above findings are supported by Mhembwe et al. (2019) on smallholder farmers in Zimbabwe. They established that small-scale irrigation schemes were a panacea to food security challenges in rural households.

VI RECOMMENDATIONS

Information Communication Technology (ICT) development

Information is critical in the adoption of smallholder farmer led irrigation initiatives. In this regard the Government of Zimbabwe will need to develop well-equipped agricultural resource centers in all provinces of the country in order to demonstrate new technologies which assist smallholder farmers improve their crop productivity especially for those resettled under the A1 model of the FTLRP. The research findings of this study indicate this need for new information centres for A1 smallholder farmers in the areas of farmer led irrigation farmers as the study pointed out the need for new innovation, the ability to organize resources and sourcing for information at a cost.

ICT could accelerate productivity of Zimbabwean smallholder farmer led irrigation farming especially under the A1 scheme of the FTLRP in the areas of weather forecasting and irrigation scheduling.

Enhanced female participation in irrigation farming

It is generally acceptable that empowerment of women is empowering a nation. In terms of study findings, female headed families constituted 39.0% which is a big percentage in terms of number of households under the support of this female headed households. In smallholder farming especially under the A1 resettlement areas, there is need for the introduction of gender-friendly irrigation initiatives to accommodate the cases of female headed households which ultimately expand irrigated areas under the FTLRP. There is also need for policy priority to sustain the economic benefit of smallholder farmer led irrigation which is inclusive to all gender parties. The enhancement of rural livelihoods is achieved through focusing on policies aimed at female participation in A1 farmer led irrigation farming. Government should be focused on equal allocation of land between females and males under the Government programs and move on to support smallholder farmer-led irrigation with the aim of improving the livelihoods of the resettled farmers.

Government support to A1 smallholder farmers

According to Mutero et al. (2016), access to funding, markets, information and technology impact feasibility in terms of smallholder farming and this is supported by the current findings that established access to funding as one of the major challenges in smallholder farmer led irrigation farming ventures. Mobilizing and increasing rural credit lines to smallholder farmers including A1 irrigating farmers in Zimbabwe should be prioritized during policy formulation. As a result, the land bank (Agricultural Finance Cooperation) needs to be quickly operationalized to offer medium to long term capital borrowing to allow farmers to borrow for irrigation development. Irrigation accessories such as water pumps and engines, solar panels and piping should be exempt from paying duty on being imported into the country. These irrigation accessories form an important driver in the attainment of a viable smallholder farmer led irrigation development in the resettlement and the communal areas of Zimbabwe.

Provision of security of tenure for resettlement land

In this study, security of tenure documents for A1 farmers is varied and a segment of A1 resettled farmers do not have land tenure documents. This process of land tenure documentation is slow thereby curtailing the will by A1 irrigating farmers to invest sustainably. Studies elsewhere show that smallholder farmers invest even in the absence of tenure documents but the Zimbabwe situation is different in that farmer evictions happen regularly especially after elections. Banks have also been reluctant to offer funding where there are no tenure documents.

VII SUGGESTIONS FOR FURTHER RESEARCH

Even though the study has meaningful results, there are other areas requiring further researches. Firstly, selection of irrigation practices was not exhaustive. Consequently, other factors might offer insights on effect of smallholder farmer led irrigation farming on livelihoods of farmers. The major underlying issues at the front of the study variables as identified through factor analysis might be vital. Thus there could be need to include other construct items and statistical tools besides those used here to improve robustness of validity of results.

Secondly, it is widely understood that in empirical research, the results are always based on self-reported data of the respondents. As much as it was assumed that the respondents were adequate for reliable and valid data. It could be useful to put together farmers' responses to questionnaires with views held by their customers, competitors and distributors.

VIII CONCLUSION

The study findings contributed to limited land reform academic literature available pertaining to smallholder farmer led irrigation farming and the livelihoods of A1 model farmers settled under the FTLRP in Mazowe district, Zimbabwe. This study concluded that farmer led irrigation had a positive impact in the livelihoods of resettled A1 model farmers under the FTLRP. In this regard this paper proposed a model using the Structural Equation Model (STEM) that represents an important tool for predicting livelihoods of farmers across a range of smallholder farmer led irrigation farming categories in the Zimbabwean context. Furthermore, the recommendations discussed in this paper could help government to include farmer led irrigation in its National Irrigation Policy together with the viable financing models for financial institutions. Farmer led irrigation initiatives can complement government irrigation projects in pursuit of its target of irrigating 250 000 hectares by 2025 and attaining Zimbabwe's Vision 2030 whose aim is to achieve an upper middle class status for its citizenry. NGO and other interest groups targeting the smallholder farmer led farming within the smallholder farming sector will be able to make informed decisions in their pursuit in assisting smallholder farmers engage in farmer led irrigation initiatives which have been shown in this study to positively enhance livelihoods of resettled farmers under redistributed lands under the FTLRP in Zimbabwe.

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Diseases of Circulatory System as the Cause of Deaths in North East India

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Abstract- One of the reasons of low life expectancy in North East India is the large number of premature deaths of the infants, child and adults. Along with the decline in infant and child mortality rates, the focus now has to be on reducing the premature adult deaths. For that, analysis of the adult deaths and its causes that account for these deaths is very important. One of the important causes of such deaths is the diseases related to the circulatory system. This paper, therefore, attempts to focus on the diseases of circulatory system as one of the important causes of deaths, as provided by the data in the MCCD 2015, in the eight states of North Eastern Region of India. The paper also examines the age and sex variation in this cause-group of the deaths in the selected states.

Index Terms- Diseases of Circulatory System, Medically Certified Deaths, MCCD 2015

I. INTRODUCTION

Premature adult mortality is pointed out as a major contributor to global mortality now as the child mortality is declining worldwide. Around two-thirds of India's 10 million deaths per year occurred before age 70 years in 2014. Around 1.4 million of these deaths were in children younger than 5 years of age, 0.6 million deaths were in young people aged 15-29 years and 4.4 million were in adults aged 30-69 years (United Nations, 2015 as cited in Ram et al., 2015). If the fast reduction in mortality rate has to take place and the United Nations 2030 Sustainable Development Goals need to be achieved, they invariably will require improved information on mortality and causes of death along with appropriate measures to reduce them. Government of India, recognising this, committed to introducing universal health coverage and has endorsed WHO's call for 25 percent reduction in the death rates of adults aged 30 – 69 years from selected non-communicable diseases between 2008 and 2025 (WHO, 2013 as cited in Ram et al., 2015).

Planners, researchers and other professionals regularly reliable cause specific mortality statistics for evidence-based decision-making with regard to resource allocation, monitoring of

indicators, identifying the priorities for programs and other related activities in the area of Public Health (MCCD, 2015). However, causes of many of the fifty million annual deaths in low and middle income countries including India remain unknown, as most of the deaths occur at home without medical attention (Gomes et al., 2017). The scheme of Medical Certification of Cause of Death (MCCD), introduced in India under the provisions of Registration of Births and Deaths (RBD) Act 1969, has helped to accumulate and disseminate data for various states and union territories of India. The MCCD data is collected in the prescribed forms (Form 4 for Hospital deaths and Form 4A for Non-institutional deaths). Both these forms have been designed by World Health Organization (WHO). The forms are filled-up by the medical professionals attending to the deceased at the time of terminal illness. Thereafter, these forms are to be sent to the concerned Registrars of Births and Deaths for onward transmission to the Chief Registrar Office for tabulation as per the National List of Causes of Death based on Tenth Revision of International Classification of Disease (ICD-10). The states and union territories then subsequently send it to the Office of RGI for consolidation at the national level.

II. DESCRIPTION OF THE STUDY AREA

The North East India is comprised of 8 states, namely Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura which cover nearly 8.0 percent of the geographical area of the country with the population share of 3.8 percent.

The largest and the smallest states in terms of geographical area are Arunachal Pradesh and Sikkim respectively. The most and the least populated states in this region are Assam and Sikkim respectively. The sex ratio is the highest in Meghalaya and the lowest in Sikkim. The population density is the highest in Assam and the lowest in Arunachal Pradesh. Meghalaya experienced the highest decadal growth rate (2001-2011) at 27.9 percent, whereas Nagaland experienced a negative growth rate of 0.6 percent during the same period (**Table 1**).

Table 1: Demographic characteristics of NER of India, 2011

States	Geographical Area (Sq. Km.)	Population			Sex ratio	Population density	Decadal growth rate
		Total	Male	Female			
Arunachal Pradesh	83,743	1383727	713912	669815	938	17	26.0
Assam	78,438	31205576	15939443	1526633	958	398	17.1
Manipur	22,327	2855794	1438586	1410278	985	128	24.5
Meghalaya	22,429	2966889	1491832	1475057	989	132	27.9
Mizoram	21,081	1097206	555339	541867	976	52	23.5
Nagaland	16,579	1978502	1024649	953853	931	119	-0.6
Sikkim	7,096	610577	323070	287507	890	86	12.9
Tripura	10,486	3673917	1874376	1799541	960	350	14.8

Source: National Health Profile, 2015

The health sector specific information of the north eastern states (**Table 2**) says that, being the largest economy in the North East with an estimated Gross State Domestic Product (GSDP) at current prices at ₹ 1,98,098 crores, Assam spends the highest in the field of health sector. Assam yet does not hold the record of being the state with the highest per capita health expenditure or when health expenditure is calculated as a percentage of GSDP. In

fact, on the above mentioned yardsticks, Assam ranks the lowest among all the North Eastern states as its per capita health expenditure stands at ₹ 1137 and it spends only 1.83 percent of its GSDP. Sikkim has the highest per capita health expenditure in the North East at ₹ 5666 and Mizoram spends the highest in the health sector as a percentage of the GSDP (4.64 percent).

Table 2: Health expenditure figures in NER of India, 2014-15

States	Population (₹ Crores) 2014-15	Total health expenditure on health (₹ Crores)	Total state expenditure (₹ Crores)	Health Expenditure as a % of total health expenditure	GSDP 2014-15 Current Prices (₹ Crores)	Health Expenditure as a % of GSDP	Per capita health expenditure (₹)
Arunachal Pradesh	0.13	671	10899	6.16	16761	4.00	5196
Assam	3.19	3626	63609	5.70	198098	1.83	1137
Manipur	0.25	625	10901	5.73	18043	3.46	2450
Meghalaya	0.27	645	11683	5.52	24408	2.64	2366
Mizoram	0.10	536	7359	7.29	11559	4.64	5130
Nagaland	0.23	498	8941	5.57	18414	2.7	2127
Sikkim	0.06	361	6627	5.44	15209	2.37	5666
Tripura	0.38	853	11986	7.12	29667	2.87	2266

Source: National Health Profile, 2015

III. OBJECTIVES OF THE STUDY

The specific objectives of the paper are:

- to study the variation in the diseases of circulatory system as the medically certified causes of death in the North Eastern Region of India.
- to study the age-sex variations in the diseases of circulatory system as the causes of death in the North Eastern Region of India.

Methodology Used in the Present Study

The report on MCCD-2015 for the whole country is based upon 11,83,052 total medically certified deaths (Male: 7,36,882 and Female: 4,46,170) accounting for 22.0 per cent of total registered deaths in respect of 33 States/UTs which supplied data for the report. The percentage of the medically certified deaths in the registered deaths is more than 50 percent for only Tripura and, Manipur, whereas for states like Nagaland and Arunachal Pradesh, the respective figures stand at 8.2 percent and 13.8 percent.

The number of medically certified of deaths in the North Eastern States of India, as per the MCCD 2015, is as under:

Table 3: Medical certification of deaths in NER of India in 2015

States	Number of medically certified deaths
Arunachal Pradesh	504
Assam	30017
Manipur	2077
Meghalaya	5708
Mizoram	2762
Nagaland	169
Sikkim	1321
Tripura	6496
NER States	49054
Total MCCD Reporting States/UTs	1183052

Source: MCCD, 2015

The paper mainly uses descriptive statistics to analyse the data as per the objectives mentioned above. The data which provide the base for the present analysis are presented in various tables as shown in the appendix.

IV. ANALYSES AND DISCUSSION

The MCCD provides data on medically certified causes of death in eight broad categories. These eight leading causes (groups) of deaths constitute around 88.0 per cent of total medically certified cause of deaths in the country.

- Diseases of Circulatory System - 33.2 per cent
- Certain Infectious and Parasitic Diseases - 11.0 per cent
- Diseases of Respiratory System - 9.0 per cent
- Certain Conditions Originating in the Perinatal Period - 6.6 per cent
- Injury, Poisoning and Certain other Consequences of External Causes - 6.2 per cent
- Neoplasm - 5.3 per cent
- Diseases of Digestive System - 4.4 per cent
- Symptoms Signs & Abnormal Clinical Findings (Not Elsewhere Classified) - 12.2 per cent

When we go deeper into the data and try to find out the magnitude to which diseases of circulatory system like atherosclerosis (hardening of arteries), heart attack, mitral valve prolapse, etc. account for the total number of medically certified deaths in North East India, then we observe the followings:

- Arunachal Pradesh:** 19.6 Percent
- Assam:** 6.9 Percent
- Manipur:** 24.1 Percent
- Meghalaya:** 15.6 Percent
- Mizoram:** 13.9 Percent
- Nagaland:** 18.9 Percent
- Sikkim:** 27.7 Percent
- Tripura:** 37.9 Percent

The above data show that Tripura accounts for the highest deaths as a percentage to the total number of medically certified deaths related to diseases of circulatory system, followed by Sikkim and Manipur. As far as age – sex variation in these deaths is concerned; it is presented in Table 4.

Table 4: Medically certified deaths for diseases of circulatory system by age group and sex for the NER of India, 2015

States	Sex	Age Groups				N. S.	Total
		0-14	15-44	45-64	65+		
Arunachal Pradesh	Male	0	27(32.9)	34 (41.5)	21 (25.6)	0	82 (100.0)
	Female	0	5 (29.4)	4 (23.5)	3 (17.6)	0	17 (100.0)
	Total	0	32 (32.3)	38 (38.4)	24 (24.2)	0	99 (100.0)
Assam	Male	0	56 (4.8)	446 (38.6)	414 (35.8)	240 (20.8)	1156 (100.0)
	Female	0	49 (5.4)	288 (31.6)	356 (39.1)	217 (23.8)	910 (100.0)
	Total	0	105 (5.1)	734 (35.5)	770 (37.3)	457 (22.1)	2066 (100.0)
Manipur	Male	13 (3.7)	49 (14.1)	131 (37.7)	153 (44.1)	1 (0.3)	347 (100.0)
	Female	3 (1.9)	15 (9.9)	62 (40.5)	73 (47.7)	0	153 (100.0)
	Total	16 (3.2)	64 (12.8)	193 (38.6)	226 (45.2)	1 (0.2)	500 (100.0)
Meghalaya	Male	16 (2.9)	107 (19.5)	208 (37.9)	197 (35.9)	20 (3.6)	548 (100.0)

	Female	11 (3.2)	48 (13.9)	93 (26.9)	191 (55.4)	7(2.0)	345 (100.0)
	Total	21 (2.3)	155 (17.3)	301 (33.7)	383 (42.9)	27 (3.0)	893 (100.0)
Mizoram	Male	22 (8.8)	59 (23.6)	82 (32.8)	87(34.8)	0	250 (100.0)
	Female	15 (11.2)	22 (16.4)	36 (26.9)	61(45.5)	0	134 (100.0)
	Total	37 (9.6)	81 (21.0)	118 (30.7)	148(38.5)	0	384 (100.0)
Nagaland	Male	0	4 (18.2)	8 (36.4)	8(36.4)	2 (9.0)	22 (100.0)
	Female	0	2 (20.0)	3 (30.0)	4(40.0)	1 (10.0)	10 (100.0)
	Total	0	6 (18.7)	11 (34.4)	12(25.5)	3 (6.4)	32 (100.0)
Sikkim	Male	1 (0.5)	33 (15.4)	69 (32.2)	110(51.4)	1 (0.5)	214 (100.0)
	Female	2 (1.3)	30 (19.7)	50 (32.9)	70(46.0)	0	152 (100.0)
	Total	3 (0.8)	63 (17.2)	119 (32.5)	180(49.2)	1 (0.3)	366 (100.0)
Tripura	Male	184 (10.8)	232 (13.6)	580 (34.0)	697(40.9)	13 (0.8)	1705 (100.0)
	Female	120 (15.9)	114 (15.1)	225 (29.8)	293(38.8)	2 (0.3)	754 (100.0)
	Total	304 (12.4)	345 (14.0)	805 (32.7)	990(40.3)	15 (0.6)	2459 (100.0)
NER States	Male	236 (5.4)	567 (13.1)	1558 (36.0)	1687(39.0)	276 (6.4)	4324 (100.0)
	Female	151 (6.1)	285 (11.5)	761 (30.7)	1051(42.5)	127 (5.1)	2475 (100.0)
	Total	387 (5.7)	851 (12.5)	2319 (24.1)	2733(40.1)	403 (5.9)	6799 (100.0)

- Calculation based on MCCD, 2015. Figures in the parentheses represent percentages.

Compared to other states of the NER, Tripura and Arunachal Pradesh have the highest incidence of diseases of circulatory system for both males and females in the age groups of 0-14 years and 15-44 years respectively. For example, males (10.8 percent) and females (15.9 percent) in the age group 0-14 years in Tripura suffer from these diseases (5.4 percent for males and 6.1 females in the NER), whereas the corresponding figures in the age group 15-44 years in Arunachal Pradesh are 32.9 percent and 29.4 percent respectively against the NER figures of 11.5 percent and 12.5 percent.

V. CONCLUSION

The number of premature adult deaths in the North East India is very high if we go by the Report on Medical Certification of the Causes of Death, 2015. For example, out of all the medically certified deaths, the age group 65+ accounts for around 16 percent in Arunachal Pradesh, 20 percent in Assam, 17 percent in Manipur, 11 percent in Meghalaya, 7 percent in Mizoram, 7 percent in Nagaland, 15 percent in Sikkim and 21 percent in Tripura. The aggregate percentage for the NER is 18 percent. Therefore, the given the national life expectancy at approximately 68 years in 2015, the remaining deaths (excluding the number in the not specified list) in the NER can safely be termed as the premature deaths.

The percentage of medically certified deaths to total registered deaths and the percentage of registered deaths to all deaths are found to be lower. Majority of the medically certified causes of the death are found to be in the productive age group of 15 – 64 years. Until and unless most of the deaths are registered

and also the causes of the death are ascertained, the public health planners will have tough task to formulate a comprehensive health policy to meet the demand of the ever growing millions in India.

The diseases of circulatory system also account for the significant number of medically certified deaths across North East Indian states and a widespread variation is also observed among the North Eastern states in terms of diseases of circulatory system accounting for the significant number of medically certified deaths.

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Relationship Between Marketing Strategies And Firm Performance Of Food And Beverage Processing Companies In Kenya

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Abstract- This paper sought to find out the influence of marketing strategies on firm performance of Food and Beverage processing Companies in Kenya. The study adopted a descriptive cross sectional survey method. A census survey comprising 71 senior managers was contacted for this study. Data was analyzed using descriptive and simple regression analysis. The findings established that product and pricing strategies were the most practiced by the food and beverage processing firms. The regression results revealed a positive and statistically significant relationship between Marketing strategies and firm performance. The study recommends for policy makers and management of food and Beverage companies to support these firms by offering marketing management skills, capabilities and push for legislations aimed at low interest rates for startup firms, reduced tax on essential processed commodities and subsidized inputs by the Government.

Index Terms- Marketing strategies, Firm performance, Food and Beverage processing Companies.

I. INTRODUCTION

Marketing strategies is a blend of the four-strategy elements namely product, price, place and promotion that marketers use in their efforts to satisfy customer requirements and attain organizational goals (McCarthy, 1971). Kotler and Armstrong (2001) pointed out that the entire firm's marketing mix endeavors must be geared towards improving the performance of organizations. An organizational success is defined by the ability to execute marketing strategy decisions effectively and efficiently (Varadarajan, 2010).

Strategic marketing theories and the stakeholder theory guided this study and it focused on manufacturing sector in Kenya. Marketing strategies are processes which are concerned with product designing and development, pricing and distributing to meet buyer requirements (Greenley, 2007). Stakeholder view concerns the interested groups in company activities.

Manufacturing sector in Kenya which is critical in wealth and job creation as explained in Kenya's Vision 2030 blue print formed the basis of this study. Food processors and beverage

bottling and packaging companies have a unique role in the manufacturing industry in enhancing business opportunities because they are universal to human life and sustenance.

Marketing strategies are concerned with management of classical four Ps (4Ps); product, price, place and promotion (Morgan,2009).Changing customer needs and competitive business environment require adaptation to produce and deliver products and services that match customer expectations(Slater et al, 2005).Effective pricing strategies have an impact on value perception and about competitor and companies need to be knowledgeable about it (Dawar & Parker, 2004).Firms need to develop essential marketing communication skills to enhance purchase decisions and reduce cognitive dissonance by constantly communicating products and services benefits to potential customers in order to be competitive in an industry(McKee, 2002.).

Firms' broad goals can be achieved if better and efficient marketing strategies are implemented to lead the allocation of scarce resources through marketing capabilities. Knowledge by both managers and marketing academics about the link between marketing strategies and firm performance is very important for the purposes of continued growth of their firms

II. LITERATURE REVIEW

Marketing management literature draws greatly from strategic marketing theory. According to McCarthy (1971) the strategic marketing theory comprises four elements; product, price, place and promotion which marketers used to meet buyer requirements and eventually attain company goals. These elements popularly known as four Ps are the major marketing strategy components that marketers must use to design a mix and cater for their market needs (Jha, 2012). Strategic marketing theory is an amalgamation of theories relating to specific marketing mix elements;product, price,place and communication theories.

Theories that advance the notion of product as a critical marketing mix element are bountiful. Among them is product life

cycle theory, new product development theory, product adoption and diffusion theory, product branding theory, product packing theory among others. Product life cycle theory first introduced by Raymond Vernon in 1950s to describe characteristics of international trade details the stages that every product or service undergoes during its life cycle. These stages are; new product development, introduction, growth, maturity and decline stage. At different stages product revenues and consequently the profits fluctuate. These fluctuations require different marketing strategies to assure success and enhance performance of the product. New product development theory as documented by various authors like Booz and Hamilton (1982) concerns the importance of introducing new products in a company's product portfolio for continued business success. The theory documents critical stages that new product development process takes that culminate in to a new product in to the market.

Product adoption and diffusion theory was advanced by Rogers (1962) in his book, diffusion of innovations. According to this theory, diffusion is a process of new product adoption by the users and the rate of diffusion refers to the speed by which a new product circulates among users through new buys. A higher diffusion rate implies faster acceptance of a product hence high product success in the market. Product branding theory emanates from the understanding of the importance of company products and services identifier from their competitors'. These identifiers could be inform of a company name, symbol, logo or just a combination of any of them and it is critical in differentiating its products and services. Branding as a recognition element especially at the point of sale or as a communication anchorage assist buyers to a great extent in their purchase decision making process as they identify with it. This is an implication that effective branding strategy can enhance product performance in the market. Product packaging theory as explained by Wansink and Huffman (2001) concerns what holds up the product as it awaits purchase. Adoption of an effective packaging strategy will go a long way in protecting, preserving and facilitating distribution. It will also aid in communicating with customers, contribute to sustainable marketing and influence buyer product perceptions and evaluation processes.

Although marketing research on price setting seems to be scanty, there is a precise method to price determination that considers cost of production, the market segment, consumer response behavior and the overall integration of other marketing mix elements (Rao, 2009). More recent research conceptualize pricing decisions as a relationship among strategic management variable, such as pricing strategies, external influencing variable (perceived quality, competition reaction), internal influencing factors like costs, margins and organizational objective variables (profits, market share and customer retention) (Smith, 2009). Organizational pricing strategies are plans put in place to manage price and enhance competitiveness in the market place and achieve organizational objectives. Pricing decisions and judgments are executed at the price implementation actions to achieve strategic pricing goals and objectives.

Different pricing strategies can be adopted including skimming, penetration and competitor pricing strategies among

others depending on product differentiation, cost of production and customer response behavior. Literature suggests that pricing decisions are very important and very critical because price changes directly impacts on several other company performance indicators like profits, sale, market share and customer retention.

Literature has advanced studies in relation to the fourth marketing mix element the place, more specifically on distribution channels. Channel management has been one of the earliest concerns by marketing researchers because of its importance concerning product market reach. Marketing literature has over the years advanced diverse dimensions concerning channel theory. Stern and Reve (1980) states that channel theory can be categorized into two broad dimensions. One dimension is an economic approach and the other is a behavioral dimension. Accordingly, economic dimension deals with the analysis of the channel efficiency concerned with aspects of channel designing and structuring. This dimension further applies micro economic theory that focuses on horizontal and vertical market distribution systems. Channel structuring; designing and identification of a distribution system are strategic marketing functions that require organizational consideration because they are increasingly being considered to be key determinants of industry competitiveness and profitability (Chen & Lai, 2010).

Efforts by diverse researchers have resulted to an integrated marketing communication theory commonly referred to as contemporary marketing communication theory. The theory postulates that communication is a process that tries to develop commonness with others and comprises three critical parts; the message source, message itself and the message receiver. The process starts when the message is encoded by the source, the source transmits the message and it is received by the decoder. Communication or commonness is arrived at only if there is commonness between the decoder and the encoder. Message distortion may occur and commonness may not be achieved and the process requires a medium by which the message is conveyed (Buttle, 1995). The theory is best depicted by the marketing communication process model.

The stakeholder theory as expounded by Freeman (1984) identified and categorized groups which he referred to as stakeholders of a firm. He further suggested ways by which managers can satisfy the expectations and interests of each of these groups. Each of these stakeholders has a unique interest and values a unique set of company goals (Fitzgerald & Storbeck, 2003). The theory attempted to address the principle of who or what really counts. According to this theory therefore the sum total of utility created for each stakeholder defines firm performance through its activities and this forms its basis that a firm should serve multiple stakeholders.

In the recent past, there has been a focus by managers and scholars on the link between financial performance and resource deployment to marketing efforts (Moorman & Rust, 2004). Alterations made to the marketing strategies and specifically the 4Ps of the marketing mix determines organizational performance.

A study done by DeDee et al (2008) established that there was an increase in return on common equity as a result of

enhanced product and services development capabilities, and control over types of research and development costs. Research and development expenditures on products and services enhance long term sales goals and should never be cut back. A study by Bennett (2005) focusing on construction industry in Britain (UK) concluded that firm performance is not influenced by price stability overtime during periods of general inflation. Low price and standardized product quality and standardized pricing mechanism for high quality products has been suggested to positively impact on firm performance (Ang et al,2001).This study was however carried out on quite unrelated industry (construction) and only two variables were considered. With this knowledge from existing literature, it is prudent to incorporate price strategy in every marketing effort if better performance levels are to be realized.

The adoption of various promotion strategies for purposes of organizational performance is also of great importance. A study by Kim (1998) established that in dynamic business situations, constant advertising enhance company sales volumes and increases market share. In addition,DeDee et al (2008) established that those companies that focused on staff reduction and cutting on advertising budget performed poorly compared to those who increased their marketing communication budget. In times of hard economic conditions, buyers experience lower purchasing power and therefore exhibit a more rational buying behavior. Such conditions call for companies to focus on more appealing attributes like product safety, reliability and durability instead of image and status in their advertising campaigns (Shrager, 2002).

A study done in former Yugoslavia by Shama(2001) found that, during a period of poor performance, many firms shifted their focus from their long term objectives to listening and responding to their customer demands through sales representatives. They concluded that continued sales personnel interaction with them can eventually result to desire for company products. The study however was not industry specific and no performance indicators were identified to be impacted on by the marketing strategies.

Studies on distribution management have suggested various ways that can impact on firm performance. Such ways include; redistribution of limited resources to those channel

members that are better performing and eliminating insignificant and unprofitable channel members. A study of Australian firms by Ang et al (2000) concludes that choosing only effective channel members and directing company efforts to discount wholesalers improve company sales volumes. They concluded that a positive company performance can be realized by lowering the operating costs and enhancing cooperation with the chosen alternative channel member.

A study by Oke (2015) in Nigeria focusing on financial services gave positive results of improved performance. He concluded that effective marketing mix is what can guarantee improved performance in service industry like financial institutions. Another related study in Kenya by Arasa et al (2014) indicated strong and positive relationship between competitive strategies, and firm performance. Locally both Karanja (2014) and Arasa et al (2014) established that competitive marketing strategies had a strong and positive relationship with firm performance. However, these studies were in financial sector and mobile banking sector respectively and in quite different environment. This study is based on the operationalization of strategic marketing variables in relation to (McCarthy, 1971).

III. METHODOLOGY

This study adopted a descriptive cross sectional survey design. A census survey was contacted for the population comprising seventy one Food and Beverage companies operating in Kenya which are duly registered members of Kenya Association of Manufacturers (KAM) as at 31st, August 2017. Data were tested for reliability before analysis using Cronbach’s alpha. Descriptive statistics and simple regression analysis were used to analyze the data.

IV. FINDINGS OF THE STUDY

Descriptive statistics was first used to analyze the data; Mean scores and standard deviation. The results are presented in Table 4.1.

Table 4.1 Summary of Descriptive Statistics for Marketing Strategies

Study Variable	Dimension Description	N	Mean Scores	St.Dev
Marketing Strategies	Product Characteristics	64	3.24	1.163
	Pricing Strategies	64	3.77	1.003
	Promotion Strategies	64	2.82	1.075
	Place(Distribution) Strategies	64	3.89	1.030

Results from Table 1.1.shows that product strategies with a mean score (3.24) were adapted to a moderate extent and that product differentiation is a critical practice in product strategies.

Pricing strategies with an average mean score of 3.77 indicates that it is to large extent considered a critical element in the marketing strategy of a company. The average mean score of 2.82

indicates that promotion strategies had a moderate effect on the overall marketing strategy of the organizations. The average mean score for all the statements on place was 3.89 while the average standard deviation was 1.030 and CV was 27%. The findings show

that channel management through innovative distribution strategies and practices enhance channel performance and effectiveness.

Table 4.2 Summary of Descriptive Statistics for firm performance

	Dimensions of Performance		N	Mean Scores	Std.Dev.
Firm Performance	Financial	Summary	64	3.53	1.0771
	Non-Financial	Customer Loyalty	64	3.21	0.991
		Customer satisfaction	64	3.69	1.088
		Employee loyalty	64	3.46	1.139
Average Score			64	3.48	1.074

Firm performance was measured on two broad dimensions: financial and non-financial measures. The operationalisation of performance follows freeman (2002) and Barney (2010). Financial gain and customer satisfaction was the greatest gain after adoption of marketing practices with Mean score 3.53, Std.Dev. 1.0771 and

Mean Score 3.69, Std.Dev. 1.088 respectively. It is noted that all dimensions of performance were highly rated indicating that they were outcomes of marketing practices.

Table 4.3 Regression Results of Marketing Strategies and Firm Performance

(a) Goodness of Fit

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.365 ^a	.133	.119	.439

(b) Analysis of Variance (ANOVA)

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.838	1	1.838	9.520	.003 ^b
	Residual	11.971	62	.193		
	Total	13.809	63			

a. Dependent Variable: Firm Performance

b. Predictors: (Constant), Marketing Strategies

(c) Regression Coefficients

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.376	.493		2.792	.007
	Marketing strategies	.424	.137	.365	3.085	.003

Dependent variable: Firm performance

The results in the above Table 4.3 shows that marketing strategies have a statistically significant influence on firm performance and explains 13.3% of variance (R2 = 0.133). The standardized regression coefficient (Beta) of the composite score of marketing strategies was 0.365 with a t-test of 3.085 and a p-value of 0.003. The results imply a linear relationship between firm performance of food and beverage processing firms and their marketing strategies.

V. DISCUSSIONS OF FINDINGS

The findings suggest that marketing strategies influence firm performance. Marketing strategies were measured in terms of product strategies, pricing strategies, promotion strategies and distribution strategies. On the other hand firm performance was measured in terms of financial performance and non-financial

indicators. More specifically, the non-financial indicators included customer loyalty, employee satisfaction and customer satisfaction. The study found that the 4Ps of marketing; product, price, promotion and place (Distribution) have a statistically significant effect (p-value of 0.003, R² = 0.133) on firm performance, however the effect was more pronounced for product strategies. The findings are consistent with previous studies such as by Ronald (2010) who contends that the level of firm performance is positively related to marketing strategies adopted by a firm.

VI. CONCLUSION

From these findings, it can be concluded that product characteristics comprising packaging, color, and other relate attributes are key in determining the effectiveness of other Ps; pricing, promotion and distribution. The findings agree with the theme of strategic marketing theory that postulate the 4Ps as the major marketing strategy components that marketers must use to design a mix and cater for their market need. (McCarthy, 1971). The overall results is consistent with other similar studies that confirms that firms need to understand the marketing mix related to the 4Ps well to be competitive in the industry(Jha, 2012). This study concludes that implementation of key marketing strategies by these firms will result in improved firm performance as indicated by key performance measures. The study recommends managerial support, industry policies aimed at reducing production cost and favorable legislations that supports new business startup.

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Understanding the Effect of University Service Quality on Student Loyalty to Online Learning Adoption in the Light of COVID-19 Pandemic

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Abstract. The COVID-19 Pandemic has caused significant disruption to a wide range of human activities, with academic commitment at universities being one of the most important. By the end of COVID-19, everyone will recognise that universities cannot be held responsible for the adoption of online studies. However, in the context of the COVID-19 Pandemic, it is critical to investigate the relationship between "University Service Quality" and "Student Loyalty" in order to better comprehend the impact of online learning adoption. Studying the Influence of university service quality on student loyalty to online learning adoption in the context of the COVID-19 Pandemic, on the other hand, will lead to greater understanding of how students' commitment to online learning is linked to how satisfied they are with their university's services in the wake of the COVID-19 outbreak. As a result, a focus group experiment was conducted with university students to determine their level of loyalty towards their universities based on their online studies instead of face-to-face. According to the findings, students believe they should be compensated in some way because they paid for face-to-face instruction while receiving online instruction. The universities should not charge the same amount for online learning as it does for face-to-face study. Consequently, they lost a lot of faith in the university, and their loyalty to the university dropped drastically.

Keywords: student loyalty, service quality, COVID-19 pandemic.

1 Introduction

Many human activities have been disrupted as a result of the COVID-19 Pandemic, including university academics' commitments (Watermeyer et al., 2021). Because of COVID-19, colleges will no longer be held liable for the adoption of online courses by their students. In light of the COVID-19 Pandemic, research into the relationship between "University Service Quality" and "Student Loyalty" toward online learning is critical (Putri et al., 2020). In the wake of the COVID-19 pandemic, students' propensity to use online learning may be investigated in terms of how service quality affects their commitment to it. Student progress toward face-to-face learning has been hampered by the COVID-19 problem, which has forced universities to close their campuses and leave them without a plan for restarting face-to-face learning because COVID-19 spreads swiftly. On the 18th of March 2020, universities and practically all academic institutions in Malaysia close as part of the first lockdown for movement control under the "Movement Control Order (MCO)" (Azan et al., 2020). When school was closed for the first time, the first alternative considered was to begin all academic activities online without any prior pilot planning or preparation. The majority of universities were operating under the assumption that, in a few weeks, everything would be back to normal and academic activities would resume as usual.

The increased spread of the COVID-19 makes it difficult to predict when the university will be able to resume normal operations. Unfortunately, the likelihood of the virus spreading can only be predicted or extrapolated in some cases (Case et al., 2021). In practical, all universities around the world uses the option of online learning which has replaced traditional classroom instruction as the primary mode of doing all academic activities (Zalat et al., 2021). As the spread of COVID-19 proceeds, universities are being compelled to implement re-opening measures despite the virus's presence on their campuses (Saikat et al., 2021). The initiatives, on the other hand, place a strong emphasis on the well-being of students and the support provided to those from socioeconomically disadvantaged homes. It is equally crucial that all students participate in the establishment of a comprehensive set of safety measures in order to ensure that students feel comfortable and that they may participate in online learning when away from the university campus. COVID-19 may cause students to be gone from usual academic activities for an extended period of time. If this is the case, it is critical that students consider what academic activities they will be able to participate in during this period of prolonged absence. Furthermore, it is necessary to address general student performance and safety concerns while conducting online learning activities. Specifically, addressing the requirements of the most vulnerable groups of students and their individual vulnerabilities. The lack of computing resources is one of the most important concerns for these groups, as a lack of such resources may

result in a higher risk of school dropout and exacerbated disparities, which are frequently the result of unequal access to alternate learning techniques. These are among the major research problems this current study is willing to solve.

As a result of the COVID-19 pandemic, one of the primary objectives of this current study is to investigate students' participation in an online study in order to analyse the influence of "University Service Quality" on "Student Loyalty" to online learning adoption. Additionally, it is necessary to determine which factors may also have an impact and whether special consideration should be given to students from low-income families, students with disabilities, and other vulnerable students when participating in online studies as a result of COVID-19. Finally, it is necessary to examine whether special needs and vulnerable students are more interested in participating in online studies than the general population.

With the exception of this section, the remaining sections of the paper are organised as follows: The literature review for the study was presented in Section 2, the research methodology was presented in Section 3, the results and discussion of the research were presented in Section 4, and the implications of the research were presented in Section 5. Finally, Section 6 is the conclusion which summarises the findings of the research.

2 Literature Review

The lack of access to technology or resources necessary for an online study during COVID-19 may cause some students to experience problems (Baticulon et al., 2021). However, even if they have access to the equipment and resources necessary for an online study during COVID-19, other students may experience difficulties in creating a conducive learning environment (García-Morales et al., 2021). Therefore, these children are more likely to suffer from the most severe academic difficulties as well as psychological harm over the course of their education. Typically, university services are not included in the implementation of the tools and resources that students will need to work from home (Sari & Nayır, 2020). There have been a number of past studies that have looked into the nature of student loyalty across the university service quality on pushing students to participate in online learning in the wake of the COVID-19 epidemic.

In the context of university education, the academic and administrative service provided by students results in the university gaining a certain level of loyalty from those who have received that service (Sabo & Yahaya, 2019). To put it another way, when students receive the highest quality academic and administrative services, they become more loyal to the university. Consequently, in terms of university students, service quality is considered to be student-based rather than resource-based, as opposed to other types of students (Awang et al., 2018). Moreover, according to Nguyen (2018), "university staff members are more empowered than employees in other service industries, such as financial institutions, owing to the greater autonomy that they have in communicating with students." As a result, it is expected that human interaction with students in universities will play an important role in defining and assessing service quality in educational settings. In their 2018 paper, Roy, Shekhar, Lassar, and Chen defined perceived service quality as a global judgement, or attitude, about how superior a service is.

Due to the COVID-19 pandemic period, during which students are required to stay away from their university campuses and complete all of their academic activities online, student loyalty will now be a key strategic theme in higher education institutions. To put it another way, universities must strike a balance between their educational offerings, financial systems, and student performance in order to gain a competitive advantage. In terms of what it takes to win a student's loyalty, during COVID-19, attitudinal loyalty expressed through positive words of mouth and recommending specific words of encouragement to students" were discussed (Dumrongsuntithum, & Wongleedee, 2019).

According to previous research, behavioural loyalty is expressed by the frequency with which something is repeated and the consistency with which it is done in relation to the subject under consideration (Pham, Lai, and Vuong, 2019). If a student pays for an on-campus face-to-face mode of study but is then forced to switch to an online mode of study, they may have a problem maintaining their loyalty if they do not receive some sort of discount. That is, students will be aware of their expenses and the value of their purchases, and they will demonstrate cognitive loyalty to a particular institution after critically examining all available alternatives and making a logical decision about their future. As a result, according to Wiklund and Jansson (2019), loyalty includes both readiness to act and resistance to the available alternatives. They argue that loyalty is defined as a customer's intention or predisposition to buy while retention is defined as the behaviour itself. The unique aspect of student loyalty has to do with the amount of time students spend on campus, which allows for systematic relationship building and the development of emotional attachments among them. Iranmanesh and colleagues (2022) discover that the quality of information, trust in members, and social usefulness all play important roles in determining students' satisfaction and loyalty. In other words, student loyalty is critical to any institution of higher learning because it assists in the management and promotion of the institution's academic and non-academic affairs, as well as the establishment, development, and maintenance of successful long-term relationships with current and former students (Annamdevula and Bellamkonda, 2016).

Mostafa and Hamieh (2022) conduct an investigation into the influence of Corporate Social Responsibility activities on attitudinal loyalty and behavioural loyalty using a sample of 203 Lebanese students as a research subject. The findings revealed that ethical, legal, and philanthropic social responsibility have a significant impact on both attitudinal and behavioural loyalty in a company. However, the effect of economic responsibility on attitudinal and behavioural loyalty was found to be insignificant in this study. In turn, this indicates that student loyalty, similar to customer loyalty, should, at least in the long run, be positively related to student satisfaction and the performance of an educational institution (business unit).

3 Research Methodology

This current study adopts a focus group research methodology, specifically, a teleconference focus group discussion strategy, in order to better understand the relationship between student loyalty to online learning adoption and the university service quality in the context of the COVID-19 Pandemic. All ethical norms were adhered to throughout the process. When the COVID-19 pandemic outbreak occurred, students who were in the midst of their academic careers were eligible to participate in the study. Those who took part in the study were chosen from a pool of answers to invitations to take part in the study. Following that, a consensus was achieved on the group's online meeting schedule, with the goal of performing the teleconference focus group discussion via Microsoft Teams Meeting as the primary method of communication.

At the outset of the teleconference focus group discussion, it was made clear to the participants (students) in the online group discussion that the purpose of the research was to examine the relationship between "University Service Quality" and "Student Loyalty" to online learning adoption in the context of the COVID-19 pandemic. Furthermore, the research aims to measure the extent of student loyalty towards their universities based on their online studies rather than face-to-face interactions with faculty. Also emphasised to the students was that in order to attain the goal of this study, they would need to participate in a conversation in small groups with one another. The researcher engaged in a discussion with the student and took notes on their points of view. There were approximately six separate group discussions that took place, involving a total of 47 students, with the minimum number of students in a group being six and the maximum number of students in a group being thirteen. In addition, four sessions were held with seven students each, bringing the total number of students in a group to 47. In each of the groups. It took little more than an hour of discussion to get to a conclusion. Within the context of the COVID-19 epidemic, the subject of the discussion focuses on "University Service Quality" as it relates to student loyalty to the university and the use of online learning opportunities. The data was gathered and evaluated in order to produce qualitative outcomes.

4 Analysis and Presentation of the Results

Immediately following the conclusion of each group's discussion, the data analysis and presentation of the results were carried out in the following order: When putting together the material on the group conversation, the transcripts of Microsoft Teams Meetings were used as a resource. As an illustration, this is a fantastic alternative to transcribed text. It has led to substantial breakthroughs in the field of focus group research as a result of these efforts. It has an impact on qualitative research, which is influenced by grouping data into a few subjects ranging from five to seven themes, according to the results of data analysis (Creswell & Creswell, 2017). In order for the information acquired for this study to be properly organised and prepared for analysis, it was necessary to classify and organise it into discrete themes in order for the study's analysis and interpretation to be successful.

Evaluations of Extracted Results

The extraction assessments are also known as data coding, and it is the act of collecting and aggregating information in a novel way in order to develop facts from the information (Miles et al., 2018). As a result of this process, this research was able to extract the most relevant concepts from students' responses of the focus group discussion that was provided by the researchers, and are able to organise them into categories as well. The data gathered from the extracted text, according to the objective of this study, and was organised into concepts and themes. Following extensive deliberation, the summary of ideas and topics was split into categories, which are depicted in the accompanying Table 1. Three experts evaluated the quality of the extracted themes in order to verify that the themes were easily understandable by the readers after they were removed. This ensured that the primary ideas and conceptual elements accurately represented the real facts behind the objectives of what the research is willing test.

Table 1. The Summary of the Extraction Procedures for University Service Quality

Focus issue	Extracted themes
University Service Quality in the light of COVID-19 pandemic	i., as a result of the COVID-19 outbreak, the university sends videos as lectures... i...., because to the COVID-19 epidemic, even the student portal frequently crashes... i...., several internet queries were delayed or inaccessible due to the COVID-19 outbreak, ...

	<p>....., given the COVID-19 outbreak, university services have improved. Because of COVID-19's numerous flaws, various public opinions of its good, ...</p> <p>....., due to the entire suspension of most academic activity, the quality of university services cannot be measured, ...</p> <p>i....., the COVID-19 pandemic has questioned university service quality. This occurred due to a broken Internet connection, ...</p> <p>i....., the lockdown demotivated me academically, and the university's response to the COVID-19 outbreak was inadequate, ...</p> <p>i....., In light of the COVID-19 epidemic, the quality of university services has deteriorated, ...</p> <p>k....., students have trouble coupling, and if you're studying during lockdown, the quality of university services suffers, ...</p> <p>k....., Internet learning is difficult and has hampered university services due to the COVID-19 epidemic, ...</p> <p>i....., although I feel COVID-19 has no impact on my research, the process is cumbersome and has lowered the quality of university services, ...</p> <p>i....., In light of the COVID-19 pandemic, the quality of university services has impacted many families, including mine, ...</p> <p>i....., the COVID-19 epidemic has prompted worries about university service quality due to frequent Internet connection failures during online classes, ...</p> <p>....., COVID-19 has raised the bar for university service quality, ...</p> <p>....., several times during the lecture, we lost Internet connectivity, ...</p> <p>i....., the study went well overall, but there were a few Internet issues here and there. Time constraints also hampered research, affecting the quality of university services during the COVID-19 Pandemic, ...</p> <p>i....., In light of the COVID-19 pandemic, I was unable to get what I need quickly, ...</p> <p>i....., slow Internet during lectures makes it difficult to focus on the topic, it has been a concern since the COVID-19 outbreak...</p>
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The extracted themes, dwell on the central issues with the COVID-19 and how it boosted the value of service quality at universities. The extraction indicated a communalities on most online lectures plagued by problems with Internet access, that according to students this is mostly associated to the instructors Internet service. Furthermore, because of the COVID-19 pandemic, some universities are focusing on videos as lectures instead of synchorouns lectures. The extraction of themes indicate that University service quality is tarnished by a COVID-19 pandemic. This is due to many failures associated to student portals frequent crashed. Numerous Internet requests were slowed or halted as a result of the COVID-19 outbreak. Furthermore, concerning student loyalty, the extraction of the finding from the focus grou discussion is presented in Table 2.

Table 1. The Summary of the Extraction Procedures for Student's Loyalty

Focus issue	Extracted themes
<p>Student loyalty towards their universities online learning adoption in the light of COVID-19 pandemic</p>	<p>i....., although I would prefer to be on campus, I don't want to squander time because we paid for face-to-face education but received online tuition. We should be reimbursed, my loyalty to the university drops...</p> <p>i....., because the university decision is poor, university should have some arrangement in some way because loyalty lies with payment, we paid for face-to-face on campus studiesbut giving online lectures, ...</p> <p>i....., universities are busy and online learning has many issues, but university focus on money most, no discount, no need of loyalty</p> <p>....., university should repay for the money we spent on in-person instruction and now receive via the Internet, ...</p> <p>....., It is only reasonable that we be rewarded for paying for in-person training while obtaining online training, this is where the loyalty lies, ...</p> <p>i....., online learning is difficult due to lack of involvement, my loyalty remains, but we should be compensated for paying for in-person training while receiving online training, ...</p> <p>i....., COVID-19 has no effect on my university performance, however it will be good if university will give discount, ...</p> <p>i....., the university is still maintaining its good image, because it gives academic leave for people affected by COVID-19, ...</p> <p>k....., there is no interaction with the university, which is problematic. I have problem with the way they handle issue, ...</p>

, the university does not provide enough time for online education, they can do better...
, despite the university's best efforts, the payment issue remains unresolved, and the degree or quality of my loyalty remains untouched, ...
 The university does everything it can to be faithful to us, but that is not enough....

In terms of student loyalty, there is a mix-reaction, some students indicate that their loyalty remains intact, whereas the majority are disappointed especially to payment. The extracted themes show that the relationship between students and the university can be better understood and improved by looking at the characteristics of different student groups in various locations. The extracted themes also show that it is possible to create personalised online learning environments that cater to the needs of diverse students and promote their loyalty. Furthermore, the extracted theme also indicates that it is feasible to develop online learning environments that can be tailored to the specific needs of individual students, thus fostering equity in online education. This can help improve student university relationships. It is possible to enhance the quality of the relationships by improving an online learning platform's features.

5 Discussion

Considering the study's findings, it was discovered that the COVID-19 pandemic has increased the importance of service quality at universities. The fact that students have revealed that they have encountered several instances of Internet connectivity troubles throughout the majority of online courses is critical in proving this point. Associated with this are worries regarding the quality of university services, particularly in the wake of the COVID-19 pandemic, where it has been suggested that, in some circumstances, universities have resorted to providing films as lectures, which has been mentioned as an example. In light of the COVID-19 epidemic, this has a detrimental impact on the perception of the university's service quality. Furthermore, the COVID-19 infection has had an influence on the quality of university services, with even the student portal experiencing frequent crashes as a result of the outbreak. Several online requests were delayed or were not accessible as a result of the COVID-19 epidemic, which had a negative influence on the university's service quality. As a result of the COVID-19 epidemic, the university's service quality has significantly increased. Some people's impressions of its effectiveness have evolved as a result of the numerous loopholes that the public has judged untrustworthy.

As a result of the COVID-19 epidemic, it is impossible to assess the overall quality of university services because the vast majority of academic activities have been discontinued completely. The COVID-19 pandemic has prompted concerns about the quality of university services, which have been highlighted in recent weeks. Because of a technical difficulty with the Internet connection, the synchronous lecture did not run smoothly during the session. Students have been demotivated academically as a result of the lockdown, and the university's response to the COVID-19 pandemic has been woefully inadequate. Due to an insufficient service provision, the quality of university services has become a topic of worry following the COVID-19 outbreak in the aftermath. Students are having difficulties coping, which makes it impossible to maintain the quality of university services in the midst of the COVID-19 pandemic. Studying during lockdown is considerably more difficult. Learning on the Internet is extremely challenging, and this has had an impact on the quality of university services in the wake of the COVID-19 pandemic, as the institution's Internet service has been impacted by the virus. Despite the fact that I believe COVID-19 has had no impact on my research, the procedure has been wasteful and has had an impact on the quality of university services in the wake of the COVID-19 epidemic.

The COVID-19 pandemic has had an influence on the quality of university services, which has in turn had an impact on the institution's ability to function well academically. The COVID-19 epidemic has prompted concerns about service quality at universities, which have been raised in the wake of multiple incidents of Internet connection failure occurring during an online class. In general, the study went smoothly, but there were a few technical glitches with the Internet here and there. Additional time restrictions impeded the investigation, resulting in a reduction in the overall quality of university services during the COVID-19 Pandemic. In the wake of the COVID-19 outbreak, there have been instances when students required a response immediately but were unable to obtain one, resulting in a decrease in the overall quality of university services. Contribution to the university While Internet speed during lectures makes it more difficult to concentrate on the topic, it has also emerged as a source of concern in the wake of the COVID-19 epidemic.

The finding also indicates that it is not the fault of the university that students should not be on campus rather than online, but it was revealed that students do not want to waste their time at home waiting for the returning to campus, despite paying for face-to-face education but receiving online service, it is quite difficult that the university can offer some compensation, while students also expect to receive some form of compensation. As a result of the university's shaky decision, studies should be placed on pause until it can return to campus. Students emphasized that they should be compensated in some way because they paid for face-to-face education while receiving online instruction. They also dwell on not having enough time to devote to a wide range of activities, and online learning has a number of drawbacks. Students' accessibility is a concern, and there is no interaction with other students, that is another fact that draws back the loyalty students have for the university. In some certain situation, COVID-19 has had no effect on the academic performance of some students, in their perspective. Some of the opinion of the students lies with the academic leave that the university consider to offer to students for those who have family members who have been affected by COVID-19,

6 Conclusions

The study's conclusions have shown that there is a need for the universities to improve its service quality. Online students report substantial Internet connectivity concerns. This is vital to the case. Concerns have been raised concerning the quality of video lectures sent as lectures following the COVID-19 outbreak. This impacts service quality at the university due to the COVID-19 outbreak. The COVID-19 outbreak is generating frequent crashes in student portals. COVID-19 epidemic caused delays and inaccessibility of online requests, affecting university service. After the COVID-19 epidemic, the institution's service level might improve. The student's perception of universities has changed due to its multiple shortcomings. Because of the COVID-19 pandemic, most academic activities have been halted. Since the COVID-19 outbreak, university services have been questioned. An Internet connection problem halted the synchronised classes. Demoralised by the university's response to the COVID-19 pandemic mode of operations, students have been worried about the quality of university services. With the COVID-19 outbreak, students have problems coupling, and learning is difficult during lockdown. COVID-19 has impacted university services due to disruptions in Internet service. The COVID-19 outbreak had no impact on research activities, because the process became inefficient and lowered university service quality. In light of the COVID-19 pandemic, students sometimes needed immediate action but couldn't obtain it. Finally, the findings show that students believe they should be recompensated because they paid for face-to-face teaching while obtaining online study. Universities shouldn't levy the same fees for online study as they do for in-person study. As a result, they had their trust in the university shaken, as well as their commitment to it.

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A Comparative Study Between Plating And Titanium Elastic Nailing In Fracture Midshaft Clavicle

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Abstract- Introduction- Clavicle is the subcutaneous bone and is a part of shoulder girdle. It articulates with sternum medially and acromion of scapula laterally. The clavicle will fracture (closed, open) and affects the movement at affected shoulder joint. Fracture of clavicle will be treated by various mode of treatment (conservative, operative). This study was conducted to evaluate the outcome of plating and intra-medullary titanium elastic nailing in treatment of displaced midshaft clavicle fracture and compare between them on the basis of various modalities.

MATERIAL AND METHOD- In this retrospective study, 30 patients of displaced mid shaft clavicle fracture were treated by TENS(15) and PLATING(15) during november 2018 to june 2020 at SRMS IMS BAREILLY. Allocation into plate fixation group or TENS group was done alternatively. The assessment was done on the basis of, using disabilities of arm, shoulder, and hand (DASH)score and shoulder pain CONSTANT score, radiological outcome ,complication and functional status in all these patients at 2/6/12/24 weeks post operatively.

Results- As per radiological and clinical evaluation union time was faster in TENS group (93%) but clavicular shortening (43%) was found more in TENS group as compared to plate group. CONSTANT score and DASH score was improved better in TENS group with more radiation exposure during fixation. In TENS group there was 20% cases of non union as compared to plate group(13%).

Conclusion- TENS nailing is a minimal invasive procedure for displaced mid shaft clavicle fractures with faster union rate, lesser morbidity, easier implant removal, but associated with non union, hardware prominence as few complications. But for comminuted, segmental, abnormally displaced and neglected cases plating remains the procedure of choice.

I. INTRODUCTION

Anatomy- The clavicle is located between the ribcage (sternum) and the shoulder blade (scapula). It is the bone that connects the arm to the body. The growth plates of the medial and lateral clavicular epiphyses do not fuse until the age of 25 years. Peculiar among long bones is the clavicle's S-shaped double curve, which is convex medially and concave laterally. The deltoid, trapezius, and pectoralis major muscles have important attachments to the clavicle. The deltoid muscle inserts onto the

anterior surface of the lateral third of the clavicle, and the trapezius muscle onto the posterior aspect. The pectoralis major muscle inserts onto the anterior surface of the medial

(B) Incidence- The frequency with which the 3 groups of fractures occur is as follows:

- Group I (middle third) - Approximately 80%
- Group II (distal third) - 12-15%
- Group III (medial third) - Less than 5%
- Clavicular injuries occur 2.5 times more commonly in males than in females, reflecting a greater involvement of males in contact and violent sports and motor vehicle accidents (MVs).

(C) Mechanism- Clavicle fractures may be caused by direct or indirect trauma. The most common mechanism is an indirect one, involving a fall directly onto the lateral shoulder. A less common mechanism for clavicle fractures is a fall onto an outstretched hand (i.e., a FOOSH injury). 87% clavicle injuries resulted from a fall onto the shoulder, 7% resulted from a direct blow, and 6% resulted from a fall onto an outstretched hand.

(D) Symptoms- Clavicle fracture can be very painful and may make it hard to move your arm. Other signs and symptoms of a fracture may include:

- Sagging of the shoulder downward and forward
- Inability to lift the arm because of pain
- A grinding sensation when you try to raise the arm
- A deformity or "bump" over the break
- Bruising, swelling, and/or tenderness over the collarbone

(E) Treatment-

- I. Conservative treatment-** Conservative or non-surgical treatment is the norm for middle-third clavicle fractures, and is recommended for not displaced fractures given the generally low incidence of non-union after conservative treatment of these fractures with rates ranging from 0.03% to 5.9% . There are numerous conservative treatment options available, the most common being the use of a sling or 'figure-of-eight' bandage (also known as figure-of-eight splint, or back-pack bandage), or a combination of these two methods

II. Surgical Treatment- If the broken ends of the bones have significantly shifted out of place, it may recommend surgery. Surgery typically involves putting the broken pieces of bone back into position and preventing them from moving out of place until they are healed. This can improve shoulder strength when you have recovered. It includes-

1. Plates and screws
2. Titanium elastic nailing (TENS)

(F) Complications- Complication of clavicle fracture include radiographic and symptomatic malunion and shoulder deformity, non-union and infections.

1. Malunion secondary to angulations and shortening
2. Infection
3. Wound dehiscence
4. Hardware problem
5. Protudation of implant

II. MATERIAL AND METHOD

The present study will be conducted in the department of Orthopaedics of SRMS-IMS, Bareilly from November 2018 to June 2020 in all the patients having mid-clavicle fracture shaft after obtaining approval from Hospital Ethics Committee.

Inclusion criteria

- 1) Age >16 and <65 year of age
- 2) Duration <2 weeks.
- 3) Unilateral displaced mid shaft clavicle fractures with a displacement of more than a shaft width
- 4) Shortening of over 2 cm or threat of skin perforation

Exclusion criteria- Patient having following entities will not be included in the study:

1. Patients with pre-existing morbidity concerning arm, shoulder, or hand.
2. Moderate to severe head injury (GCS <12)
3. Multi trauma patients
4. Open fractures
5. Pathological fractures
6. Fractures of > 2 weeks duration
7. Bilateral clavicle fractures
8. Segmental fractures
9. Fractures with associated neurovascular injuries

PRE-OP DESCRIPTION- Patient comes in OPD/EMERGENCY with complain of:

- 1- Sharp pain felt at the time of injury
- 2- Stiffness in the shoulder
- 3- The affected shoulder sags, forward or downward.
- 4- Swelling, tenderness, and bruising occurs over the collarbone.
- 5- The desire to hold the affected arm close to the body—supporting it with the hand of the healthy arm.

[A] On examination-

- 1- Swelling, ecchymosis and tenderness.
- 2- Crepitus from fracture ends rubbing against each other.

3- Difficulty in breathing or diminished breathing sounds on affected side if there is pneumothorax.

4- Tenting and blanching of skin at the fracture site.

5- Associated neurovascular injury if any.

[B] INVESTIGATION:

1- X-RAY both shoulder AP view

2- X-RAY affected shoulder in 30 degree Cephalic Tilt view.

3- Blood investigations

- Complete blood count
- Erythrocyte sedimentation rate
- Bleeding time, clotting time
- Blood grouping
- Blood urea
- Serum creatinine
- Serum electrolytes
- Other lab investigations (if needed)

Allocation into plate fixation group or titanium elastic nailing group will be done alternatively.

OPERATIVE-

a) Plate fixation- After anaesthesia, patients will be positioned in a supine position. Involved shoulders prepared and draped free. Incision will be made transversely just under the fracture site. Supraclavicular nerves to be identified and spared wherever possible. Soft tissue dissection to be kept to a minimum injury. After reduction of fractures, a pre contoured locking plate will be fixed on the anterosuperior surface of the bone, starting medially using bi-cortical screws. In oblique or comminute fractures, inter fragmentary lag screws may be used to achieve compression. The fascia and skin to be closed in layers. We can also put percutaneous plate by MIPO technique.

(b) TENS fixation- After anaesthesia, the patients will be placed in supine position and the sternoclavicular joint was palpated and marked on the affected side. We will use image intensification in 45° cephalad and 45° caudal directions. This can provide us with images in two planes, 90° apart. A small incision will be made approximately 1 cm lateral to the sternoclavicular joint. The anterior cortex will be opened using a sharp, pointed awl. A TEN will be inserted (the diameter varied from 2 to 3 mm depending on the width of the bone). Before introduction, the original curvature of the small and flattened nail tip straightened slightly to allow better gliding in the small medullary canal.

Closed reduction will be performed under fluoroscopic control using two percutaneous introduced pointed reduction clamps. If closed reduction failed, an additional incision (mini-open) may be made above the fracture site for direct manipulation of the main fragments. The nail then advanced manually until it is just medial to the acromio-clavicular joint. Accurate manoeuvring of the nail tip is necessary under fluoroscopic control to avoid penetration of the thin dorsal cortex. After reaching the end point, the fracture will be compressed and the nail cut close to the entry point to minimize soft tissue irritation, at the same time leaving sufficient length behind for easy extraction later on. The fascia and skin will be closed in layers.

We will include peri-operative data like operative time, amount of blood loss and size of the surgical wound; complications such as radiation exposure, neurovascular injury, wound infection, non-union, mal-union, implant migration, implant failure, soft tissue irritation, re-fractures after implant

removal and cosmetic outcome with regards to visible deformity, hypertrophic scars and hardware prominence under the skin. Implant removal will not be done routinely in our study. It will be done as per need and will of the patient after fracture union. The number of days to return to normal activities after implant removal will be noted.

POST-OP PERIOD- Postoperatively, patients were given a sling, but were encouraged for early shoulder mobilization (as tolerated), starting with pendulum exercises from the second day. After 7 days, passive and active assisted range of movement exercises will be started, however, overhead shoulder abduction will be allowed only after 2 weeks. Activities of daily living were started thereafter, but those requiring lifting heavy objects were delayed until union was achieved. All patients will be reviewed in the outpatient department at 2, 6 weeks, 12, and 24 weeks after surgery. At each visit, patients will be assessed clinically and radiologically for any complication and union of bone. Functional outcome will be assessed by the Constant score. Radiographic union will be defined as evidence of bridging callus or obliteration of fracture lines. After union, shortening of clavicle length will be measured clinically as the linear difference of clavicle lengths from sternal end to acromial end between operated and normal side.

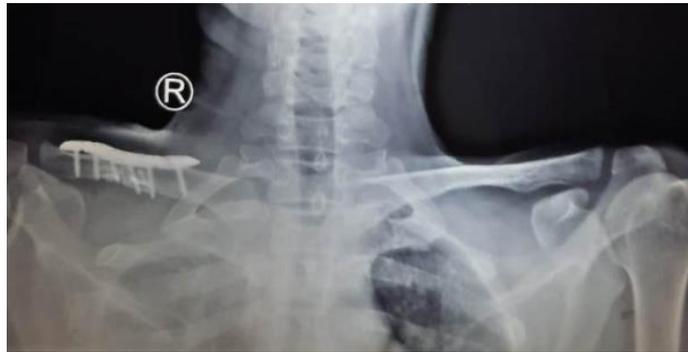
Radiographic Evaluation in Plate Fixation (case-1)



Pre-op X-Ray



Post-op X-Ray



12 Weeks

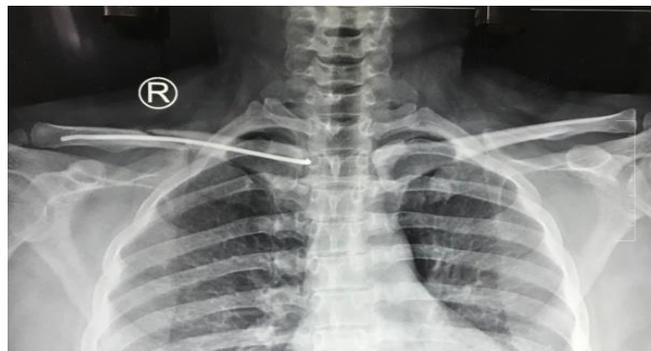


24 Weeks

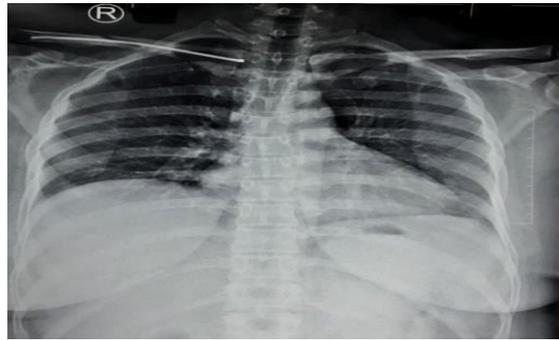
Radiographic photograph of TENS fixation (Case-1)



Pre op X-ray



Post-op X-ray



12 Weeks



24 Weeks

Clinical Photographs Figure (Plate Fixation case-1)



Flexion



Extension



Abduction



Internal Rotation

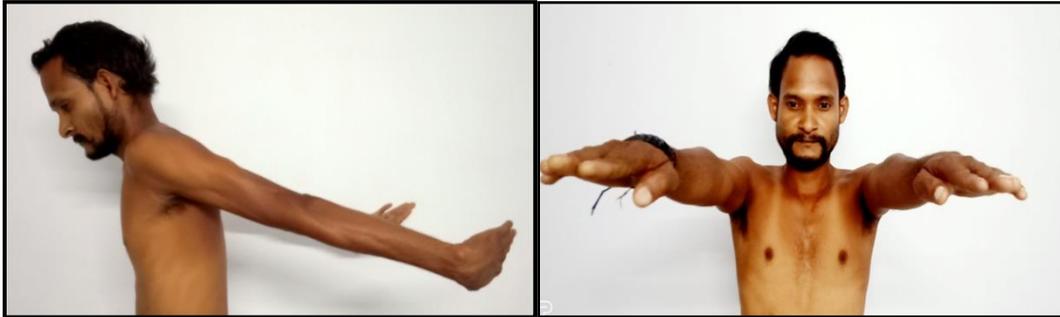
Pt. No. 41876054

Diagnosis – Fracture clavicle Right

Treatment – ORIF with Plate fixation

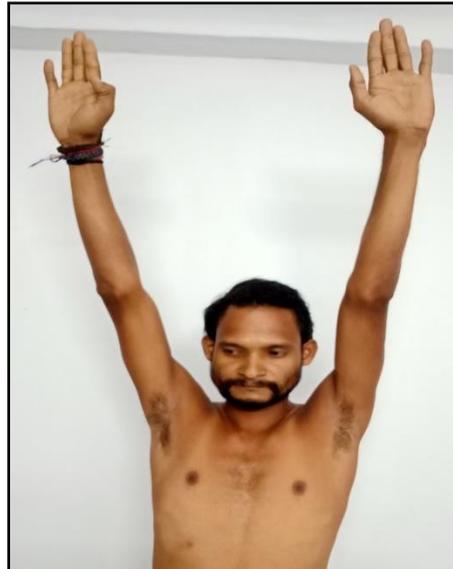
Movement- At Right Shoulder Joint

Clinical photographs figure (TENS Fixation Case-1)



Extension

Flexion



Abduction



Internal Rotation

Pt. No. 41794568

Diagnosis – Fracture Clavicle Right

Treatment – CRIF with TENS fixation

Movement- At Left Shoulder Joint

COMPLICATIONS

1- Implant Prominence



Pt. No. – 41619369

Diagnosis – Fracture clavicle Right (Simple)

Treatment – CRIF with TENS fixation

2- Joint stiffness at left shoulder



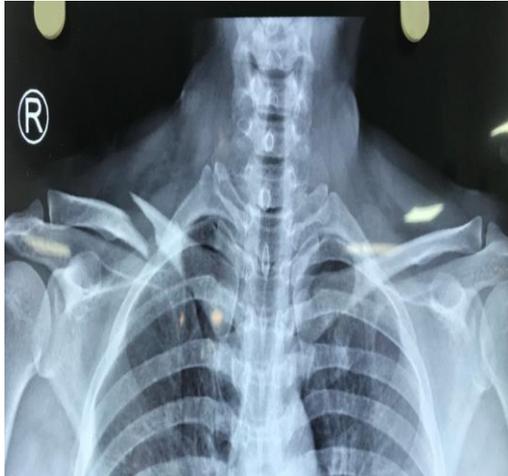
Pt. No. – 41968825

Diagnosis – Fracture clavicle Left (Comminuted)

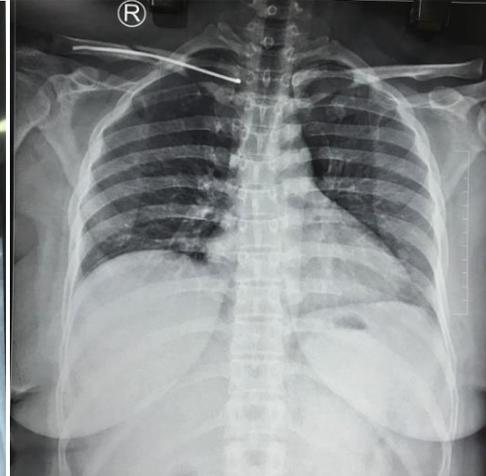
Treatment – ORIF with Plate fixation

3- Non Union

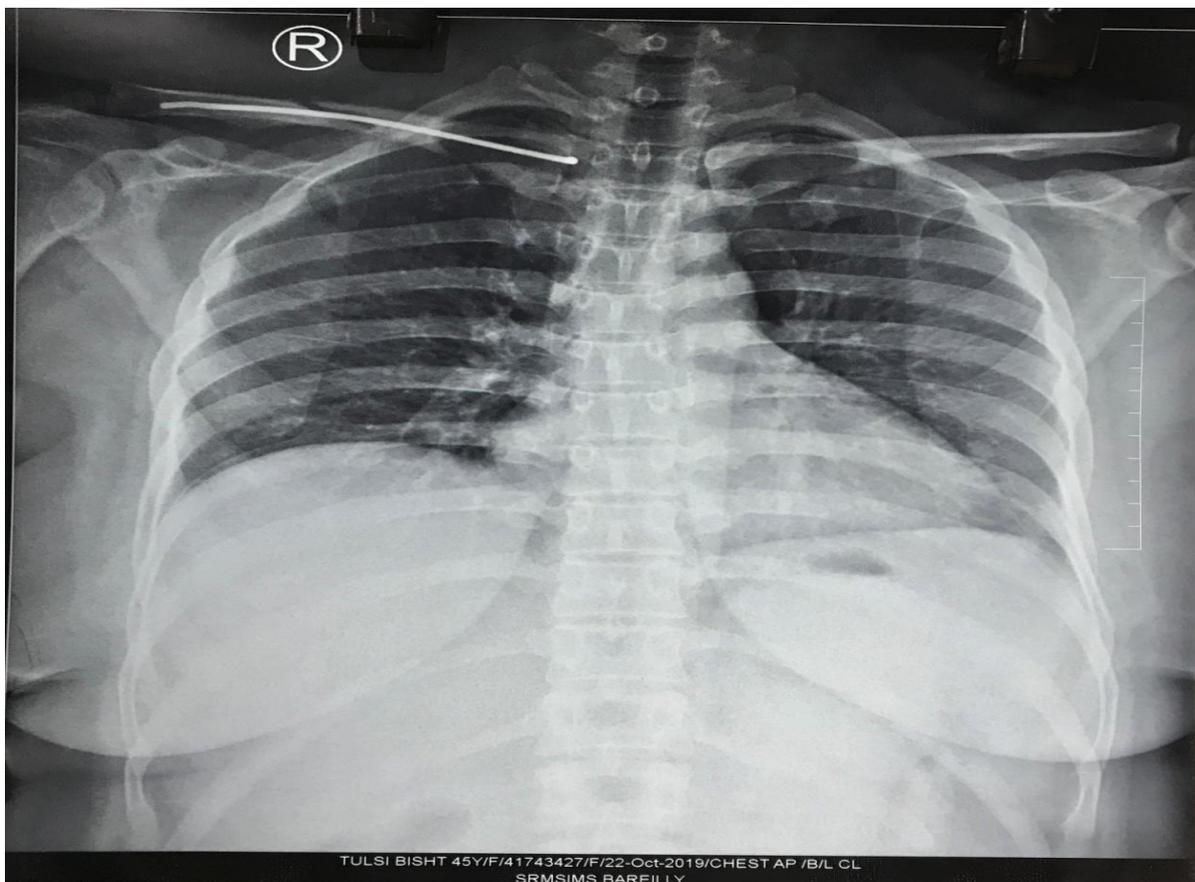
Pre-op X-Ray



Pre-op X-ray



Immediate post-op X-ray



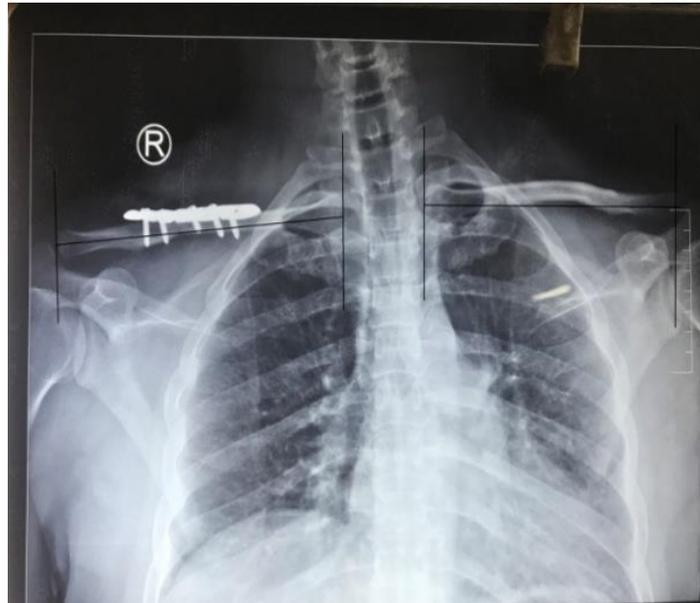
Radiographic Evaluation at 6 month post-operatively

Pt. No. – 41743427

Diagnosis – Fracture clavicle Right

Treatment – CRIF with TENS fixation

POST-OP CLAVICLE SHORTENING MEASUREMENT



Pt. No.- 20415126
Clavicle shortening = 2.5 MM



Pt. No.- 41478348
Clavicle shortening = 3 MM

III. RESULTS

Table 1: Age distribution among the study groups

Age (yrs)	Plating Group	TENS Group
15-25	03	08
26-35	03	05
36-45	04	01
46-55	03	01
56-65	02	00
Mean	38.67	27.8
SD	12.11	10.48

Mean age among the plating and TENS group was 38.67 ± 12.11 and 27.80 ± 10.48 years respectively as shown in table 1, Figure1.

Figure1: Age distribution among the study groups

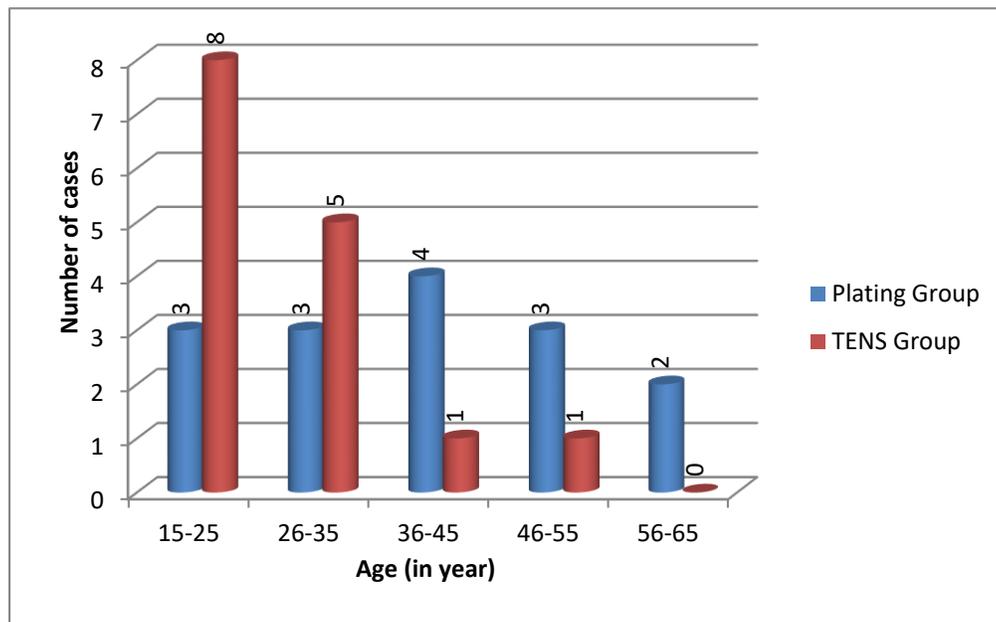
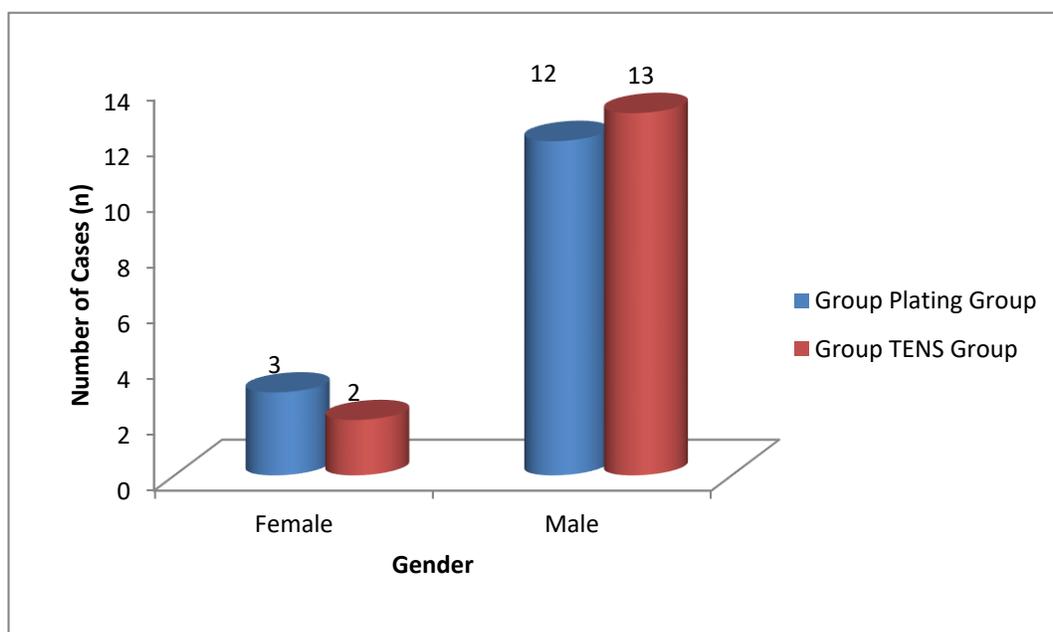


Table 2: Gender distribution among the study groups

Gender		Group	
		Plating Group	TENS Group
Female	N	3	2
	%	20.0%	13.3%
Male	N	12	13
	%	80.0%	86.7%

Figure2: Gender distribution among the study groups



The present study was conducted in the Department of Orthopaedics of SRMS-IMS, Bareilly from November 2018 to June 2020 among 30 patients having mid-clavicle fracture shaft. Equal number of patients underwent surgery either by plate fixation group or titanium elastic nailing group. Allocation into plate fixation group or titanium elastic nailing group was done alternatively. In both the groups, there was dominance of males (83.33%) as compared to females (16.7%) with ratio of 5:1 (table 2, Figure2).

Table 3: Side of Injury among the study groups

Side of Injury		Group	
		Plating Group	TENS Group
Left	n	6	9
	%	40.0%	60.0%
Right	n	9	6
	%	60.0%	40.0%

In our study, right and left side midshaft clavicle fracture was reported among 6 (40%), 9 (60%) and 9 (60%), 6 (40%) subjects among plating and TENS group respectively (table 3, Figure 3).

Figure 3: Side of Injury among the study groups

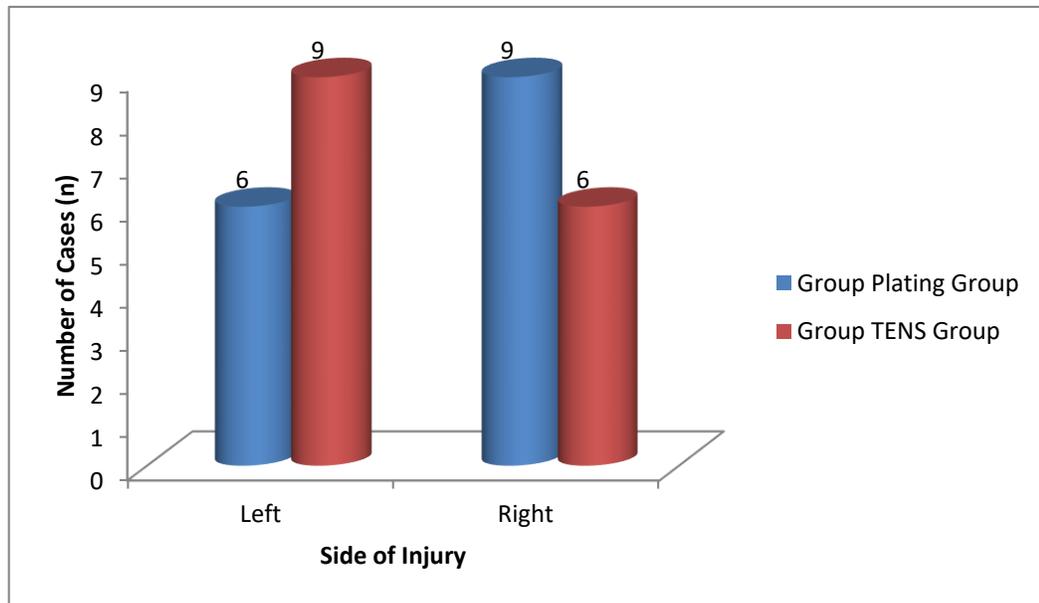


Table 4: Mode of injury among the study groups

Mode of injury		Group	
		Plating Group	TENS Group
Fall from Height	n	4	4
	%	26.7%	26.7%
Fall on outstretched hand	n	2	2
	%	13.3%	13.3%
RTA	n	7	7
	%	46.7%	46.7%
Sports	n	2	2
	%	13.3%	13.3%

In the present study, most common mode of injury was road traffic accident (RTA) reported among 46.7% of the subjects in plating as well as TENS group. Least common mode of injury was sports related and fall on outstretched hand (table 4, Figure 4).
 Figure 4: Mode of injury among the study groups

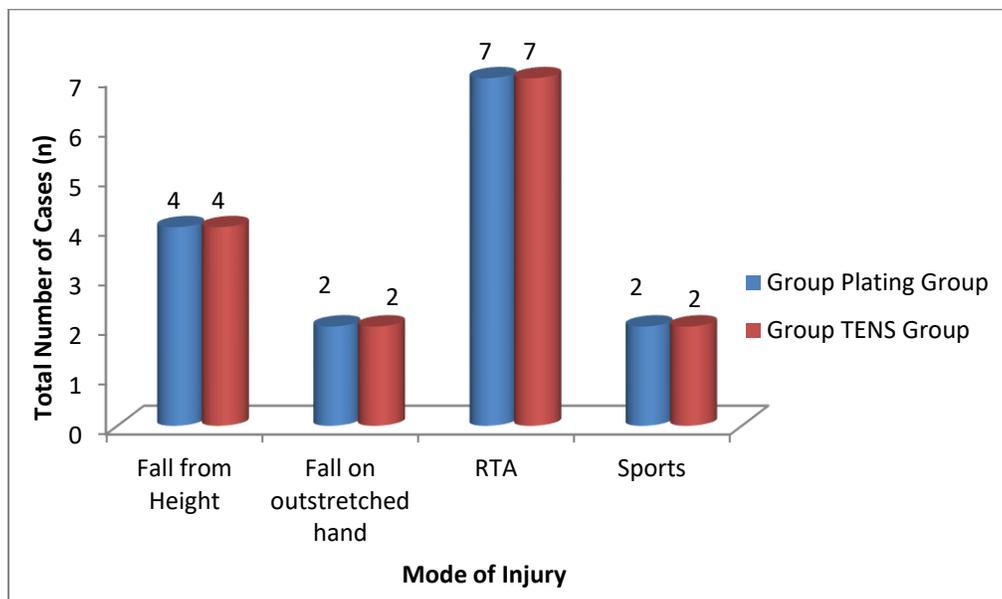


Table 5: Type of fracture as per OTA among the study groups

Type of fracture		Group	
		Plating Group	TENS Group
B1	n	7	7
	%	46.7%	46.7%
B2	n	8	8
	%	53.3%	53.3%

BI and B2 fracture as per OTA classification was revealed among 46.7% and 53.3% of the subjects plating as well as TENS group (table 5, Figure 5).

Figure 5: Type of fracture as per OTA among the study groups

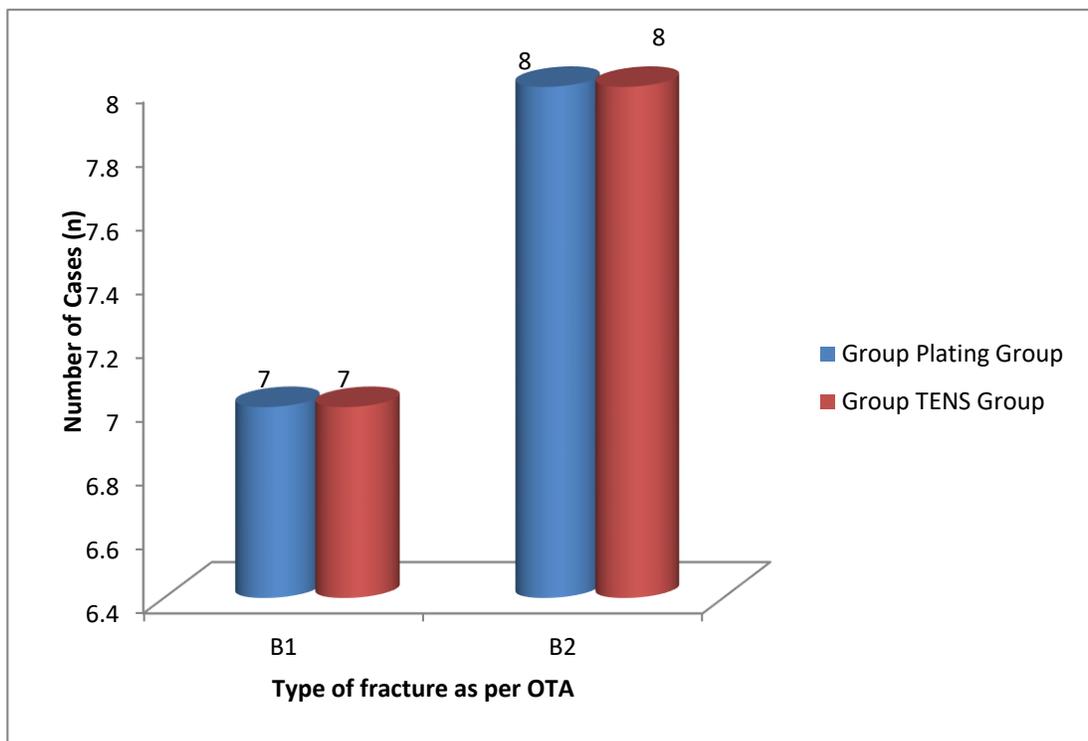


Table 6: Fracture Pattern among the study groups

Fracture Pattern		Group		Total
		Plating Group	TENS Group	
Comminuted	n	6	2	8
	%	40.0%	13.3%	26.7%
Simple	n	7	7	14
	%	46.7%	46.7%	46.7%
Simple Butterfly	n	2	6	8
	%	13.4%	40%	26.7% %

Comminuted, simple and simple butterfly was found among 40%, 46.7%, 13.4% and 13.3%, 46.7%, 40% of the subjects in Plating and TENS group respectively (table 6, Figure 6).

Figure 6: Fracture Pattern among the study groups

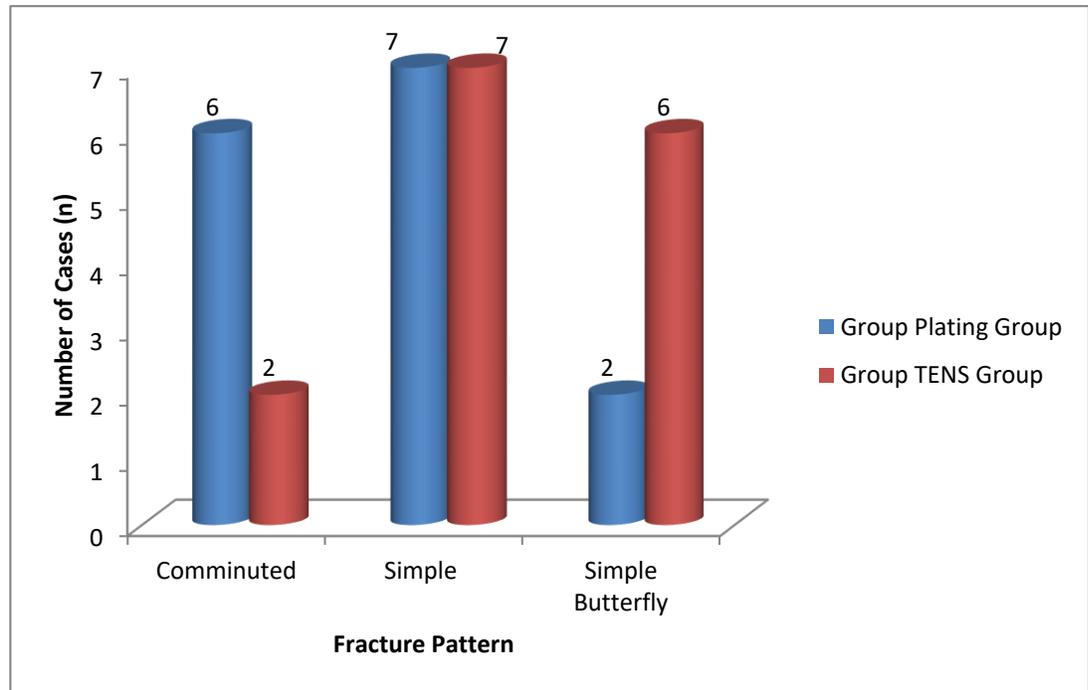


Table 7: Time period between injury and surgery (Days) among the study groups

Time Period		Group		Total
		Plating Group	TENS Group	
3-5	N	6	6	12
	%	40%	40%	40%
6-10	N	6	8	14
	%	6.7%	53.3%	46.67%
>10	N	3	1	4
	%	13.3%	6.7%	13.33%

3-5, 6-10 and >10 days of time period between injury and surgery was reported among 40%, 6.7%, 13.3% and 40%, 53.3%, 6.7% of the subjects in plating and TENS group respectively (table 7, Figure 7).

Figure 7: Time period between injury and surgery(Days) among the study groups

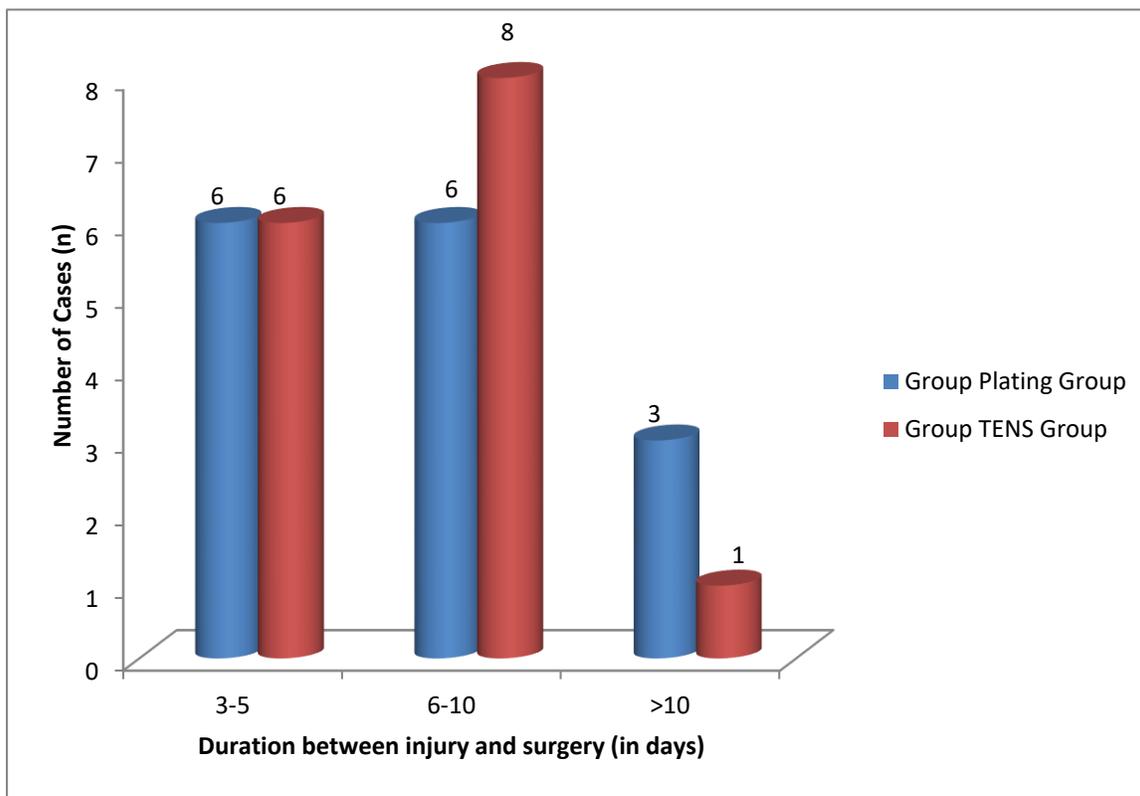


Table 8: Radiation Exposure(number of shoots) among the study groups

Radiation Exposure (Total No. of Shoots)	Plating Group	TENS Group
0-10	08	00
11-20	07	11
21-30	00	04
Mean	10	18.67
SD	2.67	6.31
t-test	12.91	
p-value	< 0.01*	

*: statistically significant

Mean radiation exposure (number of shoots) among the plating and TENS group was 10 ± 2.61 and 18.67 ± 6.31 respectively with statistically significant difference (table 8, Figure 8).

Figure 8: Radiation Exposure (number of shoots) among the study groups

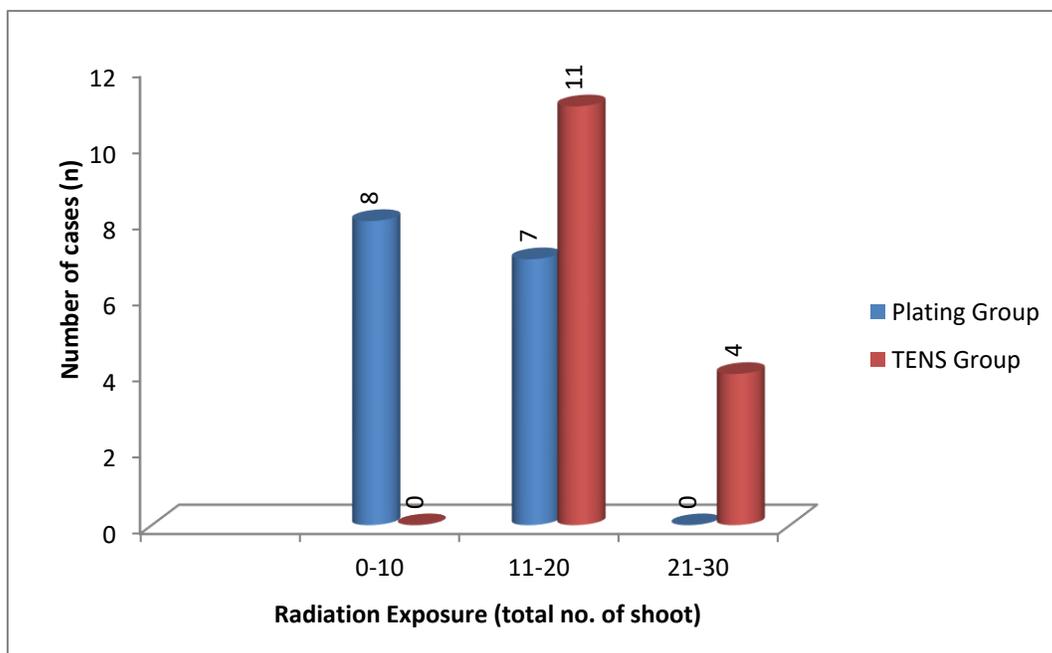


Table 9: Operation Time (Minutes) among the study groups

Operation Time (Min)	Plating Group	TENS Group
≤ 60	00	14
61-90	12	01
91-120	03	00
Mean	81.93	48.73
SD	16.808	6.563
t-test	50.79	
p-value	< 0.01*	

*: statistically significant

Mean operating time required was comparatively less in TENS group (48.73 minute) as compared to plating group (81.93 minute) with statistically significant difference (table 9, Figure 9).

Figure 9: Operation Time (Minutes) among the study groups

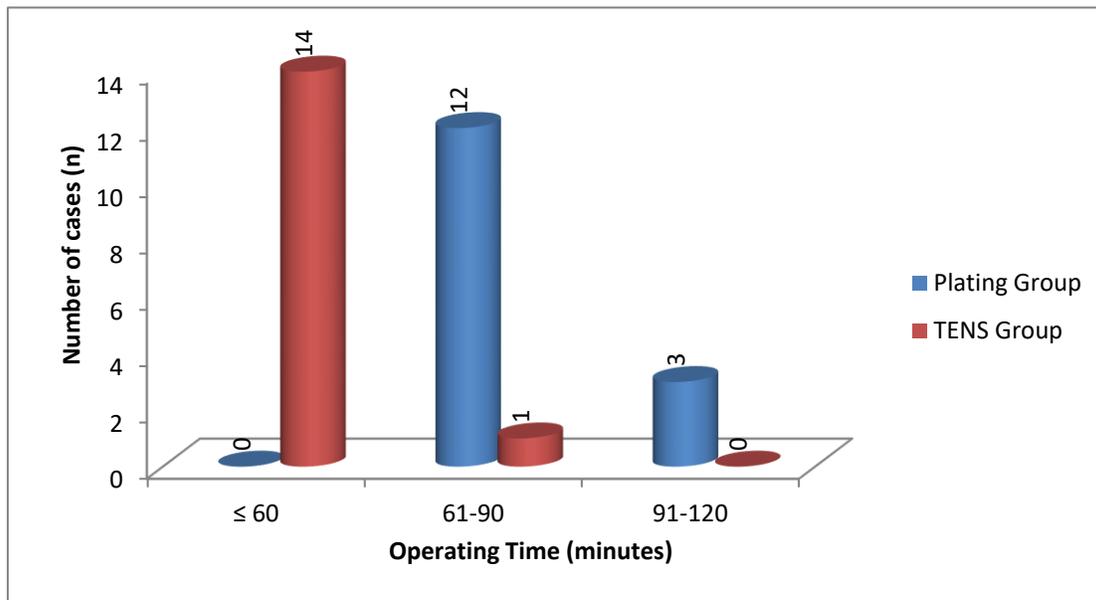


Table 10: Comparison of union time (Weeks) among the study groups

Union Time (Weeks)		Group		Total	Chi Square	p value
		Plating Group	TENS Group			
12	n	13	12	25	2.81	0.38
	%	86.67%	80%	83.33%		
18	n	0	2	2		
	%	0%	13.33%	6.7%		
24	n	2	1	3		
	%	13.33%	6.7%	10%		

Union time required by most of the subjects (>80%) was 12 weeks in both the groups. When union time (Weeks) was compared statistically among plating and TENS group, it was found to be statistically not significant as $p > 0.05$ (table 10, Figure 10).

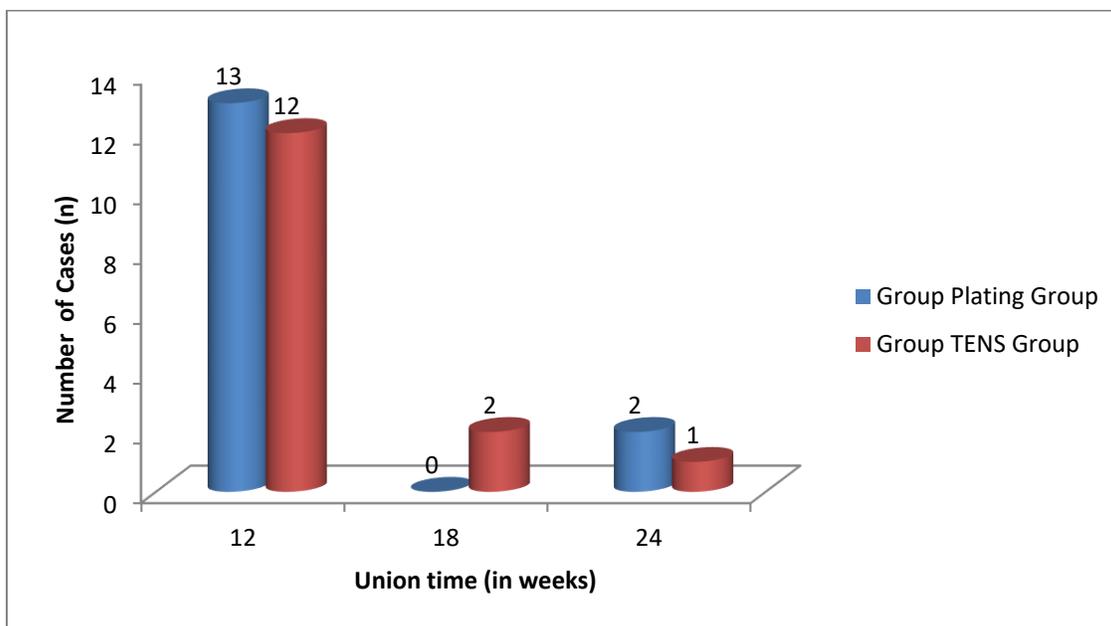


Figure 10: Comparison of union time (Weeks) among the study groups

Table 11: Clavicular Shortening (in mm) among the groups

Clavicular Shortening (in mm)		Group			
		Plating Group		TENS Group	
		B1 type	B2 type	B1 type	B2 type
1-2	n	00	00	00	00
	%				
2-3	n	00	02	00	03
	%		13.33%		20%
3-4	n	00	01	00	02
	%		6.67%		13.33%
Chi Square		2.83			
p value		0.42			

In our study, clavicular shortening i.e. 2.5, 3 and 3.5mm was reported among 13.33%, 6.67%, 0% and 13.33%, 6.67%, 13.33% of the subjects in plating and TENS group respectively. Clavicular shortening was found more in TENS group as compared to plating group, though statistically not significant (table 11, Figure 11).

Figure 11: Clavicular Shortening (in mm) among the groups

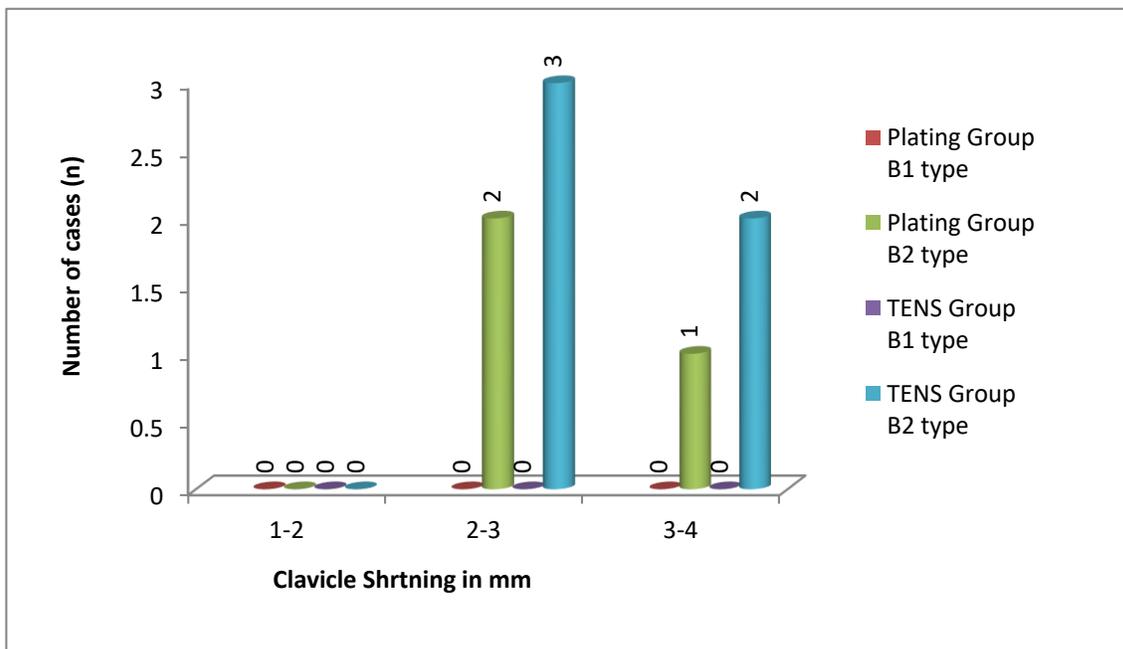


Table 12:- Constant Score among the study groups at different interval

Group		Constant Score (2 Weeks)	Constant Score (6 Weeks)	Constant Score (12 Weeks)	Constant Score (24 Weeks)
Plating Group	Mean	65.6	70.4	77	82.67
	SD	4.55	3.94	4.34	4.12
TENS Group	Mean	62.8	69.27	76.47	82.87
	SD	5.24	4.22	3.85	5.58
t test		3.81	0.65	0.91	0.51
p value		0.03*	0.43	0.62	0.72

*: statistically significant

Figure 12: Constant Score among the study groups at different interval

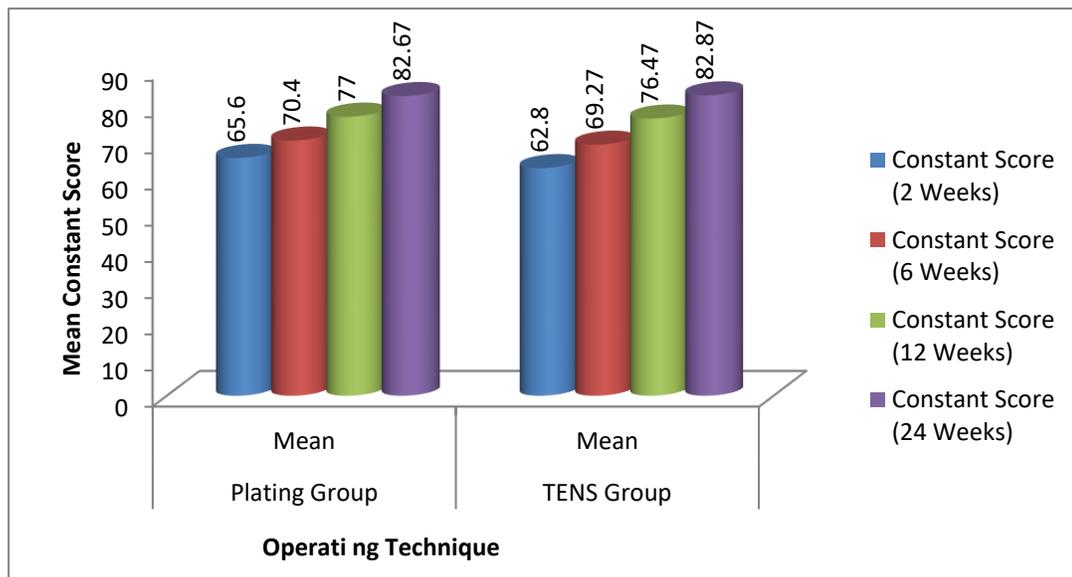


Table 12-, Figure 12- shows the comparison of constant score among the study groups at different intervals in TENS and plating group.

In our study, mean constant score was continuously improving among both the group at all the intervals, with slightly better improvement in plating group at 2 and 6 weeks post-operatively. At 24 weeks of follow-up the mean constant score was approximately equal in both the study group with no statistical significant difference.

Table 13: Dash Score among the study groups at different interval

Group		Dash Score (2 Weeks)	Dash Score (6 Weeks)	Dash Score (12 Weeks)	Dash Score (24 Weeks)
Plating Group	Mean	66.20	57.53	28.73	6.33
	SD	4.36	4.63	4.43	1.68
TENS Group	Mean	74.40	62.47	26.47	6.47

	SD	7.16	6.664	4.688	2.066
t test		8.93	4.44	2.37	0.04
p value		0.003*	0.04*	0.14	0.85

*: statistically significant

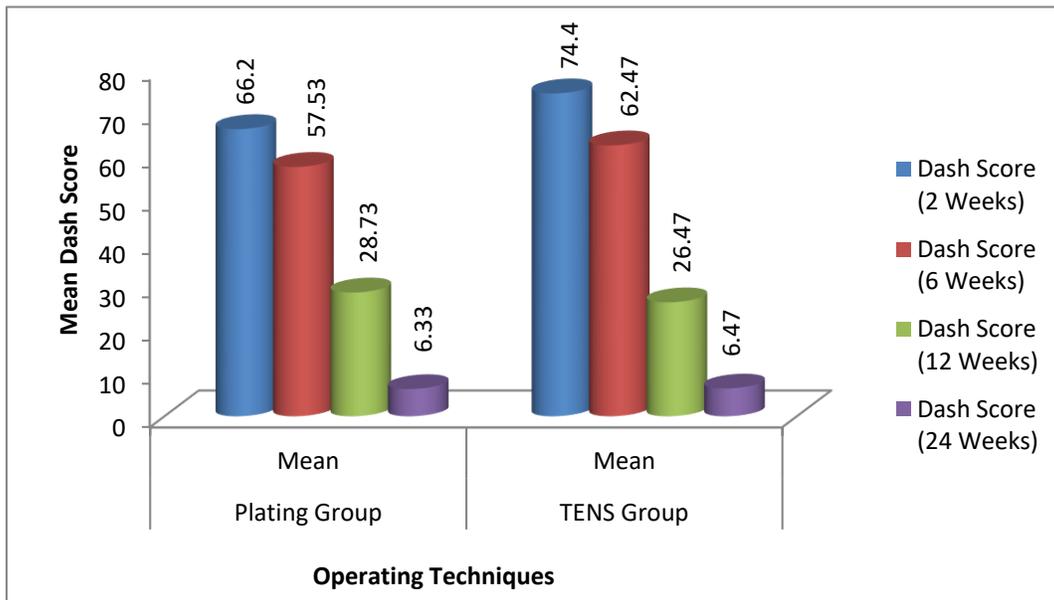


Table 13, Figure 13 shows the comparison of Dash score among the study groups at different intervals.

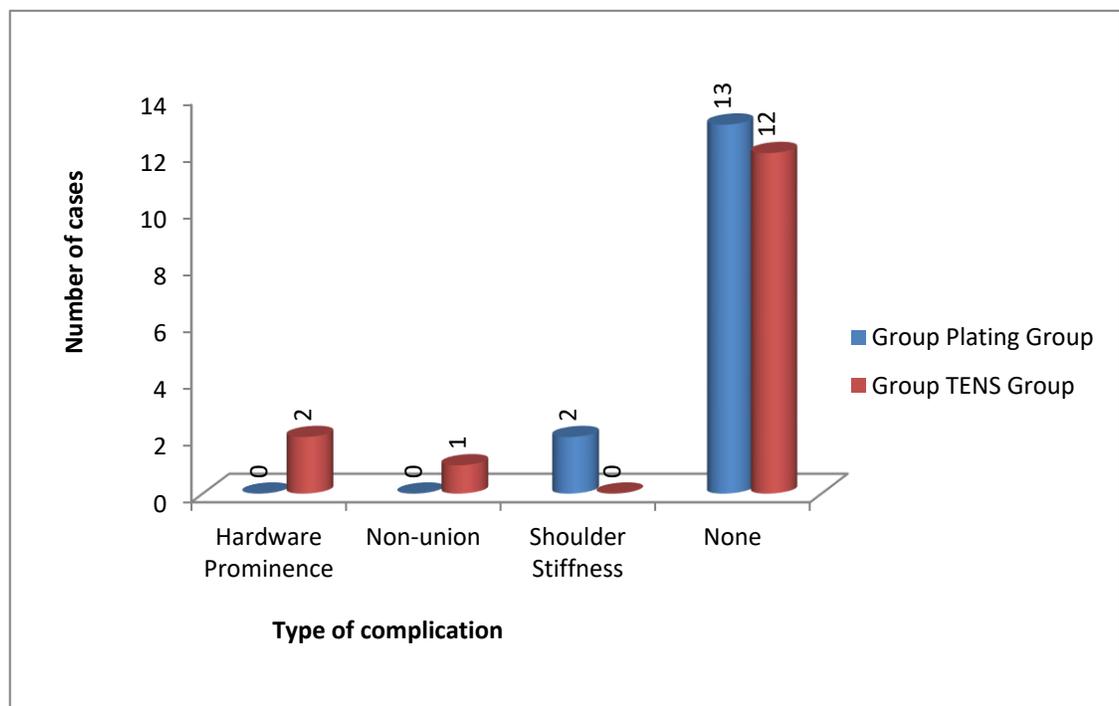
Mean Dash score was continuously reducing among both the group at all the intervals, with better reduction in plating group but the difference was statistically not significant. At 24 weeks the DASH score was approximately equal in TENS and plating group.

Table 14: Complications among the study groups

Complications		Group		Total
		Plating Group	TENS Group	
Hardware Prominence	n	0	2	2
	%	0.0%	13.33%	
Non-union	n	0	1	1
	%	0.0%	6.7%	
Shoulder Stiffness	n	2	0	2
	%	13.3%	0%	
None	n	13	12	25
	%	86.7%	80%	
Chi Square		4.17		
p value		0.53		

Complications was found among 3 subjects (20%) in TENS group and 2 (13.3%) in plating group. Both the subjects in plating group reported shoulder stiffness while 2 (13.3%) and 1 subject (6.7%) in TENS group revealed hardware prominence and non-union respectively (table 14, Figure 14).

Figure 14: Complications among the study groups



The results of the study are as follows:

- In both the groups, there was dominancy of males (83.33%) as compared to females (16.7%) with ratio of 5:1 in the present study.
- Mean age among the plating and TENS group was 38.67±12.11 and 27.80±10.48 years respectively.
- Right and left side midshaft clavicle fracture was reported among 6 (40%), 9 (60%) and 9 (60%), 6 (40%) subjects among plating and TENS group respectively.
- Most common mode if injury was road traffic accident (RTA), reported among 46.7% of the subjects in plating as well as TENS group. Least common mode of injury was sports related and fall on outstretched hand.
- BI and B2 fracture as per OTA classification was revealed among 46.7% and 53.3% of the subjects plating as well as TENS group in the present study.
- Comminuted, simple and simple butterfly was found among 40%, 46.7%, 13.4% and 13.3%, 46.7%, 40% of the subjects in Plating and TENS group respectively.
- 3-5, 6-10 and >10 days of time period between injury and surgery was reported among 40%, 6.7%, 13.3% and

40%, 53.3%, 6.7% of the subjects in plating and TENS group respectively.

- h. Mean radiation exposure (number of shoots) among the plating and TENS group was 10 ± 2.61 and 18.67 ± 6.31 respectively with statistically significant difference.
- i. Mean operating time required was comparatively less in TENS group (48.73 minute) as compared to plating group (81.93 minute) with statistically significant difference.
- j. Union time required by most of the subjects (>80%) was 12 weeks in both the groups. When union time (Weeks) was compared statistically among plating and TENS group, it was found to be statistically not significant as $p > 0.05$.
- k. Clavicular shortening i.e. 2.5, 3 and 3.5mm was reported among 13.33%, 6.67%, 0% and 13.33%, 6.67%, 13.33% of the subjects in plating and TENS group respectively. Clavicular shortening was found more in TENS group as compared to plating group, though it was statistically insignificant.
- l. In this study, constant score was continuously improving among both the group at all the intervals, with slightly better improvement in TENS group. But there was no statistical significant difference between the plating and TENS group w.r.t mean constant score at all the intervals except at 2 weeks.
- m. Dash score was continuously reducing among both the group at all the intervals, with better reduction in plating group. There was statistical significant difference between the plating and TENS group w.r.t mean Dash score at 2 and 6 weeks in the present study. But at 24 weeks, it was approximately equal in both the groups.
- n. Both the subjects in plating group reported shoulder stiffness while 2 (13.3%) and 1 subject (6.7%) in TENS group revealed hardware prominence and non-union respectively.

IV. DISCUSSION

Among bony injuries, clavicle fracture is reported to be the most common injury. Approximately 2% to 5% of all fractures in adults and 10% to 15% in children involve the clavicle. Studies indicate that 29 to 64 per 1, 00000 suffer from a clavicle fracture each year.^{1,2} Study conducted by **Bostman et al**⁵⁸ showed that the average age was 33.4 years.³ In our study, the results are approximately similar to the above-mentioned studies. **Saha P et al**⁷ in their study revealed similar male dominance i.e. in the Plate group (M:F:: 30:7), and in the TEN group (M/F, 30/7). **Govindasamy R et. al**³ in their study, they included 28 left sided and 26 right sided fractures out of 54 patients. **Elango M**⁴⁴ includes 12 right sided and 16 left sided clavicle in their study. **Govindasamy R et. al**³ in their study found that the mode of injury in 35 patient was road traffic accidents and in 19 cases it was due to fall from height. **Borthakur B. et al**³⁶ in their study includes 28 B1 and 3 B2 cases. **Sahu A K. et al**⁵³ revealed that 50% cases were simple (B1) type and 50% cases were wedge (B2) type. **Hussain N et al**²³ reported 55% simple, 38% comminuted and 7% simple butterfly type of fracture pattern in their study. **Borthakur B. et al**³⁶ in their study reported the duration of injury was 5.91 ± 1.96

days. **Balachandar S et al**⁴⁶ noted that the duration between injury and surgery was 3-5 days. **Simek J et al**⁶⁰ in their study reported that the total radiation exposure was less in plating group as compared to TENS group. **Pramod B Itagi**⁴² found the mean operating time was 36.2 minutes in TENS group while in case of plating it was 59 minutes. **Elango Met al**²⁵ noted that the union time was 18.62 ± 3.4 weeks in TENS group and 22.4 ± 4.85 weeks in plating group. **Lazarides S et al**²⁹, noticed that, shortening of final clavicular >18 mm in males and >14 mm among females were significantly associated with unsatisfactory findings. **Sahu A K et al**⁵³ in their study revealed that mean Constant shoulder score in TENS group was 9.36 ± 7.04 and 15.08 ± 9.4 in plate group respectively. **Mckee MD et al**¹⁷ found that average constant score among TENS group was 91.6 ± 14.1 and in plate group, it was 97 ± 4.5 and mean Dash score 4.1 ± 7.0 and 11.49 ± 7 respectively.³ **Sahu A K et al**⁵³ in their study revealed that mean DASH score in TENS group was 1.87 ± 3.4 and 4.8 ± 9.0 in plate group respectively. **Balachandar S et al**⁴⁶ noticed that 73.4% patient in plating group and 80% cases in TENS group had delayed union and shoulder stiffness. Nail migration noticed in 13.3 % cases in TENS fixation and in 1 % case there was infection in plating group. Re-fracture secondary to additional trauma either medial and lateral to original occurs and reported at a rate between 1% to 2% by **Mckee et al**¹⁷. **Poigenfurst et al**⁵⁹ reported re-fracture in 4 patients out of 122 patients.

V. CONCLUSION

With the present day advancement in surgical method and technique and a better understanding of patho-anatomy and biomechanics of clavicle, the management of clavicle fractures by surgical fixation has evolved. However it is essential to stringently adhere to the basic principles of management, having an understanding of the various fracture configuration and their idiosyncrasies.

In our study on fracture mid-shaft clavicle, patient were randomly divided into plating and TENS group; following conclusions are made. Fracture mid-shaft clavicle is more common in male as compared to females. The mode of injury was usually road traffic injury followed by sports and fall on out stretched hand. The operating time required was less in TENS group as compared to plating group. Radiation exposure time was more in TENS group as compared to plating group. Constant score was better in TENS group; but not statistically significant as compared to plating group. Dash score was better in plating group; but not statistically significant as compared to TENS group.

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Polymer-reinforced hybrid composites: Review

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Abstract

Background: Polymer composites for use in prosthetics contain several components, but the main ingredients are the organic component-matrix and the inorganic component-reinforcement. The physical-mechanical properties of the composite depend on the reinforcement content, the bond between the matrix and the reinforcement as well as on the reinforcement distribution. Hybrid composite materials are a combination of either two types of matrix with one reinforcement or two types of reinforcement in one matrix, and other combinations are possible. In that way, it is possible to design and modify - cut the physical-mechanical and functional properties of composites, and process materials with predefined properties.

Within the framework of this final master thesis, the influence of the composition and structure as well as the process parameters of obtaining a hybrid composite material on the thermal and mechanical properties of the obtained composite will be analyzed. The correct choice of components and design of modern composite materials for use in prosthetics based on acrylate with reinforcement in the form of polymer fibers and particles will be considered.

The synergistic effect of different reinforcements as well as modifications of the reinforcement-matrix boundary surface will be monitored through the resulting mechanical properties-hardness and toughness. **Materials:** For polymer matrix mostly the commercial acrylic denture resins were used. Commercial acryl denture material "Simgal-Acryl R", Galenika AD, Belgrade, Serbia, was used as autopolymerized acrylic resin [47, 54]. It is a two-component system consisting of a powder and a liquid. The powder consists of a PMMA copolymer and the initiator benzoyl peroxide (BPO) in a concentration of 1.1% w/w. The liquid was made of methyl methacrylate (calc) 94.15% w/w; acid as methacrylic acid 19.8 ppm w/w; N, N-dimethyl-p-toluidine as accelerator 0.85% w/w; ethylene glycol dimethacrylate as cross-linking agent 5.00% w/w; water 27 ppm w/w. **Conclusion:** Organic-inorganic nanocomposites have wide application in dentistry and prosthetics.. Inorganic materials play a key role in sustaining and supplementing mechanical properties of polymer matrices and in further favoring cellular behaviors. As a result, in dentistry, biocompatible nanocomposites are able to be substituted for native tissue as shown in many clinical cases. **Keywords:** Polymer composites, component-matrix, Hybrid composite materials.

1. Introduction

Considering advantages of ceramics in dentistry and prosthetics which include biocompatibility and durability, esthetic appearance, such materials have some clear disadvantages. Brittle catastrophic fracture and abrasive wear of the natural teeth unless low fusing ceramics are used, are some of potential disadvantages [1-3]. Mechanical properties and fracture resistance of ceramic crowns depends on different factors, such as fabrication method, surface microstructure, finish of the crowns and the packing conditions before loading until fracture. Many of the well-established materials, such as metals, ceramics or plastics cannot fulfill all technological desires for the various new applications. Scientists and engineers realized early on that mixtures of materials can show superior properties compared with their pure counterparts. One of the most successful examples is the group of materials called composites, which are formed by the incorporation of a basic structural material into a second substance, the matrix. Usually the systems incorporated are in the form of particles, whiskers, fibers, lamellae, or a mesh. Most of the resulting materials show improved mechanical properties and are regularly used for lightweight materials with advanced mechanical properties,

usually are linked to the volume fraction, size and the shape of the filler particles.

Development of modern medicine also shifts focus to organic-inorganic systems that can bond to a tooth, show wear resistance, biocompatibility and satisfy esthetic standards. Composites have emerged as substitute for amalgams, due to their favorable physical and mechanical properties. Amalgams, despite some of their good properties have several disadvantages, but probably the biggest shortcoming is potential risk of mercury poisoning. Probably the most promising development in restorative dentistry is the associated procedure of attaching resin composites to hard tooth tissues. Over the last decade, substantial progress was achieved to improve the properties of dental resin composites in order to enable their usage in load bearing restorations. Composite resins are now being used in stress-bearing posterior restorations with increased frequency even though they were first used as anterior restorative materials. Resins were introduced in dentistry in late 1960s and since then they have endured a lot of changes in order to become restorative materials with satisfactory aesthetic and mechanical properties comparable to those of dental amalgam. Dental composites consist of a polymerizable resin matrix, usually urethane dimethacrylate (UDMA) or ethylene glycol dimethacrylate, glass particulate fillers, and a silane coupling agent. Polymerization of the resin matrix is either light activated or chemically initiated. The silane coupling coats the surface of the hydrophilic filler particles, allowing them to couple with the hydrophobic resin matrix. Research of the composite materials structure is mostly focused on the resin matrix monomers so as to improve properties like stress, biocompatibility, viscoelastic and thermal properties, polymerization shrinkage and filler content which plays a huge role in other properties, like reduce shrinkage, hardness, elastic modulus, flexural strength and compressive strength. Better mechanical and aesthetic properties promoted ongoing demand of direct restoratives for specific applications. Organic end of the molecule usually tends to bond with the resin matrix, merging in the process organic and nonorganic phase in the composite, whilst organic-nonorganic adhesive is usual addition to filler particles with nonorganic end of the molecule bonds. Usually new dental composites contain paste made with a mixture of cross-linked agents with silane treated glass of the filler (i.e. ceramic particles) with different sizes. In order to promote adhesion, silane as a coupling agent is used on different surfaces such as epoxy, polyester or methacrylate resins which are organic polymers or glass and ceramics which are minerals. Most of the dental composite materials that appeared in the past 15 years are some combination of silane-coated inorganic filler particles. Usually the filler particles are either barium silicate glass, quartz or zirconium silicate, often combined with very small-sized particles of colloidal silica.

for example in the construction of vehicles, sports equipment, devices, etc. In order to improve polymer composites mechanical properties fillers with smaller dimensions, in the micrometer range are added to the polymer. Those properties are

In order to predict their behavior in the oral environment, the investigation of the resin-based restorative materials elastic properties is very important. The elastic modulus quantifies the relative stiffness or rigidity of a material within the elastic range and may be described as the ratio of uniaxial stress to strain at small strain levels. The elastic parameters of a material are indicative of the deformation of the material under external forces. Elastic modulus is of great importance for the longevity of both the restoration and the surrounding dental tissue since dental restorative materials must withstand the masticatory

This Research paper investigates processing of different hybrid denture polymer composites with the aim to improve their mechanical properties. More than one type of fillers will be embedded to achieve improvement and the proper analyses will be conducted. Mechanical tests will show if the fillers are effective in building superior hybrid composite material.

2.Methodology

forces in the oral cavity. It is possible that the tooth structure will suffer from a fracture or that the bond between tooth and restoration will be compromised if the composite has a low modulus and in that case it will deform more under the functional stresses. If the composite has a low modulus, it will deform more under the functional stresses and it is possible that the tooth structure will suffer from a catastrophic fracture or that the bond between tooth and restoration will be compromised leading to marginal gap deformation, post-operative sensitivity and secondary caries. Also, the stresses at the post-gel phase of polymerization which are extremely important for the polymerization shrinkage and the strain are related to the elastic modulus of the composite. Incorporation of nanotechnology is one of the most recent advancements in the direct dental restorative materials. Nanotechnology is the engineering of functional systems at the molecular scale, understanding and control of matter at dimensions of roughly 1–100 nm. Both aesthetics and mechanical performance showed improvement in nanofilled composite resins - nanocomposites. Polymer nanocomposites (PNC) compared to more conventional composites have showed considerable mechanical improvements at lower fillers content, which in return makes processing of such composites simpler. Even though PNCs can be tracked back to 1950s they did not get substantial attention until synthesis of nylon 6-clay composite material which was reported by the Toyota research group. Considering remarkable enhancement of physical and mechanical properties with the addition of a small filler volume fraction compared to traditional composites, PNCs have attracted considerable interest in academia as well as in industry. Some of the improved mechanical properties can include yield stress, fracture toughness, ultimate stress, shock resistance and Young's modulus (or stiffness). In dental materials, improvements in high flexural strength, low polymerization shrinkage, low abrasion and resistance to fracture are especially important. Mechanical performance improvement of nanocomposites is due to the nanosize dimensions of the fillers (as a result of a very large aspect ratio), and to the durable filler - polymer interactions that can affect the effectiveness of load transfer between polymer matrix and the nanofillers.

Hybrid polymer composite materials show improved mechanical properties coming from a synergy of different reinforcements. Combinations used can be divided into groups: particles-fibers, particles-particles, particles-whiskers and fibers-fibers. The idea behind creation of hybrid material is that every reinforcement improves a different property. For example, certain particle filler can improve hardness, while chosen fibers increase toughness. This leads to a number of filler combinations that can produce superior materials in all industries. Dental materials can be modified to withstand higher impact force and to have excellent elastic properties and high biocompatibility at the same time.

In general, the reinforcement is supposed to be the strongest of all of the components, and therefore, in structural composites, its main role is to enhance the overall mechanical properties of the resulting material. The matrix is required to fulfill several functions, most of which are vital to the performance of the material. As a first approximation, it can be stated that the matrix holds the reinforcement in place to define the shape of the final product. The roles of the matrix in fibre-reinforced and particulate composites are quite different. The binder for a particulate aggregate simply serves to retain the composite mass in a solid form, but the matrix in a fibre composite performs a

2.1 THEORETICAL PART

2.1.1 Composite materials

Composite is a material made from two or more constituent materials with significantly different [physical](#) or [chemical properties](#) that, when combined, produce a material with characteristics different from the individual components. The individual components remain separate and distinct within the finished structure, differentiating composites from [mixtures](#) and [solid solutions](#). The 'composite' concept is not a human invention. Wood is a natural composite material consisting of one species of polymer – cellulose fibres with good strength and stiffness – in a resinous matrix of another polymer, the polysaccharide lignin [4]. The idea of combining different materials in order to take advantage of the peculiar positive properties of each single constituent has ancient historical roots. However, it is only in the last half century that the science and technology of composite materials have developed sufficiently to provide engineers with a novel class of materials and the necessary tools to enable them to use them advantageously [4]. A structural composite is a material system consisting of two or more phases on a macroscopic scale, whose mechanical performance and properties are designed to be superior to those of the constituent materials acting independently [5]. In general, a composite consists of three components: the matrix as the continuous phase; (the reinforcements as the discontinuous or dispersed phase, including fibre and particles; and the fine interphase region, also known as the interface [6,7]. By carefully choosing the matrix, the reinforcement, and the manufacturing process that brings them together, the engineers can tailor the properties to meet specific requirements [8].

Composites are commonly classified at two distinct levels. The first level of classification is usually with respect to the matrix constituent. The major composite classes include

- 1) organic- matrix composites (OMCs),
- 2) metal- matrix composites (MMCs) and
- 3) ceramic- matrix composites (CMCs).

The term 'organic- matrix composite' is generally assumed to include two classes of composites:

- polymer- matrix composites (PMCs) and
- carbon- matrix composites (commonly referred to as carbon-carbon composites) [11].

The second level of classification refers to the form of the reinforcement:

- 1) particulate reinforcements,
- 2) whisker reinforcements,
- 3) continuous- fibre laminated composites and
- 4) woven composites [11].

[9]. What is more, modern composite materials are usually optimized (with respect to the aforementioned aspects) to achieve a particular balance of properties for a given range of applications [11]. However, as a common practical definition, the term 'composite materials' may be restricted to emphasize those materials that contain a continuous matrix constituent that binds together and provides form to an array of a stronger, stiffer reinforcement constituent. When designed properly, the new combined material exhibits better strength than would each individual material. The main advantages of composite materials

variety of other functions, which must be appreciated to understand the true composite action which determines the mechanical behavior of a reinforced material. These functions should therefore be considered in some detail [9]. The matrix binds the fibres together, holding them aligned in the important stressed directions. Loads applied to the composite are then transferred into the fibres, the principal load-bearing component, through the matrix, enabling the composite to withstand compression, flexural and shear forces as well as tensile loads. The ability of composites reinforced with short fibers to support loads of any kind is dependent on the presence of the matrix as the load transfer medium, and the efficiency of this load transfer is directly related to the quality of the fiber/matrix bond. The matrix must also isolate the fibres from each other so that they can act as separate entities. Many reinforcing fibres are brittle solids with highly variable strengths. When such materials are used in the form of fine fibres, not only are the fibres stronger than the monolithic form of the same solid, but there is also the additional benefit that the fibre aggregate does not fail catastrophically. The matrix should protect the reinforcing filaments from mechanical damage (abrasion) and from environmental attack. Through the quality of its 'grip' on the fibers (the interfacial bond strength), the matrix can also be an important means of increasing the toughness of the composite [9]. Composites have unique advantages over monolithic materials, such as high strength, high stiffness, long fatigue life, low density and adaptability to the intended function of the structure. Additional improvements can be realized in terms of corrosion [10]. Polymers are often two- phase composites, consisting of a matrix of one polymer with distributions of harder or softer particles contained within it. Concrete (the direct descendant of straw and mud bricks) is a classic example of a ceramic/ceramic composite, with particles of sand and aggregate of graded sizes in a matrix of hydrated Portland cement. These materials have been well known for many years, and materials scientists have learned to control their properties by controlling their microstructures; that is to say, the quantity, the shape and the distribution of what we might refer to as the 'reinforcing phase'. The idea of mixing components across materials class boundaries is a natural extension of this idea [9].

Composites are used not only for their structural properties but also for electrical, thermal, tribological and environmental applications. These features rely strongly on the specific constituents combined in the composite, on the extent of their presence in the final material (weight or volume fraction), and on the shape and architecture of the reinforcing phase. Ideally, the properties of engineering materials should be reproducible and accurately known. Since satisfactory exploitation of the composite principle depends on the design flexibility that results from tailoring the properties of a combination of materials to suit a particular requirement, the accurate prediction of those properties is imperative. At the present time, some of the more important engineering properties of composites can be estimated well on the basis of mathematical models, but many cannot

Decaying of the tooth is mainly due to the activity of bacteria. Different types of bacteria are found in the mouth; some of these are helpful, while some are harmful, which causes tooth decay. With sweet foods, these bacteria react and produce acids, and these acids remove mineral from enamel. Decay begins with enamel and goes deeper to dentine, and finally reaches to the pulp (nerve) of teeth, which creates cavities in the tooth over time. A decaying tooth causes pain, difficulty in eating, tooth loss, and inflammation around the tooth and gum. The human body has amazing properties for rebuilding injured parts; that is, if a bone fracture occurs, the human body heals the bone by developing new cells and joining them

are their high strength and stiffness, combined with low density, when compared with bulk materials, allowing weight reduction in the finished part [12]. In composites, materials are combined in such a way as to enable us to make better use of their virtues while minimizing to some extent the effects of their deficiencies. This process of optimization can release a designer from the constraints associated with the selection and manufacture of conventional materials. The designer can make use of tougher and lighter materials, with properties that can be tailored to suit particular design requirements [9]. The obtainment of tailored and desired properties cannot preclude specific manufacturing considerations. Indeed, the need to combine different materials appropriately and realize a well- defined product has a remarkable impact on the manufacturing processes that are suitable.

2.1.2 Dental materials

2.1.2. Teeth

Bones and teeth, the hard tissues in the human body, are made partly of organic and partly of inorganic material. The inorganic component mainly consists of a substance called hydroxyapatite - $\text{Ca}_5(\text{PO}_4)_3(\text{OH})$. The outer layer of the teeth is the hardest material in human body and is called enamel. Enamel is a ceramic material that consists of approximately 92% hydroxyapatite. Beneath the enamel, the bulk of a tooth is made of dentin. This is a composite material and contains a mixture of hydroxyapatite, collagen, water, and salts. Collagen is an organic substance. Teeth function in one of the most inhospitable environments in the human body. They are subject to larger temperature variations than most other body parts and can cope with exposure to ice at 0 °C and to hot tea and coffee. Teeth also encounter pH changes in the range 0.5 to 8, as well as large mechanical stresses during chewing. Tooth decay, called caries, occurs when teeth are frequently exposed to foods containing carbohydrates (starches and sugars). Human teeth are not just aesthetic; they also play an important role in health and nutrition. Teeth prepare food for swallowing and digestion. Figure 1 represents the structural composition of the tooth.

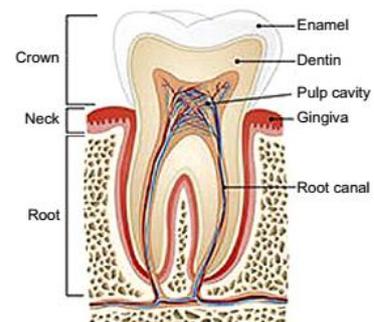


Figure 1. Tooth structure [13].

The light causes the monomer molecules to react with one another and link together to form a solid resin. The resin shrinks a little during polymerization so several successive composite layers are added and photocured. Photocuring is useful because it allows the dentist time to work with the material, building and shaping it correctly before it is exposed to light. When the dentist is ready, the filling can be hardened immediately by shining light on it. Finally, the filling is polished. Composite fillers have advantages and disadvantages. The table below summarizes these.

together. But this is not true in the case of teeth. Once a cavity is formed in a tooth, the human body cannot repair it. To repair a tooth cavity, a filling has to be done. With the help of a filling, dentists restore the damaged teeth back to their normal shape and function. Fillers have been used for a long time. Researchers have found around 7500–9500 years old molars with fillers in Pakistan. Recently, in Italy, scientists found a 6500-year-old tooth in which the filling was made up of bee’s wax [14]. It confirmed that fillers have been used for thousands of years. In the beginning of the 19th century, metal (gold, tin, silver, etc.) fillers were used. At the end of the 19th century, amalgam fillers were introduced. Amalgam fillers were made up of silver, mercury, tin, and copper.

Table 1 Advantages and disadvantages of using amalgam tooth filling [15].

Advantages	Disadvantages
<ul style="list-style-type: none"> Reasonably priced and cost effective Strong, resistant to wear and durable Dependable Least time-consuming kind of filling for a dentist to perform Average lifetime of amalgam fillers is about 15 years Used for more than a century with good results 	<ul style="list-style-type: none"> Silver color is no longer considered aesthetically acceptable (it is thought to look unpleasant) Does not stick to the tooth, which means the dentist has to make a large undercut cavity to keep the filling in place Conducts heat too well, which results in some people with amalgam fillers experiencing pain when they eat hot or cold foods Contains mercury (mercury compounds are poisonous) Getting rid of millions of potentially environmentally hazardous old fillers is a substantial disposal problem

2.1.5 Composite fillers

Composites used for filling teeth are generally made of silica or glass particles bound with a polymer resin. The polymers that are used as the resin in composites for fillers are based on a monomer called methacrylic acid. The polymer resin is usually filled with between 35 to 85% glass filler. The procedure used to place a composite filling in a tooth involves several steps. First, the tooth must be prepared. It is etched with acid to remove debris and an adhesive is applied. The solvent in the adhesive is then evaporated. Next, the cavity is filled with a layer of composite. This layer is hardened by shining a light on it – a process called photocuring.

2.1.6 Dental composite materials

The majority of matrix materials that exist on the composites market are polymer. There are several different polymer matrices which can be utilized in composite materials. Among the polymer matrix composites, thermoset matrix composites are more predominant than thermoplastic composites. Though thermoset and thermoplastics sound similar, they have very different properties and applications. Understanding the performance differences can help to make better sourcing decisions and the product designs as composites [16].

2.1.4 Glass ionomer fillers

Glass ionomer fillers are similar to composite fillers because they also use a polymer resin. However, the filling material contains strontium, phosphate and fluoride ions. The big advantage of this filling material is that it interacts with the enamel and dentin in the tooth and forms an excellent seal between the filling and the tooth. A true biological and chemical link is formed with the tooth and this reduces the sensitivity of the filled tooth. Another advantage of glass ionomers is that the fluoride ions from the filling material are continually released by reaction with saliva. These fluoride ions are next to the teeth and can react with the enamel. This helps strengthen the teeth and prevent further decay. The disadvantages of glass ionomer materials are that they are not as aesthetic as composites and they are weak under normal chewing forces.

Table 2 Advantages and disadvantages of composite fillers[15].

Advantages	Disadvantages
Color and texture can be matched to the patient’s teeth by the addition of different fillers	Less durable than amalgam and not strong enough to withstand the chewing forces in the back of the mouth
May be used to change tooth color, shape and size to improve the smile	Subject to shrinkage and loosening when the material sets, which leads to formation of a small gap between the tooth and filling
Does not contain mercury	Cannot be used for large fillers
Very useful for front teeth and small holes in the back teeth where the biting load is not too great and appearance is crucial	Wears out faster than amalgam
Less tooth has to be removed to provide a key for the filling than is necessary with amalgam fillers	If the coating is too thick, the polymer may separate from the tooth surface during the setting process, which weakens the bond between the filling and the tooth
	The acid-etching technique removes minerals from the dentin in the tooth and can weaken it
	Dental caries and composite fillers have poor X-ray contrast with their surroundings, which makes it hard for the dentist to identify new areas of decay
	Filling a tooth using composites is a more precise procedure and takes longer to perform than inserting an amalgam filling; composite fillers may therefore cost more

Thermosets are materials that undergo a chemical reaction or curing and normally transform from a liquid to a solid. In its uncured form, the material has small, unlinked molecules known as monomers. The addition of a second material as a cross-linker, curing agent, catalyst, and/or the presence of heat or some other activating influences will initiate the chemical reaction or curing reaction. During this reaction, the molecules cross-link and form significantly longer molecular chains and cross-link network, causing the material to solidify. The change of the thermoset state is permanent and irreversible. Subsequently, exposure to high heat after solidifying will cause the material to degrade, not melt. This is because these materials typically degrade at a temperature below where it would be able to melt. Thermoplastics are melt-process able plastics. The thermoplastic materials are processed with heat. When enough heat is added to bring the temperature of the plastic above its melting point, the plastic melts, liquefies, or softens enough to be processed. When the heat source is removed and the temperature of the plastic drops below its melting point, the plastic solidifies back into a glasslike solid. This process can be repeated, with the plastic melting and solidifying as the temperature climbs above and drops below the melting temperature, respectively. However, the material can be increasingly subject to deterioration in its molten state, so there is a practical limit to the number of times that this reprocessing can take place before the material properties begin to suffer. Many thermoplastic polymers are addition-type, capable of yielding very long molecular chain lengths or very high molecular weights [17]. Both thermoset and thermoplastic materials have its place in the market. In broad generalities, thermosets tend to have been around for a long time and have a well-established place in the market, frequently have lower raw material costs, and often provide easy wetting of reinforcing fibre and easy forming to final part geometries. In other words, thermosets are often easier to process than thermoplastic. Thermoplastics tend to be tougher or less brittle than thermoset. They can have better chemical resistance, do not need refrigeration as uncured thermosets (prepreg materials) frequently do, and can be more easily recycled and repaired. Dental composites were developed in 1962 with dimethacrylates, combined with powdered silanized quartz [18]. Composites have replaced the amalgam due to their unique properties (aesthetic and adhesive properties). Today, composites are used globally as tooth-colored restorative materials. Composites are generally made up of three components: organic materials (resin matrix), inorganic materials (fillers), and coupling agents. Figure 2 represents the classification of dental filling composite materials.

3. Materials

For polymer matrix mostly the commercial acrylic denture resins were used. Commercial acryl denture material „Simgal-Acryl R”, Galenika AD, Belgrade, Serbia, was used as a autopolimerized acrylic resin [47, 54]. "It is a two-component system consisting of a powder and a liquid. The powder consists of a PMMA copolymer and the initiator benzoyl peroxide (BPO) in a concentration of 1.1% w/w. The liquid was made of methyl methacrylate (calc) 94.15% w/w; acid as methacrylic acid 19.8 ppm w/w; *N, N*-dimethyl-*p*-toluidine as accelerator 0.85% w/w; ethylene glycol dimethacrylate as cross-linking agent 5.00% w/w;

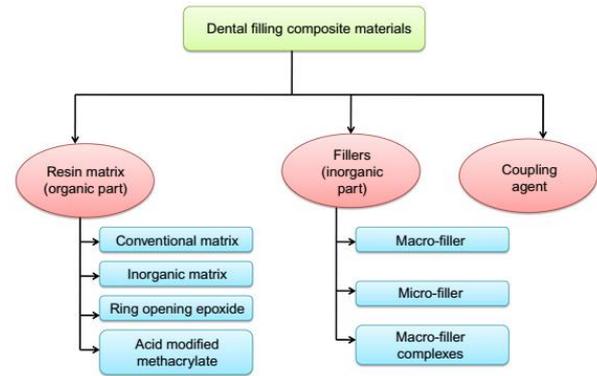


Figure 2: Classification of dental filling composite materials [19].

2.2 Experimental for hybrid denture composites

From review of some experimental research it is evident that for some systems of hybrid reinforcement's design of mechanical properties is possible with the proper combination of constituents according to exploitation requirements "Hybrid reinforcement systems have been created previously to develop mixtures of different fibers, metal oxides, or fibers and fillers reported to produce improvements in the physical properties compared to adding them separately" [50].

Table 3. Performance parameters comparison of the literature data

	Matrix	Reinforcements	Mechanical properties	Reference
1.	Acrylic Denture Base Material	1% Silanized zirconium oxide (ZrO ₂) nano filler and 2.5 %electrospun PS fibers	Absorbed Impact energy improvement 70 %, Hardness improvement 10 %	[47]
2.	Acrylic Denture Base Material	Silanized zirconium oxide (ZrO ₂) nano filler and plasma treated polypropelene (PP) fibers	tensile strength, improvement 44%	[48]
3.	PMMA	PP fibers 2.5 t.%) /Al ₂ O ₃ nanoparticles (1 wt.%)	Impact strength improvement 119% Surface hardness improvement 4.2%	[49]
4.	Denture base PMMA	ZrO ₂ -Al ₂ O ₃	Tensile strength decrease 17.0% (highest value for 100% ZrO ₂) Fracture toughness improvement 32.5% (ZrO ₂ /Al ₂ O ₃ =20/80)	[52]
5.	Denture base PMMA	ZrO ₂ /Aluminum borate whiskers	Surface hardness improvement 26.4% (reinforcement ratio 1:2, 3% ZrO ₂) Felxural strength improvement 52.3% (reinforcement ratio 1:2, 2% ZrO ₂)	[53]
6.	Denture base PMMA	Glass/UHMW PE fibers in form of fabrics 5.3%	flexural strength 90% and modulus 76%	[54]
7.	Acrylic Denture Base Material	Alumina whiskers and PS fibers with Grubs catalist	Self healing composite with 74% healed impact energy	[55]

water 27 ppm w/w. In the other studies also used auto polymerized and thermo polymerized acrylic resins." [47, 54].

As ceramic nano filler in the composite mostly used nanopowder of ZrO₂ (with a particle size ~100 nm), Sigma Aldrich, was used as particle reinforcement [47, 48, 55]. Also the alumina whiskers were commercially available from Sigma–Aldrich, and they were characterized by diameters of 2–4 nm and lengths of 200–400 nm (specified by the producer) and Aluminum borate whiskers [52, 564]. For surface modification of zirconia 3-Methacryloxypropyltrimethoxysilane (MEMO) (Dynasylane, Evonik Industries) was used [47, 48, 54], while for modification of alumina 3-mercaptopropyltrimethoxy silane (MPTMS, 95 %; Sigma–Aldrich.) was used as a coupling agent [52, 55].

Polystyrene (PS) used to obtain electrospun fibers and PS fibers with Grubs catalyst was purchased as Empera1251N from Ineos Nova. Solvent for PS solution was 99.8% dimethylformamide (DMF), purchased from Sigma-Aldrich [47, 55]. "Electrospinning (Electrospinner CH-01, Linari Engineering) was performed with a 20 ml plastic syringe with a metallic needle of 1 mm inner diameter set vertically on the syringe pump (R-100E, RAZEL Scientific Instruments) with 15 cm distance from the needle tip to the collector, and the high-voltage power supply (Spellman High Voltage Electronics Corporation, Model: PCM50P120) set to a voltage of 28 kV at the room temperature (25°C) and the humidity of 47%. The flow rate of the polymer solution was 5.0 ml/h. The concentration of PS in DMF solution prepared for electrospinning was 22 wt. %." [47, 55]. The polypropylene fiber (Crace cemfiber) cutted to 4.0 mm length and modified by oxygen plasma was also used in hybrid composite [48]. In yhe other study glass fibers -GFs (E-glass, Shanghai Richem International Co., Ltd.) 3mm length and 12 μm diameter [50].

3.1 Methods of Characterization

"The microstructure of the composites was studied by SEM microscopy/ Image analysis was performed by Image Pro-Plus 4.0 software (Media Cybernetics) that provided the information about PS fiber diameter distribution." [47, 55]

"Fourier transformed infrared (FTIR) analysis was performed to investigate bonding between nanoparticles and the matrix."

"Mechanical characterizations of the samples were performed by Vickers microhardness (HV) tester, Impact test was performed using Puncture Impact testing machine HYDROSHOT HITS-P10. Tests were performed on five specimens according to the ASTM D 3763–15, and the results were presented as mean values with standard deviations. The data were analyzed in terms of the maximum load, energy corresponding to the maximum load and total energy." [47, 55].

A pendulum Charpy-type impact test machine (Digital Charpy Izod

observed at 1173 cm⁻¹ in the spectrum of modified zirconia. The peak at 1721 cm⁻¹ that is associated with carbonyl stretching band C = O which is present in the silane coupling agent (MEMO) was observed in the spectrums of modified zirconia and the composite (shifted to 1733 cm⁻¹). The presence of adsorbed water was confirmed by the Zr–H₂O flexion at 1635 cm⁻¹. " [47].

impact tester, XJU 5.5, Jinan engrand Instrument Co., Ltd.) was used to perform the impact test at room temperature" [50]

"For tensile strength flat dumbbell shaped with (75mm in length, 4.0mm in width and 2.5mm in thickness) at the parallel segment. Dumbbell shaped specimens were fabricated according to ASTM specification D-638M (1986). Instron universal testing machine (LARYEE, china) where used to accomplished the test with crosshead speed 1.0 mm/min and maximum loading of 20 Kg." [48]

"For the flexural strength test, the specimens were bar-shaped with dimensions of 65 × 10 × 2.5mm ± 0.2mm according to American Dental Association (ADA) Specification No. 12." [50].

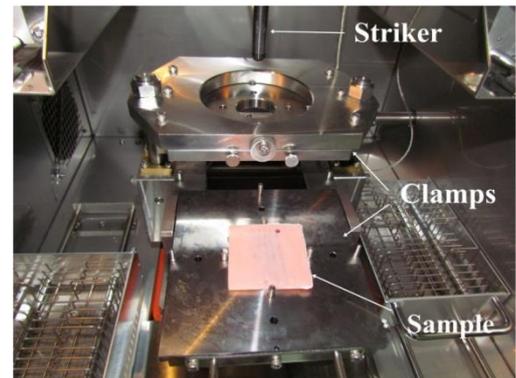


Figure 3. The sample in machine for impact test [56]

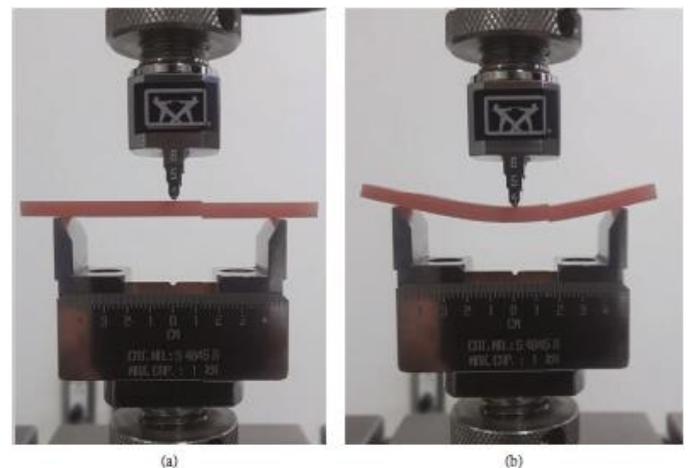


Figure 4: (a) Flexural strength of the specimen placed on the universal testing machine and (b) specimen subjected to bending strength until failure load recorded with specimen fracture. [50].

4 Results and discussion

4.1 FTIR analysis

The FTIR analysis was used to identify possible establishment of chemical bonding during processing of hybrid polymer composites. Also, it is important to prove the chemical modification of nanoparticles surfaces.

"The FTIR spectra of both unmodified and modified zirconia nanoparticles and the composite with modified zirconia are presented in Fig 12a. All spectra have a peak at 754 cm⁻¹ that is attributed to Zr–O stretching vibrations at ZrO₂ nanoparticles. Characteristic acrylate CH₃ vibration of MEMO silane was

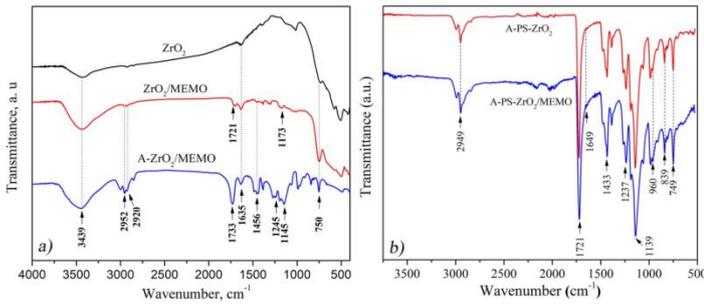


Figure 5 "FTIR spectra of: a) neat ZrO₂ particles, ZrO₂ particles modified with MEMO silane and a composite reinforced with ZrO₂/MEMO and b) hybrid composites A-PS-ZrO₂ and A-PS-ZrO₂/MEMO"[47]

"FTIR spectrums of A-PS-ZrO₂ and A-PS-ZrO₂/MEMO is presented in Fig 10b. All the spectra have peaks in the region of 2995–2840 cm⁻¹, which are assigned to the stretching of the C–H bonds contributed mostly to PMMA and PS. The peak at 749 cm⁻¹ is attributed to Zr–O stretching vibrations from nanoparticles in all the spectrums. Double bond C = C stretch which is sensitive to ring strain vibration at 1649 cm⁻¹, indicated conjunction with the phenyl group in PS, emphasized with MEMO silane. An increased intensity of the signal at 960 cm⁻¹ in A-PS-ZrO₂/MEMO compared to A-PS-ZrO₂ indicates the formation of Si–O–Zr bond." [47]

"The silanization of whiskers was followed by the FTIR spectrum of unmodified and modified whiskers (Fig. 2). The FTIR spectrum of MPTMS silane is also presented on Fig.13."

"The band at 2560 cm⁻¹ observed in the spectrum of WMPTMS is assigned for the S–H stretch band [26, 30], which was not observed in the absorption spectrum of un8]. The absorption bands for the propyl group are appearing at 2936 and 2852 cm⁻¹ due to the C–H stretching vibrations, further justifying the MPTMS anchored onto whiskers. Additionally, the band in the 1075 cm⁻¹ is assigned to the vibration of Si–O–Al bond [59, 60]. These facts indicate that chemical immobilization of MPTMS on nano whiskers was successfully occurred [60, 61]."[55].

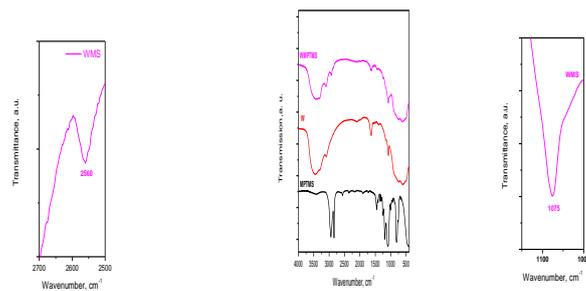
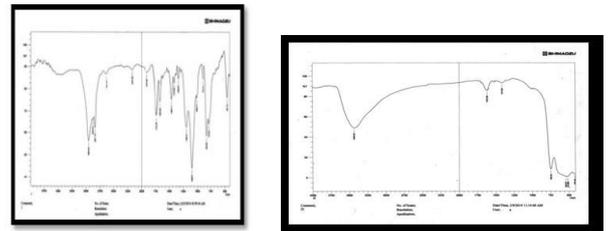


Figure 6. FTIR spectrum of MPTMS silane, whiskers (W) and silanized whiskers (WMPTMS). The enlarged parts are from WMPTMS spectrum"[55]

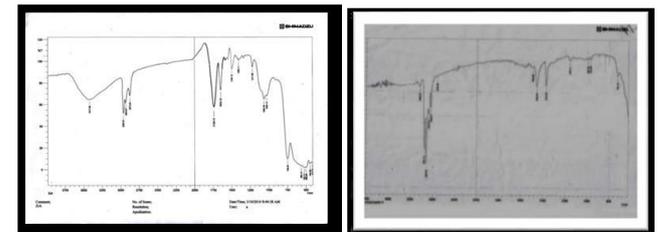
"The characterization FTIR test has performed to samples of zirconium oxide nanofiller before Silanization which mean without modification, and (trimethoxysilyl) propyl methacrylate (TMSPM) silane coupling agent to indicate the difference in the spectra, as seen in figure (4) and figure (5) below. Additionally other FTIR has performed to zirconium oxide nanofiller after Silanation to indicate the differences in in the peaks, as seen in Figure 14. MPS absorption bands could be assigned to functional groups presence." [54]

4.2 FE-SEM analysis

Morphology and size of hybrid reinforcements could be observed by FE-SEM analysis. "The size distribution of PS fibers was obtained using image analysis tools and the results are presented in Fig 15. PS diameter distribution with mean diameter $D_{mean} = 1.51 \mu\text{m}$ (standard deviation = $0.52 \mu\text{m}$) was best fitted with the Lognormal distribution curve. FE-SEM images of cross-sections of the polymer after the impact testing are presented in Fig 16. Shows that zirconia agglomerates observed in the sample with unmodified particles had larger diameters and consisted of a larger number of individual particles, (Fig 16a) while surface modification of nanoparticles with MEMO silane (Fig 16b) enabled aggregates to be smaller in diameter and more evenly spaced. In Fig 16c and 16d the areas with fibers are presented. The modification of nano zirconia with MEMO silane produced a monolayer of silane on the surface of the particles, and promotes deagglomeration in the polymer matrix because of the steric hindrance." [47].



FTIR spectrum of TMSPM FTIR spectrum of non silanized zirconium oxide nanoparticles



FTIR spectrum of zirconiananoparticlesaftersilanization FTIR of untreated PP fibers

Figure 7. FTIR analysis of established bonding during modification of reinforcements in hybrid composites[48].

"SEM view of the group D specimens (Figure 8(a)) showed the roughest surface among all the reinforced groups, glass fibers failed adhesively at the plane of the fracture and protruded, voids formed due to the glass fibers that were pulled out were higher in number than group C.

SEM image of group E specimens exhibited a similar morphology to that seen with group C, but the fibers were completely protruding out of the fractured end with voids on the opposing surface of the specimens (Figure 5(b)). As expected, a considerable number of GFs were seen on the surface of the specimens of groups F and G (Figures 8(c) and 17(d))."[50]

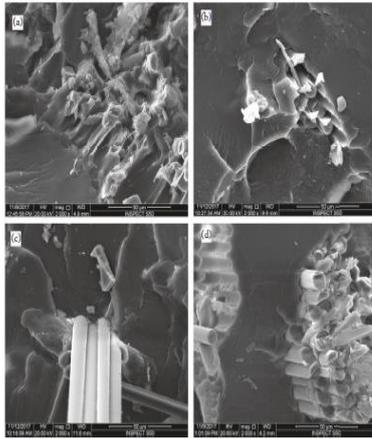


Figure 8: SEM of fracture surfaces of flexural test specimens. (a) 2.5% nano-ZrO₂ + 2.5% GFs; (b) 2% nano-ZrO₂ + 3% GFs; (c) 1% nano-ZrO₂ + 4% GFs; (d) 0% nano-ZrO₂ + 5% GFs.[50]

4.3. Mechanical properties

4.3.1. Hardness test

"Vickers hardness test reflects the uniformity of reinforcement dispersion in the composites and its resistance to shear stresses under local volume compression. Table 2 presents Vickers values for the PMMA matrix and the composites. The addition of 1 wt. % zirconia nanoparticles improved microhardness by 3%. In composites with silanized zirconia (ZrO₂/MEMO) the effective dispersion and cross-linking was achieved, and thus improvement of HV value of 29% for 1 wt. % modified zirconia resulted. On the other hand, the introduction of PS fibers leads to lower hardness values. The PMMA and PS are immiscible and don't interact easily. Added PS fibers didn't interact with the PMMA paste during the preparation of the composite.

This leads to interfacial tension in those areas which is followed by attraction of nanoparticles in the vicinity of PS fibers. This influence of the composites' mechanical behavior of leads to lower hardness and *T_g*. In order to emphasize the influence of different nanoparticle concentrations in the hybrid composites, samples with 0.5 wt. % of MEMO silane functionalized ZrO₂ nanoparticles were also subjected to micro Vickers test. The hardness growth trend remained the same—nanoparticles ZrO₂/MEMO offer improved hardness due to higher compatibility of MEMO functional groups with PMMA matrix. The presented results revealed that the hardness could be adjusted by optimizing the content ratio of modified zirconia and PS fibers."[48]

Table 4 Results of Vickers hardness test for hybrid composite PMMA-ZrO₂-PS fibers [48].

Sample	HV, MPa	St.dev., MPa
A	243	±1
A-ZrO ₂	250	±5
A- ZrO ₂ /MEMO	313	±8
A-PS	211	±5
A-PS-ZrO ₂ -1.0	229	±8
A-PS-ZrO ₂ /MEMO-0.5	232	±1
A-PS-ZrO ₂ /MEMO-1.0	269	±3

4.3.2 Impact test

"The position of a sample in the impact machine and samples before and after the impact test is presented in Fig 18. The results of the controlled energy impact test are presented in Fig 19. The impact behavior of the hybrid nanocomposites with PS fibers and modified particles was significantly improved, compared to the pure PMMA.

"The flexural strength of group G (0% nano-ZrO₂ + 5%GFs) nanocomposites was elevated by 6% when compared to that of pure

Table 4. presents the absorbed energy values. Absorbed energy is defined as the energy difference between the total energy and the energy at peak load. As the composite materials are brittle, it was assumed that energy up to the peak load was due to the elastic deformation of the sample and that beyond the peak load, energy was spent on creation and propagation of cracks. As expected, sample A-PS showed the highest ability to absorb energy during the impact, almost 92% higher than the pure PMMA. FE-SEM analysis showed the difference in the observed matrix-PS fiber interface after the impact test. Acrylic resin with PS fibers has a clear and smooth surface that indicates poor contact between the two polymers (Fig 20a). In the case of a matrix with unmodified ZrO₂ particles, it could be seen that particles built some agglomerates (Fig 20b) at PS surface and slightly improved contact between the fibers and the matrix. Surface modification of ZrO₂ particles with MEMO silane significantly improved the compatibility of the interfaces in a hybrid composite A-PS-ZrO₂/MEMO (Fig 20c). Modified composite matrix (A-ZrO₂/MEMO) filled the space between the fibers and improved the contact between the matrix and the fibers."[48]"Incorporation of pure brittle zirconia, prone to agglomeration, reduced absorbed energy, while it was successfully compensated latter with the combination of modified particles and the electrospun polymer fibers. Therefore, sample A-PS-ZrO₂/MEMO-1.0 shows the value of total absorbed energy close to the one of A-PS, and the shape of failure mode which is, following the assumption, based on FE-SEM analysis."[48].

4.3.3 Flexural test

Mean values, standard deviations, and statistically significant differences of flexural and impact strengths are summarized in Table 3, addition of different concentrations of nano-ZrO₂ + GFs significantly increased the flexural strength for all reinforced groups when compared to the control group (*p* < 0.05). Different ratios of nano-ZrO₂ + GFs resulted in varied effects on the flexural strength of the composite material.

Table 5. Tukey–Kramer multiple-comparison test for flexural strength (MPa) and impact strength (kJ/m²) of denture base resins showing mean ± SD and groups with significant differences [50]

Groups	Flexural strength (MPa) Mean ± SD	Impact strength (kJ/m ²) Mean ± SD
Control	64.52 ± 5.76	3.89 ± 0.46a
A	75.16 ± 6.95a	3.80 ± 0.71b,c
B	77.63 ± 5.65a	3.44 ± 0.82b
C	85.82 ± 6.96b	3.30 ± 0.65c,d
D	94.05 ± 6.95	3.24 ± 0.64d
E	83.28 ± 5.32b	2.77 ± 0.92b
F	75.55 ± 6.23a	2.37 ± 0.46e
G	68.21 ± 7.76	1.99 ± 0.63a,e

"The results showed that the flexural strength of group A (5% nano-ZrO₂ + 0% GFs) nanocomposites was elevated by 21% when compared to that of unreinforced PMMA. The good distribution of the very finely sized nano-ZrO₂ used in the study enabled them to occupy the spaces between linear chains of the polymer, thereby restricting the segmental motions of the macromolecular chains and increasing strength and rigidity of the resin. This mechanism enhanced the fracture resistance and improved flexural strength."[50]

PMMA. When the load is applied on the specimen, tension occurs below the long axis of the specimen. The high modulus of elasticity of GFs as well as the strong bond between the matrix and fibers leads to hindrance of crack initiation and propagation under the failure load; resist tension occurs below the long axis of the specimens, subsequently increasing the flexural strength.”[50]

Conclusion:

Organic-inorganic nanocomposites have wide application in dentistry and prosthetics. Inorganic materials play a key role in sustaining and supplementing mechanical properties of polymer matrices and in further favoring cellular behaviors. As a result, in dentistry, biocompatible nanocomposites are able to be substituted for native tissue as shown in many clinical cases. Hybrid polymer composite materials show improved mechanical properties coming from a synergy of different reinforcements. Ceramic nanoparticles, which possess appropriate surface modification; and non-woven polymer fibers are proven to be good candidates for incorporation in the acrylic matrix to successfully modulate of mechanical and thermal properties of the hybrid nanocomposite material. Interactions between the fibers and the matrix were strong enough to allow load transfer from the matrix to the fibers, which ensured better mechanical properties of the processed hybrid nanocomposite. The interfacial adhesion strength between the matrix and the fibers increased resistance to crack generation and propagation. These failure mechanisms led to the high absorption of impact energy as a consequence of dissipation during crack propagation. These results show that dental materials can be modified to withstand higher impact force and to have excellent elastic properties and high biocompatibility at the same time. However, most biocompatible nanocomposites still lack the data for clinical applications when compared to data of monophasic resin. Further in vivo or clinical studies are imperatively needed for use of bionanocomposites in dental applications.

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Employee motivation and performance of the agricultural sector in Trans Nzoia County, Kenya.

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Purpose: This study explored on the effect of employee motivation on performance of agriculture sector in Trans Nzoia County, Kenya. The specific objective of this study were; employee innovation, employee incentives, employee flexible schedules and employee feedback on performance in Kenya's Trans Nzoia County. The findings of the study are intended to be useful to Kenyan policymakers, agricultural sector and researchers and scholars.

Keywords: Employee innovation, employee incentives, employee flexible schedules and employee feedback and performance of agricultural sector.

Introduction:

Global business environment is fast changing and the organizations which are adaptable to the change are the one going to survive. Organizations need to frame strategies in order to endure the challenging competition, and the one which are able to survive was used able to sustain longer than others. One of the greatest challenges organizations face today was how to manage turnover of work force that may be caused by migration of a lot of industrial workers (Al Madi , Assal , Shrafat , Dia, 2017). This may be because of their lack of Motivation and commitment for the organization; this point of view emphasizes the importance of the study of Motivation and its relationship to Job Satisfaction, states that today's most progressive organizations in developed countries have moved from treating selected human resource practices for example, motivation, employee participation, flexible work arrangements, and training act as strategic weapons in the battle for competitive advantage.

Employee motivation was most important element for all organization to attain achievement whether these are public or private. According to the outcomes of the study accomplished on the association between motivation and job satisfaction of employees by Sedarmayanti (2012), having 135,000 farm managers from different groupings and countries, organizations implementing various motivation programs involving three constructs as camaraderie, equity and achievement were considered to be more effective than organizations that had no or twice as many 'enthusiastic' employee of total 45%). These strategies are not just directed towards the retention and attraction but also overcome other adverse effects of demotivation and dissatisfaction such as absenteeism, low performance, lower morale, low contribution to the team, less coordination, less orientation towards organizational objective these could affect the organization capacity to compete in the highly competitive business environment. This makes it important to study and understand the factors which motivate and create job satisfaction among employees.

2.1 Maslow's Need Hierarchy Theory:

It was probably safe to say that the most well-known theory of motivation was Maslow's need hierarchy theory Maslow's theory was based on the human needs. Drawing chiefly on his clinical experience, he classified all human needs into a hierarchical manner from the lower to the higher order. In essence, he believed that once a given level of need was satisfied, it no longer serves to motivate man (MSG Experts, 2015). Then, the next higher level of need has to be activated in order to motivate the man. **Physiological Needs:** These needs are basic to human life and, hence, include food, clothing, shelter, air, water and necessities of life. These needs relate to the survival and maintenance of human life. They exert tremendous influence on human behaviour. These needs are to be met first at least partly before higher level needs emerge. Once physiological needs are satisfied, they no longer motivate the man. **Safety Needs:** After satisfying the physiological needs, the next needs felt are called safety and security needs. These needs find expression in such desires as economic security and protection from physical dangers. Meeting these needs requires more money and, hence, the individual was prompted to work more. Like physiological needs, these become inactive once they are satisfied. **Social Needs:** Man was a social being. He was, therefore, interested in social interaction, companionship, belongingness, etc. It was this socializing and belongingness why individuals prefer to work in groups and especially older people go to work. **Esteem Needs** (Daft, 2000).

These needs refer to self-esteem and self-respect. They include such needs which indicate self-confidence, achievement, competence, knowledge and independence. The fulfillment of esteem needs leads to self-confidence, strength and capability of being useful in the organization. However, inability to fulfill these needs results in feeling like inferiority, weakness and helplessness. **Self-Actualizations Needs:** This level represents the culmination of all the lower, intermediate, and higher needs of human beings. In other words, the final step under the need hierarchy model was the need for self-actualization. This refers to fulfilment (Daft, 2000). The term self-actualization was coined by Kurt Goldstein and means to become actualized in what one was potentially good at. In effect, self-actualization was the person's motivation to transform perception of self into reality. According to Maslow, the human needs follow a definite sequence of domination. The second need does not arise until the first was reasonably satisfied, and the third need does not emerge until the first two needs have been reasonably satisfied and it goes on. The other side of the need hierarchy was that human needs are unlimited. However, Maslow's need hierarchy-theory was not without its detractors (MSG Experts, 2015).

2.2 Herzberg's Motivation Hygiene Theory

The psychologist Frederick Herzberg extended the work of Maslow and proposed a new motivation theory popularly known as Herzberg's Motivation Hygiene (Two-Factor) Theory. Herzberg conducted a widely reported motivational study on 200 accountants and engineers employed by firms in and around Western Pennsylvania. He asked these people to describe two important incidents at their jobs: When did you feel particularly good about your job, and When did you feel exceptionally bad about your job? He used the critical incident method of obtaining data. The responses when analyzed were found quite interesting and fairly consistent (Daft, 2000). The replies farm managers gave when they felt good about their jobs were significantly different from the replies given when they felt bad. Reported good feelings were generally associated with job satisfaction, whereas bad feeling with job dissatisfaction. Herzberg labelled the job satisfiers motivators, and he called job dissatisfies hygiene or maintenance factors. Taken together, the motivators and hygiene factors have become known as Herzberg's two-factor theory of motivation Herzberg's motivational and hygiene factors have According to Herzberg, the opposite of satisfaction was not dissatisfaction. The underlying reason, he says, was that removal of dissatisfying characteristics from a job does not necessarily make the job satisfying. He believes in the existence of a dual continuum. The opposite of 'satisfaction' was 'no satisfaction' and the opposite of 'dissatisfaction' was 'no dissatisfaction'. According to Herzberg, today's motivators are tomorrow's hygiene because the latter stop influencing the behavior of persons when they get them. Accordingly, one's hygiene may be the motivator of another (MSG Experts, 2015).

2.3. McClelland's Need Theory

Another well-known need-based theory of motivation, as opposed to hierarchy of needs of satisfaction-dissatisfaction, was the theory developed by McClelland and his associates'. McClelland developed his theory based on Henry Murray's developed long list of motives and manifest needs used in his early studies of personality (Daft, 2000). McClelland's need-theory was closely associated with learning theory, because he believed that needs are learned or acquired by the kinds of events people experienced in their environment and culture. He found that people who acquire a particular need behave differently from those who do not have. His theory focuses on Murray's three needs; achievement, power and affiliation. In the literature, these three needs are abbreviated "n Ach", "n Pow", and "n Aff" respectively'. **Need for Achievement:** This was the drive to excel, to achieve in relation to a set of standard, and to strive to succeed. In other words, need for achievement was a behaviour directed toward competition with a standard of excellence. McClelland found that people with a high need for achievement perform better than those with a moderate or low need for achievement, and noted regional / national differences in achievement motivation (Abrar, 2016).

Through his research, McClelland identified the following three characteristics of high-need achievers: High-need achievers have a strong desire to assume personal responsibility for performing a task for finding a solution to a problem. High-need achievers tend to set moderately difficult explores and take calculated risks. High-need achievers have a strong desire for performance feedback. **Need for Power:** The need for power was concerned with making an effect on others, the desire to influence others, the urge to change people, and the desire to make a difference in life. People with a high need for power are people who like to be in control of people and events. This results in ultimate satisfaction to man (Daft, 2000). People who have a high need for power are characterized by: A desire to influence and direct somebody else. A desire to exercise control over others. A concern for maintaining leader-follower relations. **Need for Affiliation.** The need for affiliation was defined as a desire to establish and maintain friendly and warm relations with other people'. The need for affiliation, in many ways, was similar to Maslow's social needs (MSG Experts, 2015).

2.4. McGregor's Participation Theory:

Douglas McGregor formulated two distinct views of human being based on participation of workers. The first basically negative, labeled Theory X, and the other basically positive, labeled Theory Y. Theory X was based on the following assumptions: People are by nature indolent. That was, they like to work as little as possible (Daft, 2000). People lack ambition, dislike responsibility, and prefer to be directed by others. People are inherently self-centered and indifferent to organizational needs and explores. People are generally gullible and not very sharp and bright. On the contrary, Theory Y assumes that: People are not by nature passive or resistant to organizational explores. They want to assume responsibility. They want their organization to succeed. People are capable of directing their own behavior. They have need for achievement. What McGregor tried to dramatize through his theory X and Y was to outline the extremes to draw the fencing within which the organizational man was usually seen to behave. The fact remains that no organizational man would actually belong either to theory X or theory Y. In reality, he/she shares the traits of both. What actually

happens was that man swings from one set or properties to the other with changes in his mood and motives in changing environment (MSG Experts, 2015).

2.5. Porter and Lawler's Expectancy Theory:

In fact, Porter and Lawler's theory was an improvement over Vroom's expectancy theory. They posit that motivation does not equal satisfaction or performance. The model suggested by them encounters some of the simplistic traditional assumptions made about the positive relationship between satisfaction and performance (Daft, 2000). They proposed a multi-variate model to explain the complex relationship that exists between satisfaction and performance. What was the main point in Porter and Lawler's model was that effort or motivation does not lead directly to performance. It was intact, mediated by abilities and traits and by role perceptions. Ultimately, performance leads to satisfaction. There are three main elements in this model. Let us briefly discuss these one by one. **Effort:** Effort refers to the amount of energy an employee exerts on a given task. How much effort an employee will put in a task was effected by two factors; Value of reward and Perception of effort-reward probability. **Performance:** One's effort leads to his/her performance. Both may be equal or may not be. However the amount of performance was effected by the amount of labor and the ability and role perception of the employee (MSG Experts, 2015). Thus, if an employee possesses less ability and/or makes wrong role perception, his/her performance may be low in spite of his putting in great efforts. **Satisfaction:** Performance leads to satisfaction. The level of satisfaction depends upon the amount of rewards one achieves. If the amount of actual rewards meet or exceed perceived equitable rewards, the employee will feel satisfied. On the contrary, if actual rewards fall short of perceived ones, he or she was used dissatisfied. Rewards may be of two kinds such as intrinsic and extrinsic rewards (Daft, 2000). Examples of intrinsic rewards are such as sense of accomplishment and self-actualization. As regards extrinsic rewards, these may include working conditions and status. A fair degree of research support that, the intrinsic rewards are much more likely to produce attitudes about satisfaction that are related to performance. There was no denying of the fact that the motivation model proposed by Porter and Lawler was quite complex than other models of motivation. In fact motivation itself was not a simple cause-effect relationship rather it was a complex phenomenon Porter and Lawler have attempted to measure variables such as the values of possible rewards, the perception of effort-rewards probabilities and role perceptions in deriving satisfaction. They recommended that the managers should carefully reassess their reward system and structure. The effort-performance-reward-satisfaction should be made integral to the entire system of managing men in organization (MSG Experts, 2015).

3.1 Employee Innovation

Researchers has been suggesting that innovation was the generation of new and useful ideas (Abid & Barec, 2017). It was critical for the company existence and its competitiveness. Assumption was being derived that the employee's innovation gives advantages in the outcomes of the work of the organization, researchers have been giving most of its attention to get to know about the effect on the organization what & how should the employee be doing its work they are most concerned with it. Innovation gives importance to its organizations, to the point it affects the employees job efficacy and its satisfaction. Some researcher give argument that employee's innovation will enhance when the top management allow employee to be empowered. Employee's innovation can be enhanced in the organization by empowering the employee & giving feedback on how they achieved their goals, giving them free hand how they want to achieve those goals which will result to enhance performance beyond imagination (Abrar, 2016).

The result which were attained in the linking of employee's innovation with performance of the firm had a very inclusive effect, it had a positive effect on each other explaining the fact that it does takes some processes to go through to get new knowledge but in due time the individual was able to come up with new techniques which tends to be innovative and efficient having positive relation on the organization performance. Firms image was the most important benchmark of the company's, to assess its key value & measure its performance, which increases and decreases with market competitors, a company can increase its performance by empowering their employee so they can achieve more better performance of the firm, customer satisfaction. The organization knowledge, skills, ability to make use of its maximum potential of its employees, due to modern research we come to know that capabilities now a days are more important than having surplus resources. Researchers define that the skills are the most important factor for the organization performance to enhance when these skills user are given empowerment so the employees are more innovative (Ongeri & Osoro, 2021).

3.2 Employee Incentives

The term "incentives", "Rewards", and "Recognition" are used interchangeably in the organization setting and there was no broader difference among them. However, the main category was the incentives. Widhianingrum, (2018) defines incentives as any source or medium that encourages an employee or group of employee's to perform better and to exert more effort beyond expectations. Basically incentives are divided into two main groups: Agricultural incentives and non-financial. Agricultural incentives include direct payment of cash while non-agricultural incentives may be in the form of promotion of employee's, flexible time, autonomy and involvement in decision making. Hartman, Babagana and Dungus (2015) state that incentives are one technique by which employee's" carry out their end of the employment contract, that was, compensating employee's for their efforts. In general, an incentive scheme (payment or programme) was any compensation that has been designed to recognize some specific accomplishment on the part of an employee. It was expected that the prospect of the incentive payment will „trigger“ the desired employee's productivity behaviour in the employee. Incentives are either individual or group (organization wide). In this study, agricultural incentives are designed to motivate employee's to improve their employee's productivity to increase effort and output and by

producing better results expressed in such terms as objectives for profit, productivity, sales turnover, cost reduction, quality customer service and on time delivery. This agricultural compensation provides extra money for achievement in terms of contribution or output. The emphasis in agricultural compensation was on equity, in the sense of paying people according to their just „deserts“. Incentive schemes relate compensation to productivity. A primary purpose of an incentive scheme was to encourage greater productivity from individuals and work groups. The assumption usually made by management was that money or cash alone may not motivate employees. In designing incentive schemes, output standards should be established (Oruko, Tibbs & Maniagi, 2020).

Human resource provides basis for an organization to achieve sustainable competitive advantage. Since organizations are operating in a dynamic and competitive business environment, they need to develop strategies to acquire and retain the competent workforce (Ongeri & Osoro, 2021). Human asset was considered to be the most important asset of any organization and in order to get the efficient and effective result from human resource, motivation was necessary. Researchers divide motivation into two categories, intrinsic and extrinsic. Extrinsic motivation comes from external factors such as agricultural rewards and needs to be refilled at regular intervals not to lose its effect. Intrinsic motivation comes from inside of an individual and was the kind of motivation every organization wishes their employee's would have. Bhuvanaiah *et al.* (2015), states that “employee's productivity” was defined as behavior that accomplishes these results. In light of today's business conditions especially in the banking industry where CBK has introduced a regulation on interest capping, motivating people to give their best has become more crucial than ever before. To achieve goals and objectives, organizations irrespective of size, develop strategies to compete in highly competitive markets and to increase employee's productivity. The Human Resources Management has a role to hire and come up with retention strategies for the best employee's, especially the ones holding key roles that can be difficult to replace because of the technical competencies required (Widhianingrum, 2018).

3.3 Employee Flexible Schedule

In 21st century the technological advancement has reached beyond the expectations and the frequent changes affecting the corporate world have increased the need of workplace flexibility. It was a way of thinking and a working that helps the employees to contribute and manages their personal lives as well (Ongeri & Osoro, 2021). It also engages the employees to bring the innovative and innovative solutions to the conflicts being occurred in their professional and personal life responsibilities. Flexible Work Arrangements (FWA) that vary from the conventional work pattern of 9 to 5 Monday to Friday have a very diverse variety of feasible options. FWA enable your business enhanced competition between recruitment levels and workload or customer service demands, which enables the organization to open for longer hours which increases the staff availability when the workload was on the peak and less quantity of employees when business was calm/silent. Flexible work arrangements was used highly supporting for the employees personal needs (Shah , Khattak & Shah,2020). Different businesses offer flexible work options and employees are increasingly recognizing flexible scheduling as an important factor in taking or staying with a position. Flexibility will also include the following benefits for example enhanced productivity, increases morale, lower the rate of absenteeism and improved quality of work. Flexible scheduling creates an environment where employees are more satisfied with both their jobs and their lives.

Flexible work schedules was a significant issues in this 21st Century. Nevertheless, it was not until in the recent past that these practices came to be perceived as beneficial for both employees and employers (Ongeri & Osoro, 2021). Studies supporting the benefits of flexible work schedules recognize the positive although indirect contribution of these practices to organizational profit. Organizations and employees have realized the potential advantages of the practices as far as creating a satisfied workforce, promotion of employee wellbeing, reducing the rate of absenteeism, employee commitment and improvement in organization citizenship behaviour was concerned. Flexible work schedules refer to practices that allow individuals to decide and manage their work schedules. On the other hand. Bawa (2017), he observed with regards to hours of work, based on these schedules, the employee was allowed to have some control over their job and can decide on the timing as well as the place where the job should be done. Flexible work practices are perceived by organizations as a strategy for obtaining and retaining high quality staff ((Shah *et al.*, 2020). Employers who implement such a workplace approach across the organization can realize substantial cost savings as well as higher employee performance. Besides this, there was increased productivity due to decreased absenteeism and turnover; it provides an inexpensive way to improve employee morale and innovative opportunity to retain staff (Mungania, Waiganjo & Kihoro, 2016).

3.4 Employee Feedback

Companies and professionals use employee feedback forms to gather information of two kinds. The first was employee performance feedback. Employee feedback forms are prepared to match the needs of the company or organization (Widhianingrum, 2018). The parameters are established based on which the notable or remarkable questions are posed. The second usage of employee feedback forms was to gather information from employees or about employees so that the company can improve, revise or reviews its plans of work. Feedback has become a buzz word in an organization, and the practice of using feedback either formally or informally was increasing. Formally in the sense that feedback was captured in technologically aided systems i.e. Human Resource Integrated System; and informally in a sense of team leaders providing weekly basis feedback within a team. The use of weekly and end of shift feedback has been rapidly increasing in the sales and hospitality industry, and states that people receiving feedback apply it about 30% of the time (Doshmanziari, 2018).

Feedback has been a growing concern in academia and organizations, most notably after McKinsey's publication of 'The War for Talent' that drove high performing business to dive into talent management, where the philosophy of gaining competitive advantage

started focusing on human resources. With the advent of technology and its adoption, perceptions of human resource management shifted from Personnel Department managing personal files to the department managing competency profiles of employees. The leading shift in the arena of supporting human performance was the availability of technological aids to capture and monitor feedback (Widhianingrum, 2018). Tracing the importance of performance in output from employees goes back to the 20th century, when George Elton Mayo conducted experiments in the Hawthorne Works (Chicago) of the General Electric Company between 1924 and 1927. The outcome of this experiment was called the 'Hawthorne Effect', which states that individual workers are members of a group, and that monetary incentives and working conditions have less importance compared to the behaviour of employees in that group. Therefore managers must be aware of the social needs of employees. This was the first scientific enquiry towards employee attitudes and the business organization as a social system. The experiment led to the conclusion that employees who are monitored, observed and watched by their peers are more productive than those who are not. Similar to the conclusion of the Hawthorne Effect, motivation theorists like Herzberg and Maslow also stated the impact of personal relationships among employees in contributing to increased productivity (Nyoro & Jayne, 2019).

3.5 Performance of Agricultural Sector

Productivity was usually defined as the ratio of inputs to outputs. It essentially measure how efficiently production inputs such as labour and capital are being used to produce a given level of output. Tanoli MF (2016) opined that organizational productivity was the measure of how well an organization functions and also an indication of efficiency and competition. Also it was a measure of how well resources are brought together and utilized for accomplishing set objectives. Productivity was a global concern, which has inseparable ties to the longevity of the organization. It was the key for survival in the cut-throat world of business and gives the organization a key competitive advantage above its peers when it was able to do more with less. The baseline for economic productivity of an organization was the strength and quality of human capital. Human capital refers to the skills, abilities, competencies and qualities of an organization's employee's. It comprises of the knowledge and enterprise employee's apply to produce products and services and to the operations of the organization, its equipment and machineries. When human capital was adequately motivated, it leads to enhancement in productivity and service delivery (ElMelegy, Mohiuddin, Boronico & Maasher, 2016).

Whether outsourcing or self-service, companies must constantly spend money on logistics. The cost of employees a significant part of the total logistics cost (Widhianingrum, 2018). As a result, the higher the organizational performance, the more reasonable the logistical costs are, and vice versa. Transport expenses, raw material inventory, employee costs, order processing and information system costs, expensive paperwork, delivery and payment charges are all examples of logistics costs in an Agricultural sector enterprise. Inbound logistics refers to the flow of all supplies, collections, shipments, and employee incentives from suppliers to buyers. Inbound logistics services are primarily concerned with cost reduction, employees optimization, and customer service (Ongeri & Osoro, 2021). A solid employee motivation and company system can increase the firm's efficient activities, such as prompt customer service, from supply to buy, or from suppliers to manufacturer. Moreover, various studies have underlined the relevance of employee flexible schedule in allowing transportation. They highlighted that improving transportation service efficiency could result in better service at lower costs (Omulo & Kumeh, 2020).

3.6 Research Design

Research design refers to the framework of market research methods and techniques that are chosen by a researcher (Kothari, 2011). The design that was chosen by the researchers allow them to utilize the methods which were suitable for the study and to set up their studies successfully in the future as well. Therefore a research design was a general strategy chosen by researchers to integrate the various elements of the study in a very coherent and logical approach, thereby, guaranteeing that they with success address the analysis issue. It constitutes the outline for the gathering, measure, and analysis of employee flexible schedules. This study therefore adopted a pragmatic research approach with descriptive research design. This design was applicable to this study given that it adopted both questionnaire in collecting quantitative data and interview schedules in collecting qualitative data (Teik , Wanglin & Werner, 2013).

3.7 Employee feedback on Performance agricultural sector in Trans Nzoia County

From table 4.1 below, the respondents concurred that their regular feedback had clearly articulated performance of agricultural sector in Tran Nzoia. Most of the respondents gave a mean (M) of 3.934 and a standard deviation (SD) of .8172 respectively; when the respondents were asked whether they are in agreement that their firm had the best movement of two way conversations leading to long term achievement of goals in the agricultural sector, most of the respondents gave a mean (M) of 4.072 and a standard deviation (SD) of .7543 respectively; also when the respondents were asked whether they are in agreement that their firm had a well cascaded goals throughout the agricultural sector, most of the respondents gave a mean (M) of 4.393 and a standard deviation (SD) of .7654 respectively; further when the respondents were asked whether they were in agreement that their agricultural sector always endeavours to improve their balanced feedback to both internal and external client leading to performance of agricultural sector in Tran Nzoia County, Kenya, hence high performance. Majority of the respondents gave a mean (M) of 4.028 and standard deviation (SD) of .7572 respectively; the respondents also were requested to state their level of agreement regarding their own opinion in relation to employee feedback on performance of agricultural sector in Trans Nzoia County, Kenya majority of the respondents gave Yes response which is equivalent to mean (M) of 4.281 and a standard deviation (SD) of .8203 respectively; when the respondents

were asked if they gave Yes they explain majority of the respondents gave a mean (M) of 4.035 and a standard deviation (SD) of .9186 respectively. These findings concur with Kang'oro (2016) that the goal of employee feedback was to improve performance of agricultural sector in Trans Nzoia County, Kenya. This is in line with the finding of Ongeru and Osoro (2021). It is essential for employee feedback managers to comprehend the provisions of policies to be enhanced towards performance of agricultural sector in Trans Nzoia County, Kenya.

Table 4.1: Employee feedback

Statement	Mean	Std. Dev.
Are you in agreement that in your firm you have regular feedback clearly articulated toward employee feedback performance	3.934	.8172
Are you in agreement that your firm has a two way feedback conversation to realign both short term and long term achievement of goals in the agricultural sector	4.072	.7543
Are you in agreement that your firm has well cascaded goals throughout the agricultural sector	4.393	.7654
Are you in agreement that your firm always endeavoring to improve both internal and external client leading to high performance of the agricultural sector, hence performance of agricultural sector in Trans Nzoia County.	4.028	.7572
In your own opinion do you agree that employee feedback has an effect on performance of agricultural sector in Trans Nzoia County, Kenya.	4.281	.8203
When the respondents were asked to explain	4.035	.9186

3.8 PERFORMANCE OF AGRICULTURAL SECTOR IN TRANS NZOIA COUNTY, KENYA

These results are in table 4.12 below: when the respondents were asked whether they are in agreement that their firm have employee satisfaction in their area of employee motivation on performance of agricultural sector in Trans Nzoia County. Majority of the respondents gave a mean (M) of 3.920 and a standard deviation (SD) of 0.8123 respectively; also when the respondents were asked whether they are in agreement that their firms have a good return on production cost on performance of agricultural sector in Trans Nzoia County, Majority of the respondents gave a mean (M) of 3.004 and a standard deviation (SD) of 0.7034 respectively; further when the respondents were asked whether they agree that their firms have agricultural growth sector on performance of agricultural sector in Trans Nzoia County, most of the respondents responded with a mean (M) of 4.047 and a standard deviation (SD) of 0.5972 respectively; when the respondents were asked whether they are in agreement that their firms have a good motivation style on performance of agricultural sector in Trans Nzoia County, most of the respondents gave a mean (M) of 4.706 and a standard deviation (SD) of 0.7601 respectively; finally when the respondents were asked in their level of opinion whether they are in agreement that performance can be embraced by agricultural firm policy, most of the respondents ticked Yes with a mean (M) of 3.574 and a standard deviation (SD) of 0.8633 respectively; further when the respondents who ticked Yes were requested to justify their response, and majority of the respondents gave a mean (M) of 4.068 and a standard deviation (SD) of .6920 respectively.

These findings are in line with the finding of Oruko Tibbs and Maniagi (2020) (2011), who contended that it is critical to monitor performance of all agricultural sector at regular intervals so as to guarantee customer satisfaction and continuous improvement in the agricultural sector hence, more return on production cost. These include recognizing the importance of employee motivations in the area of performance of agricultural sector in Trans Nzoia, also to implement the True North of agricultural firm.

Table 4.2: Performance of agricultural sector in Trans Nzoia County

Statement	Mean	Std. Dev.
Are in agreement that your firm has a good employee satisfaction leading to performance of agricultural sector in Trans Nzoia County.	3.920	.8123
Are in agreement that your firm has a good return on production cost on performance of agricultural sector in Trans Nzoia County..	3.004	.7034
Are in agreement that your firm has a good growth of agricultural sector on performance of agricultural sector in Trans Nzoia County.	4.906	.5972
Are in agreement that your firm has a good employee motivation on performance of agricultural sector in Trans Nzoia County.	4.706	.7601
In your own opinion performance can be enhanced by employee motivation	3.574	.8633
When the respondents were requested to explain if they indicated Yes	4.068	.6920

3.9 Inferential Pearson Correlation Analysis

The study further conducted inferential statistics entailing both Pearson and regression analysis with a view to determine both the nature and respective strengths of associations between the conceptualized predictors of employee innovation, employee incentives, employee flexible schedules and employee feedback (all independent variables) and performance of agricultural sector in Trans Nzoia County, Kenya (dependent variable).

4.10 Model of Goodness Fit

Regression analysis was used to create the strengths of relationship among the performance of all agricultural sector (dependent variable) and the predicting variables; employee innovation, employee incentives, employee flexible schedules and employee feedback (independent variables). The results showed a correlation value (R) of 0.759 which shows that there is a good linear dependence between the independent and dependent variables. These findings concur with the findings of Saunders et al., (2014). This is in line with the findings of Kothari, (2011), who observed that this also depicted the significance of the regression analysis done at 95% confidence level. This implies that the multiple regression model was important and can thus be used to assess the relationship among the dependent and independent variables. This echoes the findings of Ongeru and Osoro, (2021), who detected that analysis of variance statistics scrutinizes the differences among group means and their related procedures.

Table 4.12 Model Goodness of Fit

R	R ²	Adjusted R	Std. Error of the Estimate
0.759	0.796	0.719	0.069

Conclusion

Manifestly, this study concludes that human resource management have ostensibly impacted on the performance of Agricultural sector in Trans Nzoia County, Kenya. The findings realized that agricultural sector should endeavour to embrace the best motivation that are aimed at propelling their firming systems with a view to satisfy their customers, increase productivity and overall enhances their profitability. Hence, when agricultural sector deployed human resource management occasioned through employee innovation, employee incentives, employee flexible schedules and human resource performance of all of agricultural sector in Trans Nzoia County, Kenya was wedged

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Prevalence Of Psychoactive Substance Use And Drug Problem Among Medical Students Of Ladoke Akintola University Of Technology, Ogbomosho Nigeria

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Abstract- Study background: Medical students, like any other students, due to psycho-social factors and academic stress they go through, are at risk of psychoactive substance use. Therefore, this study aimed to determine the prevalence of substance abuse and drug problem among medical students in this study area.

Methodology: The cross-sectional study included medical students between 200-600 levels of the Ladoke Akintola University of Technology Ogbomosho. An adapted self-administered questionnaire was employed to capture sociodemographic data and a drug abuse screening test scale (DAST-10) was used for substance screening. SPSS version 21.0. Descriptive and analytical statistics were presented as frequencies, percentages, means, and standard deviations. The Chi-square test determined associations and significant associations at $P < 0.05$

Result: This work revealed that 20 respondents abuse at least one of the listed drugs and 3 abuse more than one. Cannabis is the most abused drug reported (40%) follow by tranquilizers (15%). Barbiturates, cocaine, Stimulants and Hallucinogens are abused accounting for 10% each and 5% for Narcotics. The Mean DAST 10 score was 0.830 ± 1.015 . 42.7% of the respondents reported no drug problem, 51.0% have a low level of drug problem, 5.8% have a moderate level of drug problem and only 0.5% have a substantial level of the drug problem. None of the respondents has a severe level of drug problem.

Conclusion: The prevalence of substance use in this study is 9.5% while the prevalence of drug problem is 57.3% with the majority within 20-25years age group among which 95.6% are classified under moderate level of drug problem from DAST 10 score.

Index Terms- drug abuse, psychoactive substance use, medical students, LAUTECH Ogbomosho.

I. INTRODUCTION

A psychoactive substance is a chemical substance that changes nervous system function and results in alterations in perception, mood, consciousness, cognition, or behavior.

Common psychoactive substances abused are alcohol, cannabis, cocaine, and heroin among others^{1,2}.

Because of the stress they go through in school and the bulky academic syllabus, medical students are at risk of abusing psychoactive substances. Apart from the stress of medical school and bulky syllabus, other factors implicated are unhealthy family background, high social class, peer-group influence, desire to remain awake at night, pressure to succeed in academic work, self-reported poor mental health, and easy accessibility to the drug.^{2,3} Psychoactive substance abuse among medical students may hamper learning capabilities and the development of technical skills and, therefore, the quality of care offered to patients is impaired. The use of psychoactive substances in early life has been linked with dependency later in life.^{1,4,5}

Studies have reported that medical students may resort to certain forms of "medication" to cope with challenges they face in the course of their studies.⁶ Previous studies have suggested an alarming rate of substance use among medical students.⁶⁻⁸ In a study in Enugu, south-east Nigeria, the lifetime prevalence rate of 56% was reported among a sample of medical students.⁹

Several studies have reported the prevalence of psychoactive substances among medical students but none among the medical students of this University. This study aimed to assess the prevalence and pattern of abuse of different psychoactive substances among medical students.

II. METHODOLOGY

Study area

The institution is owned by Oyo state with over twenty-five thousand undergraduates and about four hundred medical students in both pre-clinical and clinical years. It welcomes and admits prospectus medical students from all angles of the Country with her College of Health Sciences located in Ogbomosho. It also has her Teaching Hospitals located in Ogbomosho where her main University campus is located on Latitude $8^{\circ} 08' 00''$ East and Longitude of $4^{\circ} 16' 00''$ North of the Equator, within the savannah region and a gateway to the Northern part of Nigeria from the

West. About 57 kilometers South West of Ilorin (the Capital of Kwara State) 53 Kilometres North – East of Oyo, 58 Kilometers North – West of Osogbo (Capital of Osun State), and 104 Kilometres North – East of Ibadan (Capital of Oyo State).¹⁰

Study Design

The study adopted a descriptive cross-sectional design. This was a population study involving a total of medical students from 200 to 600 levels. There are 130, 133, 70, 75 and 67 students each in 200, 300, 400, 500 and 600 levels respectively. A total of four hundred and seventy-five (475) students in both the preclinical and clinical years.

Study Instruments

A self-administered questionnaire with consent was used to capture socio-demographic variables such as age, gender, marital status, level, religion, and source of funding for the medical school.

Drug Abuse Screening Test

The Drug Abuse Screening Test (DAST) is a 10-item self-administered tool that quickly assesses drug use problems. The DAST-10 has been validated in the varied setting; substance-abuse patients,¹¹ primary care, in the workplace,¹ and adapted for use with adolescents¹² Suggested scoring for the DAST-10: “0 No problem”, “1-2 Low level”, “3-5 Moderate level”, “6-8 Substantial level”, “9-10 Severe level”.¹¹

Study Procedure

Step 1: The total number of students in each level was obtained through each class representatives

Step 2: Self-administered questionnaires were distributed to all students separately according to their year of study. Introduction and explanation of the aim of this study followed with instructions for the proper process of filling.

Step 3: The questionnaires which were filled individually with the consent form alongside on the front page were collected and collated on the same day. The completion of the questionnaires was voluntary and anonymous.

Data analysis

The data obtained via questionnaires were computed and analyzed using Statistical Package for Social Sciences SPSS version 21.0. Descriptive and analytical statistics were presented as frequencies, percentages, means, and standard deviations. The Chi-square test determined associations and significant associations at P < 0.05.

Confidentiality of data

All information gathered was treated and kept with the utmost confidentiality.

Conflict of interest

The author declared no conflict of interest

III. RESULTS

The total number of respondents is 210. There is a slight female to male preponderance 52.3% to 47.6%. Most respondent are within the 20-25 years age bracket. 71.4% are Christians, 24.8% are Muslims. 96.2% are Yoruba, 2.9% Igbo and 1% Hausa. 94.7% are not married while only 5.3% are married. (Table I)

Table I: Sociodemographic Characteristics of respondents

Variables	Frequency	Percentage (%)
Sex		
Male	99	47.6
Female	108	52.3
Age		
< 20 Years	83	40.1
20 – 25 Years	111	53.4
> 25 Years	13	6.3
Religion		
Christianity	147	71.4
Islam	51	24.8
Traditional	6	2.9
Others	2	1.0
Marital Status		
Single	197	94.7
Married	11	5.3
Ethnic		
Yoruba	200	96.2
Igbo	6	2.9
Hausa	2	1.0

Most Respondents are in the second year (33.7%), fourth-year (25.5%) and Fifth Year (20.2%). Most respondent source of funding is Parent 92.8%, 4.8% are self-funded while 2.4% are on scholarship. The monthly income (in Nigerian Naira) of 48.2% of respondent is between 10,000 to 20,000NGN 23.0% earns less than 10,000NGN, 21.6% earns between 20,000 to 50,000NGN,

7.0% earns more than 50,000NGN. 87.3% have no previous tertiary qualification while 12.7% have a previous tertiary qualification. 47.8% have spent between 3 to 5 years in school, 34.3% has spent less than 3years and 17.9% have spent more than 5 years (Table II)

Table II: Academic information

Variables	Frequency	Percentage (%)
Level		
200L	70	33.7
300L	35	16.8
400L	53	25.5
500L	42	20.2
600L	8	3.8
Source of Funding		
Self	10	4.8
Parent	193	92.8
Scholarship	5	2.4
Monthly Income		
< 10k	46	23.1
10k – 20k	96	48.2
20k – 50k	43	21.6
> 50k	14	7.0
No of Year spent in Medical School		
< 3 Years	71	34.3
3 – 5 Years	99	47.8
> 5 Years	37	17.9
Had Previous Tertiary Qualification		
Yes	26	12.7
No	179	87.3

From table III, 88.5% are from monogamous setting while 11.5% are from polygamous setting. 87.0% has no family history of drug abuse, 8.2% does not know while 4.8% reported family history of drug abuse.

Table III: Family history

Variables	Frequency	Percentage (%)
Family Setup		
Monogamous	184	88.5
Polygamous	24	11.5
Family History of Subs Abuse		
Sibling	3	1.4
Extended Family	7	3.4
Don't know	17	8.2
None	181	87.0

Table IV showed that 20 people abuse at least one of the listed drugs, 3 people abuse more than one of the listed drugs. Cannabis is the most abused drug (40%) follow by tranquilizers (15%). Barbiturates, cocaine, Stimulants and Hallucinogens are abused accounting for 10% each and 5% for Narcotics

Table IV: Distribution of Substance abuse

Substance	Frequency	Percentage
Cannabis	8	40
Solvents	1	5
Tranquilizers	3	15
Barbiturates, cocaine	2	10
Stimulants	2	10
Hallucinogens (LSD)	2	10
Narcotics (heroin)	1	5
Others*	1	5
Total	20	100

NB: 3 people abuse more than one Substance
 *except alcohol or Tobacco

The Mean DAST score is 0.830 ± 1.015 . From the DAST 10 score 42.7% of the respondents have no drug problem, 51.0% have low level drug problem, 5.8% have moderate level drug problem and only 0.5% has substantial level of drug problem. None of the respondents has a severe level drug problem. (Table V)

Table V: Prevalence of Substance Abuse Related Problem (DAST 10)

Variables	Frequency	Percent
No problem	88	42.7
Low Level	105	51.0
Moderate Level	12	5.8
Substantial Level	1	0.5
Severe Level	0	0
DAST Score		
Mean	0.830	
SD	1.015	

Table VI revealed that, 50.5% of females have drug problem from DAST 10 scale while 64.9% of males have drug problem, P-value 0.075. 71.2% of those between 20 and 25years have drug problem, 61.5% of those above 25years and 37.0% of those less than 20years have drug problem, P-value 0.001. 57.4% of singles and 54.6% of married people have drug problem P-value 0.981. 33.8% of those in 2001, 54.4% of those in 3001, 81.1% of those in 4001, 71.4% of those in 5001, 37.5% of those in 6001 have drug problem P-value <0.001. 70% of those who are self-funded, 56.6% of those who are funded by parent and 60% of those on scholarships have drug problem P-value 0.450. 58.7% of those who earn less than #10,000, 50.6% of those who earn between #10,000 to #20,000, 71.4% of those who earn between #20,000 to #50,000 and 50.0% of those who earn more than #50,000 have drug problem P-value 0.606.

Table VI: Prevalence of Substance Problem in the population

Variables	DAST score				p-value
	No Problem	Low Level	Moderate Level	Substantial	
Sex					0.075
Male	34 (35.1)	56 (57.7)	7 (7.2)	0	
Female	54 (49.5)	49 (45.0)	5 (4.6)	1 (0.9)	
Age					0.001
< 20 Years	51 (63.0)	27 (33.3)	2 (2.5)	1 (1.2)	
20 – 25 Years	32 (28.8)	69 (62.2)	10 (9.0)	0	
> 25 Years	5 (38.5)	8 (61.5)	0	0	
Marital Status					0.981
Single	83 (42.6)	100 (51.3)	11 (5.6)	1 (0.5)	
Married	5 (45.5)	5 (45.5)	1 (9.1)	0	
Level					0.000

200L	45 (66.2)	21 (30.9)	2 (2.9)	0	
300L	16 (45.7)	15 (42.9)	3 (8.6)	1 (2.9)	
400L	10 (18.9)	42 (79.2)	1 (1.9)	0	
500L	12 (28.6)	24 (57.1)	6 (14.3)	0	
600L	5 (62.5)	3 (37.5)	0	0	
Source of Funding					0.450
Self	3 (30.0)	6 (60.0)	1 (10.0)	0	
Parent	83 (43.5)	96 (50.3)	11 (5.8)	1 (0.5)	
Scholarship	2 (40.0)	3 (60.0)	0	0	
Monthly Income					0.606
< 10k	19 (41.3)	22 (47.8)	4 (8.7)	1 (2.2)	
10k – 20k	47 (49.5)	47 (49.5)	1 (1.1)	0	
20k – 50k	12 (28.6)	26 (61.9)	4 (9.5)	0	
> 50k	7 (50.0)	5 (35.7)	2 (14.3)	0	

IV. DISCUSSION

The total number of respondents was 210. The poor response rate was due to factors mitigating the smooth running of academic programs in Nigeria such as the ongoing nationwide industrial actions by various academic unions at higher institutions of learning. Thus, only available students participated in the study. Most respondents were within the 20-25years age bracket similar to the report by Onofa et al¹³. There was a slight female to male preponderance of 52.3% to 47.6% resonant with the report by Osman¹⁴. Contrary to our findings, similar studies have reported a preponderance of males in Nigerian institutions^{8,13,15}. The socio-cultural perspectives and attitude that seems to favour the male child could account for this. However, the education of the female child has been on the rise in Nigeria.¹⁵ as supported by our findings.

The study revealed that the majority of the respondent has no family history of drug abuse whereas, very few do not have knowledge about their family history of drug abuse. However, 4.8% reported a family history of substance use among siblings and extended family members. There is evidence of social consequences of drug use in this country. There were major social problems such as disruption in family lives, lack of productivity and legal problems as a result of substance abuse. Also, nearly 1 in 8 persons in the general population had experienced consequences due to other peoples' drug use in their families, workplace and communities¹⁶.

This study found that twenty students abuse at least one of the listed drugs in this study, and three students abuse more than one. From a previous report, poly-drug use was very common among high-risk drug users nearly all (95 percent) as compared to nearly half of the drug users in the general population reported

using either simultaneously or concurrently more than one drug in the past year¹⁶.

The prevalence rate of psychoactive substance use within the past 12 months in this study was 9.5%. This was lower than the 29.1% reported in South East¹⁷ and 45.5% reported by a similar study in South Western Nigeria¹³. The difference could be because alcohol was part of the psychoactive substance they studied, unlike our study in which alcohol and tobacco use were excluded. And as well the peculiarity of the study population could have accounted for the low prevalence rate due to their vast knowledge of the medical implications of substance use.

Cannabis is the most abused drug (40%) follow by tranquilizers (15%). It has been reported from Western countries that the relatively easy availability of cannabis, with perceptions of a low risk of harm, makes the drug among the most common substances abused. Cannabis is often used in conjunction with other substances and the use of other drugs is typically preceded by cannabis use¹⁸. Our findings were in contrast with the report from Northcentral Nigeria where the most currently used psychoactive substances were mild stimulants which accounted for 33.3% of their studied population and only 1% reported current use of cannabis⁸. Barbiturates, cocaine, stimulants and hallucinogens abuse accounted for 10% each and 5% for Narcotics as opposed to previous studies where no current use was reported of cocaine and heroin among medical students in Enugu¹⁹ and Ogun state²⁰.

The prevalence of drug problems in this study was 57.3%. The drug abuse screening test DAST scale revealed that half of the female respondents have drug problems while far more than half of the males have drug problem. Report has shown that among every 4 drug users in Nigeria is a woman. More men (annual prevalence of 21.8 percent or 10.8 million men) than women

(annual prevalence of 7.0 percent or 3.4 million women) reported past-year drug use in Nigeria.¹⁶

From our data, the male gender was significantly associated with greater psychoactive substance use. This was in line with reports from previous studies that showed substance use as predominantly male affair^{13,14} The use of psychoactive substances is more tolerable for males in most Nigerian cultures. The majority of those between 20 and 25 years have the highest drug problem, followed by those above 25 years and less among those less than 20 years. Similarly, the highest levels of any past-year drug use have been reported among those aged between 25-39 years¹⁶

There was a higher prevalence of drug problems among students at 400 level and then 500 level. This could be explained due to their transition into the clinical arms of their training which could be more challenging. Lesser problem pattern was recorded in the extreme levels compared to the mid-levels of medical training. Moreover, the majority of those with drug problems are found among the highest earners or those with higher monthly allowances. Previous studies have reported that, since clinical students tend to have more access to funds, they may be more predisposed to substance use²⁰ which perhaps could account for their drug problems.

Our study solely depended on information gathered via the questionnaires was limited by not assaying drug screening tests. As such, our findings may not be generalized as further exploring is required along with laboratory screening of respondents in order to categorize those with drug problems into interventional-based programs.

V. CONCLUSION

Although the prevalence of substance abuse is lower compared to other reports, the long and short-term effects of drug abuse cannot be over-emphasized as the training and practice of medicine required a perfectly sound mind for optimal cognitive functioning.

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