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# Design of 800 MHz to 1.5 GHz Voltage Controlled Oscillator for Data Communication

# M. H. Ali & N. J. Chidume

Department of Physics, Faculty of Science, Bayero University, P.M.B 3011 Kano-Nigeria

*Abstract*- High frequency variable oscillator is central to the construction of high speed clock for data communication. A very wide variable frequency oscillation is designed that could be used in data communication for reliable and fast data transmission. A voltage controlled oscillator in Colpitt configuration is used in the design. The design is found to be capable of producing frequencies from 800MHz to 1.5GHz for a reverse biased voltage (VR) of 0 to 25V while maintaining a good tuning flatness throughout the range. The design is found to be free from noise and frequency variations over the tuning range.

Index Terms- oscillator, transistor, capacitor, inductor and varactor diode.

# I. INTRODUCTION

Transfer of large amount of data at high speed is on high demand currently. These two aspects of telecommunication are accomplished using very fast clock of the processor. Clock and data recovery circuit in data communication need to be designed nowadays using silicon devices for their high power handling capabilities compared to MOSFET at high frequency [2].

High frequency oscillators are needed for the construction of fast clocks. For data recovery the oscillation (clocking) must be at different frequencies. This is achieved normally using voltage controlled oscillator (VCO). The frequency of the VCO determines the speed of the clock. If there is noise in the VCO it makes the output of the clock lower. The efficiency, reliability and speed of data transmission in the communication systems are all related to the speed of the processor of the two communicating hardware. The processor speed is based on its clock. Very high frequency oscillator free from noise is vital to digital communication systems.

Commonly, both ring oscillators and LC oscillators are used in GHz range applications [7]. However, ring oscillators suffer from poor phase noise compared to that of LC oscillators and are less suitable for high-end wireless communication systems [8]. LC oscillators are more attractive due to their better phase noise performance and lower power consumption. However, they occupy larger area compared to that of ring oscillators [9].

This work is intended to present the design and simulation of high frequency voltage controlled oscillator that can be used in the construction of fast clocks for processors.

# II. METHODOLOGY

Since amplifier is an element of oscillator, we started with the design of a wideband amplifier to be used in our oscillator circuit. The oscillator configuration we used is colpitt with the feedback element consisting of a varactor diode for turning. The advantage of this type of tank circuit configuration is that with less self and mutual inductance in the tank circuit, frequency stability is improved along with a more simple design [6].

# 2.1 Amplifier Design

A classA amplifier is designed. The circuit diagram of the amplifier is shown in figure 1.



Figure 1b DC equivalent circuit of the amplifier

# 2.3 Biasing Method

We developed the transistor characteristics. The operating point (Q point) was found to be  $V_{CE} = 4.5V$  and  $I_C = 2.6$ mA. Voltage divider bias technique is employed. The circuit of figure 1 is considered and following calculations were made.

# **2.4 Design Equations**

Applying Kirchhoff's law to the output and input side of the D.C. equivalent circuit of figure 1 we have

For thermal stability of the amplifier [1].

 $\begin{array}{l} R_B \leq 0.3\beta R_E \ \ldots \ \ (3) \\ and \\ R_E = 0.2 R_C \ \ldots \ \ (4) \end{array} \label{eq:R_B}$ 

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Where  $\mathbf{R}_{\mathrm{B}} = \frac{\mathbf{R}_{2}\mathbf{R}_{3}}{\mathbf{R}_{2} + \mathbf{R}_{3}} \dots \dots \dots (5)$ 

# 2.5 Design Calculation

From the Q point (Appendix A) we used:  $V_{CC} = 9v$ ,  $V_{CE} = 4.5v$ ,  $I_B = 40\mu A$ ,  $I_C = 2.6mA$  and  $V_{BE} = 0.71V$ 

$$\beta = \frac{I_{\rm C}}{I_{\rm B} = 65 \dots (6)}$$
  
I<sub>E</sub> = I<sub>C</sub> + I<sub>B</sub> = 2.64Ma \ldots (7)

Substituting the Q point,  $V_{CC}$ ,  $I_B$ ,  $V_{BE}$ , and  $I_E$ , in (1) and (2) we have four equations with four unknown. Solving simultaneously we have

 $\frac{V_{BB-0.71}}{4.5} = \frac{(1.2 \times 10^{-5} \,\beta + 2.6 \times 10^{-3}) R_{\Xi}}{(0.013 + 2.64 \times 10^{-3}) R_{\Xi}}; V_{BB} = 1.694 V \dots (8)$ 

From (2) we have  $1.694 - 0.71 = 40 \text{ x } 10^{-6} \text{R}_{\text{B}} + 2.64 \text{ x } 10^{-3} \text{R}_{\text{E}} \dots \dots \dots (9)$ 

Substituting (3) in (5) gives

 $0.984 = 40 \text{ x } 10^{-6} \text{ x } 0.3 \text{ x } 65R_E + 2.64 \text{ x } 10^{-3}R_E$ 

$$R_{\rm E} = \frac{0.984}{3.42 \ x \ 10^{-3}}$$

 $R_E = 287.7\Omega, R_B = 5610.15\Omega$ 

$$R_{\rm B} = \frac{R_2 R_3}{R_2 + R_3} = 5610.15\Omega \dots (10)$$

Taking 1MHz as our low-frequency cut-off[3].

$$Z = Z_{in (base)} / R_2 / R_3 = \frac{R_2 R_3 Z_{in(base)}}{R_2 R_3 - R_3 Z_{in(base)} + R_3 Z_{in(base)}} \dots (13)$$

$$Z_{in(base)} = \beta re^2 \dots (14)$$

$$re^2 = \frac{25mF}{I_E} = 625\Omega \dots (15)$$

$$Z = 569.9482\Omega$$

$$C_2 = \frac{1}{2\pi Z_{f_{min}}} \dots (16)$$

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 $C_2 = 279.12 pf$ 

For C<sub>3</sub> we have  

$$C_3 = \frac{1}{2\pi R f_{mis}} = 111.25 \text{ pf} \dots (17)$$

Where  $R_4 = 1430$  (i.e. the load resistor). Bypassed Capacitor  $C_1$ 

A good rule of the thumb is that  $X_{C1}$  of the bypassed capacitor should be at least 10 times smaller than the  $R_E$  at the minimum frequency of oscillation [5].

 $10X_{C1} \le R_E....(18)$ 

 $C_{I} = \frac{10}{2\pi f_{min}} \dots \dots \dots (19)$ 

 $C_1 = 1.5908 \mu f$ 

This completes the design of our common emitter amplifier circuit.

# 2.6Resonator Design

For the oscillator, we need a resonator. The schematic diagram of the designed VCO is as shown in figure 2. The resonating circuit is made up of two center tapped capacitors and one inductor connected in series for colpitt oscillation. The series combination of the varactor diode and  $C_4$  form one of the center tapped capacitor. The resonant frequency is given by [3].



$$f_r = \frac{1}{2\pi LC} \tag{20}$$

where C is the series combination of  $C_4$  and  $C_5$  given by

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For oscillation to occur,

$$A_{v(min)} = \frac{C_5}{C_4} \ge 1 \dots \dots (22)$$

Where  $A_{v(min)}$  is the minimum gain of the amplifier with feedback [4].

$$A_{v(min)} = \frac{R_{C}}{R_{E}}$$
,  $A_{v(min)} = \frac{1438.6}{287.72} = 5$ 

Let  $f_r = 900 \text{MHz}$  and  $L_1 = 5 \text{nH}$ 

Substituting fr,  $L_1$  into (16), we have

C = 6.2488 pf

Substituting for C in (24) and the result into (23), we have

 $C_4 = 7.4988 pf, C_5 = 39.494 pf$ 

## 2.6.1 Varactor diode design

The varactor diode is connected in series with  $C_4$ . From BB515 datasheet, the capacitance of the varactor diode for a reverse bias voltage of 1V is 18.7pf. Using this, the value of new  $C_4$  was calculated. The new C4 is in series with  $C_{var}$  and their equivalent capacitance is 7.5pf.

# III. RESULTS

This circuit was simulated using Multism 12.0.1. Figure 3 is the result of the AC analysis using the designed amplifier shown in figure 4. This shows that the designed amplifier is a wide band amplifier.







Figure 4 The circuit of the designed amplifier

The complete circuit for the voltage controlled oscillator with the designed values above is shown in figure 5. The designed and simulated VCO (voltage controlled oscillator) was found to produce sinusoidal signal at uniform voltage level in the frequency range of 800MHz to 1.5GHz.



Figure 5The circuit diagram of the designed VCO

The simulated tuning range which is the graph of the frequency against reverse biased voltage ( $V_R$ ) of the VCO is shown in figure 6.



The output signal has good tuning flatness for the frequency range of 800MHz to 1.5GHz when the reverse biased voltage changes from 0V to 25V as seen in figures 7 through 9.



Figure 9 output waveform for  $V_R = 24V$ , frequency = 1.5GHz

The VCO has an average positive tuning slope of 31.07MHz/V throughout the frequency range. The minimum and maximum values of the tuning sensitivity are 1V and 25V respectively.

# IV. DISCUSSION

We found the designed and simulated VCO to produce sinusoidal signal with a frequency range of 800MHz to 1.5GHz over a voltage range of 0V to 25V with nice tuning flatness, tuning slope of 31.MHz/V at a voltage of 2.5V.Furthermore, the designed VCO has monotonic tuning characteristics and low pushing over the tuning range of 0 to 25V.

In view of the above features of the designed and simulated high frequency voltage controlled oscillator, the VCO can be used in the construction of high speed processors used in data communication for reliable and fast data transmission because of its frequency range of about 690MHz. This wide range also makes it very fit for microwave application such as surveillance and very versatile for many purposes especially when it is used in conjunction with either frequency divider or multiplier circuits as the case may be. The smoothness of the VCO waveforms throughout its tuning range indicated the absence of jitter noise and thus makes it a very good item for accurate timing of electronic communication activities.

# V. CONCLUSION

In this work we designed VCO using colpitt oscillator configuration which operates in 800MHz to 1.5GHz range. In view of the result it shows that the circuit has a bandwidth of 690MHz with a tuning flatness of about 86%. Its wide frequency range, smooth waveform and positive turning slope throughout its turning range are excellent features of this design.

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#### AUTHORS

**First Author** – M. H. Ali, Department of Physics, Faculty of Science, Bayero University, P.M.B 3011 Kano-Nigeria, Email: alim@buk.edu.ng

Second Author – N. J. Chidume, Department of Physics, Faculty of Science, Bayero University, P.M.B 3011 Kano-Nigeria, Email: mutariali@gmail.com

# **Effect of Organisation Culture on Employee Performance in Non Govermental Organizations**

Njugi Anne wanjiku<sup>\*</sup>, Nickson Lumwagi agusioma<sup>\*\*</sup>

\* Mount Kenya University \*\* Multimedia University of Kenya

Abstract- Culture may have a big influence on the performance of all organizations worldwide. This is a practice that can not just be assumed as it has both positive and negative effects as far as performance is concerned. It is more serious when it comes to non-Governmental organizations, since in most cases they involve international Governments. The main focus of the study was the non-governmental organizations in Kenya with a specific focus on World Vision Kenya. The specific objectives of the study were to establish the link between competitive culture and performance in Non-Governmental Organizations, to explore the effect of entrepreneurial culture on performance in Non-Governmental Organizations, to assess the level of bureaucratic culture and its influence on overall performance in Non-Governmental Organizations, to examine the influence of consensual culture on performance in Non-Governmental Organizations, and finally to identify the preferred cultural integrations in Non-Governmental Organizations in Kenya. The research design adopted for this study was a descriptive survey in which the research seeks to collect data from a target population of employees working in World Vision Kenya, using questionnaires to determine the correlation between organization culture and employee performance. The target population comprised of 960 employees in World Vision Kenya, a sample size of 484 was taken from the overall target population.

Data was analyzed qualitatively and quantitatively and through use of statistical package for social scientists (SPSS). The study concluded that organization culture has a great influence on performance as it dictates how things are done, organization's philosophy, work environment, performance targets and organizations stability. At World Vision Kenya there is an integration of cultures ranging from competitive culture, entrepreneurial culture, bureaucratic culture and consensual culture. Of the four cultures, employees prefer integration to consensual and entrepreneurial or competitive and entrepreneurialcultures. This owes to the fact that employees seek a work environment that maximizes their ability to be innovative, creative, and independent of micro-management, cohesion with fellow colleagues among others.

# I. INTRODUCTION

Non-governmental organizations (NGO) are legally constituted organizations created by <u>natural</u> or legal people that operate independently from any form of <u>government</u>. The term originated from the <u>United Nations</u>, and normally refers to organizations that are not a part of a government and are not conventional for-profit businesses. In the cases in which NGOs are funded totally or partially by governments, the NGO maintains its non-governmental status by excluding government representatives from membership in the organization. World Vision is a Christian humanitarian organization dedicated to working with children, families, and their communities worldwide to reach their full potential by tackling the causes of poverty and injustice. It is a Non Governmental organization founded in the United States in 1950. It is an international Christian relief and development organization whose goal is "working for the well being of all people, especially children." Working in six continents, World Vision is one of the largest Christian relief and development organizations in the world. Its headquarters are in Federal Way, Washington. World Vision was started by Dr. Bob Pierce, a young Christian minister in China and then Korea. World Vision contributes to people's needs in five major areas; emergency relief, education, health care, economic development, and promotion of justice. World Vision Kenya (WVK) began work in Kenya in 1974 during a time of severe drought and famine that affected most parts of the country. After helping to feed the hungry, World Vision then moved into longer-term community development activities and now works with communities all over Kenya. There are many lives that have been touched by this non-Governmental organization.

## II. STATEMENT OF THE PROBLEM

Most organizations put more efforts on the focus of only intrinsic and extrinsic reward systems give less concern on the traditional cultural activities. According to Kandula (2006) the key to good performance is a strong culture. He further maintains that due to difference in organizational culture, same strategies do not yield same results for two organizations in the same industry and in the same location. A positive and strong culture can make an average individual performance and achieve brilliantly whereas a negative and weak culture may demotivate an outstanding employee to underperform and end up with no achievement. Therefore organizational culture has an active and direct role in performance management (Ahmed, 2012). Organizational culture is correlated with job satisfaction (Anis et al. 2011; Sharma & Bajpai, 2010), job performance (Bergman et al., 2000; Samad, 2007; Ward & Davis, 1995; Yousef, 2000) and employee retention (Anis et al. 2011).

However, organization culture has received relatively low levels of empirical investigation among the possible antecedents of employee performance (Lok & Crawford, 2004). Although empirical research has been carried out there has been little evidence to prove the effect of organization culture on organization performance (Mckinono et al. 2003). In a study of Hong Kong and Australian managers, Lok and Crawford (2004) found a positive effect of organization culture on employee performance. Zain et al. (2009) examined the effect of four dimensions of organization culture namely teamwork, communication, reward and recognition, and training and development on employee performance and found that all the four dimensions of organization culture were important determinants of performance. Mahmudah (2012) reports a significant relationship between organization culture and service delivery. However Lahiry (1994) indicated a weak association between organization culture and performance.

Concerns have been raised on whether there are any significant relationships between the culture in organizations and employee burnout, type of coping strategies, and employee engagement. Whether there is an inverse relationship between emotional exhaustion and organizational culture (Bergman et al., 2000; Mathieu and Zajac, 1990, Samad, 2007; Ward & Davis, 1995; Yousef, 2000). Management of human resources may perhaps force not merely the restructuring of cultural values but to consider the overture of different cultural practices which perhaps leads to a superior organizational performance. This study will attempt to analyze to what extent an organizations culture has an effect on performance in Non Governmental organizations with specific reference to World Vision.

# III. LITERATURE REVIEW AND OBJECTIVE FORMULATIONS

# **Competitive Culture and Performance**

Corporate culture and reputation are intangible assets organizations use to create a competitive strategic advantage to differentiate themselves from other firms to enhance firm performance. Numerous articles cite how corporate culture may be an important intangible predictor of reputation, but only a few researchers have empirically tested the relationship between culture and reputation. Culture not only enhances financial performance, but also is positively relates to reputation.

Research on corporate reputation has identified antecedents and consequences of reputation to better explain how a firm may benefit and best strategically position itself through its reputation. Fombrun (1990). Different studies using different designs and methodologies have found that while financial performance is an important predictor of reputation, financial performance has accounted for as little as 11 to 15 percent of the variance (Hammond and Slocum, 1996; Roberts and Dowling, 2002) to as much as 38 to 59 percent (e.g., Brown and Perry, 1994; Fombrun and Shanley, 1990), leaving at least 40 to 89 percent of the variation unexplained by economic variables. Therefore, while researchers have been able to demonstrate that economic factors predict reputation (Sabate and Puente, 2003), less is known about the non-economic factors influencing reputation. Different researchers have explored the noneconomic factors in different ways. Eberl and Schwaiger (2005) examine how competence and sympathy may influence reputation and Rindova, Williamson, Petkova and Sever (2006) use a stakeholder approach to better capture the predictors of reputation, perceived quality and prominence. The quest to

identify key variables that predict reputation is important, since without this knowledge researchers cannot advise firms how they might enhance their reputation to augment their competitive advantage to increase their financial performance.

Research on reputation suggests that culture plays an important role in reputation development (Fombrun and Shanley, 1990; Fombrun, 1996; Dukerich and Carter, 2003; Alsop, 2004), since the internal (culture) and external (reputation) elements interact and inform each other (Hatch and Schultz, 2000). Preliminary empirical research shows a correspondence between culture attributes and reputation attributes (Flatt and Kowalczyk, 2000; Kowalczyk and Pawlish, 2002; Kowalczyk, 2005). In a similar study on culture, Carmeli (2004) found that culture interacts with communication and the industrial relations climate (workplace atmosphere) to predict external prestige of a firm (a similar variable to reputation).

Culture and reputation are considered intangible assets because each add value through differentiation, is rare, difficult to imitate, and without substitution (e.g., Barney, 1991; Hall, 1993; Fombrun, 1996; Porter, 1996; Roberts and Dowling, 2002; Kaplan and Norton, 2004).Empirical evidence confirms that a favorable reputation leads to higher financial performance and strategic advantage, such as reducing competitive rivalry and mobility barriers to deter market entry (Caves and Porter, 1977; Milgrom and Roberts, 1982), charging premium prices (Benjamin and Polodny, 1999), creating greater stability in stock prices (Vergin and Qoronfleh, 1998), reducing operating costs and attracting talent to a firm (Fombrun, 1996). Firms with good reputations are more likely to sustain a superior financial performance over time (Roberts and Dowling, 2002).

# IV. THEORITICAL REVIEW AND CONCEPTUAL FRAMEWORK

# **A: Consistency Theory**

According to the consistency theory, organizations tend to be effective because they have strong cultures that are highly consistent, well-coordinated and well integrated (Davenport, 1993; Saffold 1988). Employee behavior is rooted in a set of core values and leaders and followers are skilled at reaching an agreement even when they have differing views (Block, 1991). This type of consistency is a powerful source of stability and internal integration that results from a common mindset and a high degree of conformity (Senge, 1990).

# **B: Involvement Theory**

This theory is based on the idea that involvement and participation will contribute to a sense of responsibility and ownership and hence organizational performance and loyalty (Baker, 2002). Effective organizations empower their people, build their organizations around teams, and develop human capability at all levels (Becker, 1964; Lawler, 1996; Likert, 1961). Executives, managers and employees are committed to their work and feel that they own a piece of the organization. People at all levels feel that they have at least some input into decisions that will affect their work and that their work is directly connected to the goals of the organization (Katzenberg, 1993; Spreitzer, 1995).

**C: Adaptability Theory** 

This theory is based on the idea that norms and beliefs that enhance an organization's ability to receive, interpret and translate signals from the environment into internal organizational and behavioral changes will promote its survival, growth and development. Ironically, organizations that are well integrated are often the most difficult ones to change due to the deep levels of adaptability acquired over time (Kanter, 1993). Adaptable organizations are driven by their customers, take risks and learn from their mistakes and have the capability and experience at creating change (Nadler, 1998; Senge, 1990). Such organizations are continuously changing their systems to promote improvements and provide value for their customers (Stalk, 1988).

# **D:** Mission Theory

A shared sense of purpose, direction and strategy can coordinate and galvanize organizational members toward collective goals (Baker, 2002). Successful organizations have a clear sense of purpose and direction that defines organizational goals and strategic objectives and expresses a vision of how the organization will look in the future (Mintzbert, 1994; Ohmae, 1982; Hamel &Prahalad, 1994). When an organization's underlying mission changes, changes also occur in other aspects of the organization's culture (Ahmad, 2012).

These theories focus on different aspects of culture but more importantly, they stress different functions of culture. Consistency theory and mission theory tend to promote stability whereas involvement theory and adaptability theory allow for change and adaptability. Consistency theory and involvement theory see culture as focusing on internal organizational dynamics while mission theory and adaptability theory see culture as addressing the relation of the organization to its external environment (Baker, 2002).





Scholars and practitioners have constantly argued that both financial and non-financial measures should be used to determine the organizational performance (Harold & Darlene, 2004; Kaplan & Norton, 1992; Rajendar & Jun Ma, 2005). Performance is a broader indicator that can include productivity, quality and consistency. On the other hand, performance measures can include results, behaviors (criterion-based) and relative (normative) measures, education and training concepts and instruments, including management development and leadership training for building necessary skills and attitudes of performance management (Richard, 2002).

Furthermore, Kotter and Heskett (1992) found that companies with "adaptive values" are strongly related with superior performance over a long period of time as compared to just short-term performance. This has been also supported by both Collins and Porras (1994) and DeGeus (1997) in their work in long lived, financially successful companies. Thus in studying the relationship between cultural and performance, it is vital that both financial and non financial measures are used to get a more comprehensive results.

# **Culture and Performance**

A high degree of organization performance is related to an organization, which has a strong culture with well integrated and effective set of values, beliefs and behaviors (Cameron & Ouinn, 1999; Deal & Kennedy 1982; Denison, 1990; Juechter & Fisher, 1998; Kotter & Heskett, 1992). However, many researchers noted that culture would remain linked with superior performance only if the culture is able to adapt to changes in environmental conditions. Furthermore, the culture must not only be extensively shared, but it must also have unique qualities, which cannot be imitated (Lewis, 1998; Lim, 1995; Ouchi, 1981; Pascale & Athos, 1981). Several empirical studies have supported the positive link between culture and performance (Calori & Sarnin, 1991; Gordon & DiTomaso, 1992: Kotter & Heskett, 1992). Moreover, there are recent studies done by Chatman and Jehn (1994), Denison and Mishra (1995) and Kotter and Heskett (1992), have contributed significantly to the field of culture and performance studies whereby Contemporary Management culture is being treated as variable for a specific research purpose.

For example, Denison and Mishra (1995), utilizing a more rigorous methodology, discovered that cultural strength was significantly correlated with short-term financial performance. Schneider (1990) also found that the organizations focuses clearly on the cultures are more successful. It is because focused cultures provide better financial returns, which include higher return on investment (ROI), higher return on assets (ROA) and higher return on equity (ROE). The finding of a study also has been reported that industry moderates the link between corporate culture and performance (Gordon & Christensen, 1993). These

# **Conceptual Framework**

# **Independent Variable**

findings have advanced understanding of the determinants and performance effects of corporate culture.

There are some aspects of corporate culture may enhance performance in one national setting, but they may not be effective, and may even be dysfunctional, in another (Chow, Kato & Merchant, 1996; Lincoln & Kalleberg, 1990; Steers, 1989). Thus, one of the main reasons for the common popularity and interest in the study of organizational culture is due to the argument or assumption that certain organizational cultures lead to superior organizational performance.

# Dependent Variable



# **Competitive Culture and Performance**

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# **Bureaucratic Culture and Performance**

An organization that values formality, rules, standard operating procedures, and hierarchical co-ordination has a bureaucratic culture. Long - term concerns of bureaucracy are predictability, efficiency, and stability. Its members highly value standardized goods and customer service. Behavioural norms support formality over informality. Managers view their roles as being good coordinators, organizers, and enforcers of certain rules and standards. Tasks, responsibilities, and authority for all employees are clearly defined. The organization's many rules and processes are spelled out in thick manuals and employees believe that their duty is to 'go by the book' and follow legalistic processes. According to Deshpande and Farley (1999), in the bureaucratic culture, values like formalization, rules, standard operaing procedures, and hierarchical coordination.

# **Clan/Consensual Culture and Performance**

Tradition, loyalty, personal commitment, extensive socialization, teamwork, self management, and social influences are attributes of clan culture. Its members recognize an obligation beyond the simple exchange of labour for a salary. The members understand that their contributions to the organization may exceed any contractual agreements. The individual's long-term commitment to the organization is exchanged for the organization's long-term commitment to the individual. Individuals believe that the organization will treat them fairly in terms of salary increases, promotions, and other forms of recognition. Consequently, they hold themselves accountable to the organization for their actions. Deshpande and Farley (1999) aver that in the consensual culture, elements of tradition, loyalty, personal commitment, extensive socialization, teamwork, selfmanagement, and social influence are important in the organizational values.

# **Entrepreneurial Culture and Performance**

High levels of risk taking, dynamism, and creativity characterize an entrepreneurial culture. There is a commitment to experimentation, innovation, and being on the leading edge. This culture doesn't just quickly react to changes in the environment, it creates change. Effectiveness means providing new and unique products and rapid growth. Individual initiative, flexibility, and freedom foster growth and are encouraged and well rewarded. Deshpande and Farley (1999) state that in the entrepreneurial culture, the emphasis was on innovation, risk taking, high level of dynamism, and creativity.

# Market/Competitive Culture and Performance

The achievements of measurable and demanding goals, especially those that are financial and market-based, characterize a market culture. Hard - driving competitiveness and a profit orientation prevail throughout the organization. In a market culture, the relationship between individual and organization is contractual. The individual is responsible for some levels of rewards in return. A market culture does not exert much informal, social pressure on an organization's members. They don't share a common set of expectations regarding management style or philosophy. The absence of a long-term commitment by both parties results in a weak socializing process. Deshpande and Farley (1999) state that in the competitive culture, values relating to demanding goals, competitive advantage, marketing superiority, and profits were emphasized.

These four culture types all represent different types of management philosophies or styles. The cultures of these organizations are governed by how these companies are run or the beliefs of the founders of the organization. Essentially, the cultures in these organizations are driven top - down, with emphasis on the type of business or industry that this organization serves

# V. METHODOLOGY

This study was based on descriptive research design primarily using questionnaires to determine the effects of organization culture on employee performance in NGO's in Kenya. The advantages of descriptive studies is that it is a scientific method of investigation where data is collected and analyzed to describe the current conditions, terms or relationships concerning a problem. Mugenda (2008) further points out that descriptive study is limited in geographical scope and hence tend to be logistical, easier and simpler to conduct. They also provide the foundation upon which correlational studies emerge. The study was correlational in that it investigated the effects of organization culture on employee performance.

The data collected was analyzed quantitatively using the Statistical Package for Social Science (SPSS). The computed data was also analyzed using descriptive statistics including frequencies, means, and percentages. Interpretation of the data was done within the frame of reference of the research problem. Linear regression formula was used to determine the relationship between the dependent and independent variables as follows:

$$\mathbf{Y} = \boldsymbol{\beta}_0 + \boldsymbol{\beta}_1 \mathbf{X}_1 + \boldsymbol{\beta}_2 \mathbf{X}_2 + \boldsymbol{\beta}_3 \mathbf{X}_3 + \boldsymbol{\beta}_4 \mathbf{X}_4 + \boldsymbol{\varepsilon}$$

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## Whereby:

Y = employee performance  $\beta_0$  = constant  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ ,  $\beta_4$  = coefficients of the determinants of employee performance X<sub>1</sub> = Competitive culture X<sub>2</sub> = entrepreneurial culture X<sub>3</sub> = bureaucratic culture of behaviors and norms

- $X_4 =$ consensual culture
- $\varepsilon = \text{Error term}$

Mugenda and Mugenda (2003) asserted that, the accuracy of data to be collected largely depended on the data collection instruments in terms of validity and reliability. Validity as noted by Robinson (2002) is the degree to which result obtained from the analysis of the data actually represents the phenomenon under study. Validity was ensured by having objective questions included in the questionnaire. This was achieved by pre-testing the instrument to be used to identify and change any ambiguous, awkward, or offensive questions and technique. Reliability on the other hand refers to a measure of the degree to which research instruments yield consistent results (Mugenda & Mugenda, 2003). In this study, reliability was ensured by pretesting the questionnaire with a selected sample from one of the departments which was not included in the actual data collection. To ensure a high response rate, frequent follow up visits to the respondents and confidentiality was assured. Diplomatic pleading for response was applied as a response enhancement strategy. The respondents promised a summary of the findings of the research. This motivated them to participate in the process. Reliability was measured through Cronbach's Alpha which measures the internal consistency. The alpha value ranges between 0 and 1 with reliability increasing with the increase in value. Nunnally (1978) stated that reliability of a research instrument can be indicated at a minimal Alpha value of 0.6. The pilot study enabled the researcher to be familiar with researchers and its administration procedure as well as identify items that require modification. The result helped the researcher to correct inconsistencies arising from the instruments, which ensured that they measure what was intended.

# VI. DATA ANALYSIS, PRESENTATION AND DISCUSSION

General information of the respondents was established as a basis for assessing appropriateness of the respondents and access of relevant information. This also helped in classifying and analyzing the data in accordance to different demographic profile. For the purposes of the study, the profile included: position in World Vision Kenya, gender and number of years in service at the organization. The findings on the position of the respondents at World Vision Kenya are represented as shown in the figure below. The findings reveal that 83.7% were junior staff in the organization, 11.7% were in supervisory level while 4.6% were managers. Thus, employees in different hierarchical levels of organizational structure were represented.



Figure : Gender of the Respondent

Finding on the gender of the respondents was presented in Figure 4.5. From the findings, 57% were female while 43% were male. This shows that quite a majority of the World Vision Kenya employees are female. Besides, both gender (male and female) were well represented owing to a paltry disparity of 14%.



**Figure : Length of Service in Organization** 

The Figure above presents the findings on work experience in terms of the number of years that the respondent had work at World Vision Kenya. The findings show that 58% of the respondents had worked at the organization for 5 - 7 years, 13% for at least 8 years while 23% had worked for 2 - 4 years, 6% for less than one year. Thus, majority of the respondents had worked at the organization for at least 5 years which points at their adequate acquaintance with the prevailing organizational culture.

# **Competitive Culture**

Statement	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree	Mean	STDEV
My performance goals are clear and measurable	0	0	6	188	156	4.43	0.528
My performance goals are achievable	0	24	96	181	49	3.73	0.784
I have the necessary skills to achieve my goals	0	0	53	167	130	4.22	0.689
I am familiar with the overall organization strategic plans	0	0	25	160	165	4.40	0.619

**Table : Competitive Culture** 

The respondents were, thus, requested to state their level of agreement or otherwise with certain indicators of competitive culture. A 5-point Likert scale was used to rate the various indicators whereby 1 point was accorded to 'strongly disagree', 2 points to 'disagree', 3 points to 'uncertain', 4 points to 'agree' and 5 points to 'strongly agree'.

Results presented in Table show that: employees' performance goals at World Vision Kenya are clear and measurable as indicated by a weighted mean of 4.43; employees were familiar with the overall organization strategic plans given a mean of 4.40; employees have the necessary skills to achieve

their goals given a mean of 4.22; and, their performance goals are achievable given a mean of 3.73.Carmeli (2004) established that organization culture interacts with communication and the industrial relations climate (workplace atmosphere) to predict external prestige of a firm. Thus, according to Carmeli, competitive culture has got to do with the work climate existing within an organization and how it encourages high performance of employees. In concurrence, the findings established that World Vision Kenya establishes goals that are clear, achievable and measurable and organization assigns to the employees, tasks that they have the requisite skills to achieve.

**Table : Entrepreneurial Culture** 

Statement	Never	Rarely	Sometimes	Frequently	Very Frequently	Mean	STDEV
I am encouraged to be innovative within my role	6	78	106	102	58	3.37	1.054
I am empowered to perform my role to the best of my ability	0	49	153	110	38	3.39	0.858
My supervisor trusts me to perform within my role without micro managing me	8	51	99	122	70	3.56	1.037
I am encouraged to think independently in the course of carrying out my duties	5	60	87	143	55	3.52	0.996

The employees were probed with questions seeking to determine whether World Vision Kenya creates work environment that fosters innovation, independence and creativity. Likert scale was used for this purpose. Results presented in the table show that: World Vision Kenya supervisors trust employees to perform within their role without micro managing them given a weighted mean of 3.56; the employees are encouraged to think independently in the course of carrying out their duties with a mean of 3.52; employees are empowered to perform their role to the best of their ability given a mean of 3.39; and, employees being encouraged to be innovative within their role had a mean of 3.37. This depicts that World Vision Kenya fosters entrepreneurial culture in which employees are encouraged to think 'outside the box', be innovative, work independently and produce the best result they could.

Statement	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree	Mean	STDEV
I am familiar with the organizations standard operating procedures (SOPs)	0	0	81	167	102	4.06	0.721
Hierarchy structure of management within the organisation is clearly defined	0	0	21	198	131	4.31	0.579
Rules set out within the organization are practical	0	21	69	157	103	3.98	0.855
Rules set out within the organization are fair	0	42	80	130	98	3.81	0.976

# **Table : Bureaucratic Culture**

Using Likert scale to rank several indicators of bureaucratic culture as applicable within the organization, the results were presented as shown above. The findings show that: hierarchy structure of management within World Vision Kenya is clearly defined (mean of 4.31); The employees are familiar with the organizations standard operating procedures (SOPs) (4.06); rules

set out within the organization are practical (3.98); and, rules set out within the organization are fair (3.81). Therefore, it has a clearly spelt out hierarchical structure with standard operating procedure. The rules and procedure guiding operations and behaviour are well spelt out, clear and practical.

Statement	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree	Mean	STDEV
I feel valued at my place of work	0	49	89	142	70	3.67	0.950
Employees work together as a team in the organization	0	38	95	114	103	3.81	0.981
My colleagues are warm and sociable	0	46	92	158	54	3.63	0.897
I am committed to the values of the organization	0	30	95	103	122	3.91	0.977
I am loyal to the vision, mission and goals of the organisation	0	25	96	107	122	3.93	0.951
The traditions of the organization are preserved and maintained	0	0	101	106	143	4.12	0.826

Table : Consensual Culture

World Vision Kenya places a premium on teamwork, traditions, loyalty, participation, personal commitment, and consensus or socialization. The table above, presenting the findings, shows that: the traditions of WVK being preserved and maintained had a mean of 4.12; employees being loyal to the vision, mission and goals of the organisation had a mean of 3.93; employees being committed to the values of the organization had a mean of 3.91; employees working together as a team in the

organization had a mean of 3.81; employee feeling valued at their place of work had a mean of 3.67; and, employees' colleagues being warm and sociable had a mean of 3.63. Thus under this culture, the organization can be a friendly place to work where people share a lot of themselves and the leaders are considered to be mentors and perhaps, even parent figures. At WVK, the study established that employees work together as a team, colleagues are sociable and are valued by the organization.

Table:	Types	of	organization	culture	integrations
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	Frequency	Percentage
Competitive and Entrepreneurial	101	28.9
Entrepreneurial and Bureaucratic	46	13.1
Consensual and Entrepreneurial	156	44.6
Consensual and Competitive	21	6.0

All 4 cultures combined	26	7.4
Total	350	100.0

The respondents were further asked to indicate the types of organization culture integrations they were comfortable working in. This indicates that 44.6% of the respondents were comfortable working in an integration of consensual and entrepreneurial culture; 28.9% were comfortable in a competitive and entrepreneurial culture; 13.1% were comfortable in an entrepreneurial and bureaucratic culture; 6.0% preferred consensual and competitive; while, 7.4% of the

respondents were comfortable working in a integration of all the 4 cultures. This shows that majority of the respondents are comfortable working in integrated consensual and entrepreneurial culture followed by competitive and entrepreneurial culture. Consensual and entrepreneurial cultures, by imparting on employees at World Vision Kenya the sense of being valued, role independence and teamwork, creativity and innovation leads to higher employee performance and organization commitment.

Table: Organization H	Performance
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Statement	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree	Mean	STDEV
I am highly involved in achieving the overall goals and objectives of WVK	0	21	89	157	83	3.86	0.844
The Organization is characterized by high performance, visibility and outreach in its catchment areas	0	41	91	120	98	3.79	0.981
I am satisfied with my job at WVK and I intend to stay in the organization	0	28	120	131	71	3.70	0.881
WVK has strove and succeeded in creating value for each dollar/fund invested in the Organization's work	0	32	74	135	109	3.92	0.939
Organization's culture has created stability in WVK amid environmental turbulence	0	7	43	167	133	4.22	0.732
Employees are motivated to meeting the challenges of the task assigned and finding a better way to do things	0	11	132	136	71	3.76	0.806
The entire organization pulls towards a common goal encouraged by its culture and mission	0	8	68	167	107	4.07	0.766
There is greater accountability for end results within the organization	0	11	73	159	107	4.03	0.799

The study inquired about the Organization's performance given the work culture present at World Vision Kenya. This shows that: organization's culture has created stability in at the workplace amid environmental turbulence (mean of 4.22); the entire organization pulls towards a common goal encouraged by its culture and mission (4.07); there is greater accountability for end results within the organization (4.02); It has strove and succeeded in creating value for each dollar/fund invested in the Organization's work (3.92); employees are highly involved in achieving the overall goals and objectives of the organization (3.86); the Organization is characterized by high performance, visibility and outreach in its catchment areas (3.79); employees are motivated to meeting the challenges of the task assigned and finding a better way to do things (3.76); and, employees are satisfied with their job at World Vision Kenya and intend to stay in the Organization (3.70). Mulcahy and Betts (2005) observed that culture of fostering respect and establishing a new team relationship as evidenced here and were successful in both improving staff satisfaction and reducing turnover intention. Likewise, the findings show that the employees were satisfied with their job and intended to stay in the organization.

# **Regression Analysis**

 Table 4.1: Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0.847(a)	.718	.702	1.324	1.941

a. Predictors: (Constant) Competitive Culture, Entrepreneurial Culture, Bureaucratic Culture, Consensual Culture

b. Dependent Variable: Organization Performance

Multivariate regression model was applied to determine how organization culture in WVK affects the employee performance. Multiple linear regressions used in this model was:

 $Y=\alpha + \beta X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon$ 

Whereby: Y is employee performance;  $\alpha_1$  is regression constant;  $\beta_1 - \beta_4$  are regression coefficients;  $X_1$  is competitive culture;  $X_2$  is entrepreneurial culture;  $X_3$  is bureaucratic culture;  $X_4$  is consensual culture; and,  $\varepsilon$  is error term.

R is the correlation between the observed and predicted values of employee performance implying that the association of

0.844 between organization culture (competitive culture, entrepreneurial culture, bureaucratic culture and consensual culture) and employee performance was very good.

R-Square is coefficient of determination and measures the proportion of the variance in the dependent variable - employee performance- that is explained by variations in the independent variables - competitive culture, entrepreneurial culture, bureaucratic culture and consensual culture. This implied that 71% of variance or correlation between dependent and independent variables. That is, 71% of variations or changes in employee performance are caused by organization culture at WVK. However, it does not reflect the extent to which any particular independent variable is associated with employee performance.

<b>Fable</b>	: ANOVA
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	Sum of Squares	Df	Mean Square	F	Sig.
Regression	3.841	4	0.9605	4.307	0.021(a)
Residual	7.714	345	0.0223		
Total	11.556	349			

a. Predictors: Constant, Competitive Culture, Entrepreneurial Culture, Bureaucratic Culture, Consensual Culture

b. Dependent Variable: Employee Performance

The ANOVA statistics was used to present the regression model significance. An F-significance value of p = 0.021 was established showing that there is a probability of 2.1% of the regression model presenting a false information. Therefore, the model is significant.

# Table : Regression Coefficients Source: Author, (2013)

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	В	Std. Error	Beta		
(Constant)	1.406	.375		3.640	0.710
Competitive Culture	0.081	.495	.057	2.931	0.032
Entrepreneurial Culture	1.917	.646	1.792	2.803	0.041
Bureaucratic Culture	0.768	.428	.591	1.906	0.023
Consensual Culture	2.671	.590	2.029	1.672	0.017

a. Dependent Variable: Organization Performance

The regression compares the magnitude of the coefficients of the independent to determine which one had more effects on performance. From Table 4.12, the following regression model is established.

# Perf = 1.406+0.081X<sub>1</sub>+1.917X<sub>2</sub>+ 0.768X<sub>3</sub> +2.671X<sub>4</sub> P = 0.021

Where  $X1_{=}$  Competitive Culture,  $X_{2}_{=}$ Entrepreneurial Culture,  $X_{3}_{=}$ Bureaucratic Culture,  $X_{4}_{=}$ Consensual Culture

The regression constant shows that when the independent variables (competitive culture, entrepreneurial culture, bureaucratic culture and consensual culture) are constant at zero, the employee performance value would be 1.406. This shows that without the four organization cultures, WVK would perform dismally.

It was established that employee performance would raise by 0.081 with every unit positive increase in competitive culture provided that other factors (entrepreneurial culture, bureaucratic culture and consensual culture) are constant. This statistic is significant at 95% confidence level (p = 0.032). Entrepreneurial culture would lead to an increase in employee performance by factor of 1.917 with P value of 0.041 should other factors be held constant.

Additionally, holding other factors (competitive, entrepreneurial and consensual culture) constant, a unit increase in bureaucratic culture would lead to a 0.768 increase in organization performance (p = 0.023).Consensual culture would lead to an increase in employee performance by a factor of

2.671and significant at p = 0.017 should competitive culture, entrepreneurial culture and bureaucratic culture be kept constant. This indicates that organization culture would positively influence employee performance. From the findings, consensual culture as it encourages team spirit and synergies thereof, employees' value recognition and cohesion with colleagues, has the highest influence on performance. This is in contrast with competitive culture which adopts a management by objective approach and encourages internal competition of employees (Gifford, Zammuto, and Goodman, 2002). This negatively affects cohesion and might lead to employee-employee sabotage hence have the least influence in organization's overall performance.

Besides, entrepreneurial culture encourages employees to be innovative, seek newer ways of solving a problem, discourages micro managing hence enhances employees' intrinsic motivation to perform (Park and Kim, 2009). Therefore, entrepreneurial culture greatly, positively influences organization performance and is only second to consensual culture.

## VII. CONCLUSIONS AND RECOMMENDATION

From the study it can be concluded that organization culture has a great influence on performance as it dictates how things are done, organization's philosophy, work environment, performance targets and organizations stability. At World Vision Kenya there is a concoction of cultures ranging from competitive culture, entrepreneurial culture, bureaucratic culture and consensual culture. Of the four cultures, employees prefer an integration of consensual and entrepreneurial or competitive and entrepreneurialcultures. This owes to the fact that employees seek work environment that maximizes on their ability to be innovative, creative, and independent of macro-management, cohesion with fellow colleagues among others.

The study found out that on competitive culture, World Vision Kenya needs to help its employees set performance goals that are easily achievable. They can do this by ensuring Managers have one to one's with staff they manage to discuss and formulate practical work goals as well as best practice to achieve these goals. On entrepreneurial culture, it is recommended that the Managers here must empower employees by delegating more to enhance the confidence of its employees which results in more creativity and innovation; delegate tasks that are challenging rather than mundane. The organization needs to set out rules that are viewed as fair and practical by employees to promote a bureaucratic culture. This can be achieved by having open lines for feedback for example having a suggestion box as a tool for airing views and feedback concerning rules set out by Management. The findings indicated that World Vision Kenya is more inclined towards a consensual culture; however, it can improve more by having team building initiatives to help enhance team spirit within the organization. These activities could also be used as an avenue to communicate the values and goals of the organization.

## VIII. AREAS OF FURTHER STUDY

This study was based on NGO's, future studies need to be carried out in other sectors to determine the influence of Organization culture on performance. Further studies can also be carried out to identify the various levels of Organization Culture, their relevance to Organizations and how these levels can be embedded into the Organization Culture. There are several non-governmental organizations which need to be further researched on. This will give a more comprehensive answer to the culture issues.

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# AUTHORS

**First Author** – Njugi Anne wanjiku, Mount Kenya University, annenjugi@gmail.com

**Second Author** – Nickson Lumwagi agusioma, Multimedia University of Kenya, Email nickagush@hotmail.com

# Effect superheated steam on physical and lipid stability of reconstituted whole milk powder

Ghazwan Mahdy<sup>\*</sup>, Tajul A. Yang<sup>\*\*</sup>

<sup>\*</sup>Department of food science, School of Agricultural, Tikrit University, Tikrit Salah- Alddin Iraq.

\*\*Food Technology Division, School of Industrial Technology, University Sains Malaysia, Minden 11800 Pulau Pinang Malaysia.

Abstract- Milk powders are considered as food ingredients and its intervention in the manufacture of many foods and all this exposed to high temperatures when it cooked. Many of changes accrue in physical and chemical properties of milk. In this study the changes in physical properties color, viscosity, density,  $P^{\check{H}}$ and lipid stability peroxide oxidation value (POV) and total free fatty acids (TFFA) was measured to reconstituted (WMP) whole milk powder in relation thermal treatment using superheated steam with different temperature and period time. The temperature ranged from 150-210 °C for 5-25 min. The result for color showed in three different system (L, a, b). The superheated steam show lower different to color at the high temperature 210 °C and long time 25 min compare with control. At the viscosity, density and P<sup>H</sup> the result of superheated steam showed clear differences at temperature 150 and 210 °C at long time 25 min. About the lipid stability (POV peroxide oxidation value and total free fatty acids) the result of POV to superheated steam do not showed any significantly differences between sample heat treatment compare with control at 150-180 °C and that indicates no any oxidation reaction occur between the fatty acids and molecule oxygen in superheated steam. The result of total free fatty acids content showed lower changer at the high temperature 210 °C and long time 25 min but other sample no any significantly different show compare with control. All the result in this study showed stability of milk fat to reconstitute whole milk powder and that will be lead to maintain of nutrition value to milk fat during cooking.

*Index Terms*- physical analysis, superheated steam, milk powder, lipid oxidation.

# I. INTRODUCTION

Milk is one from the important products and can entered to manufacture many food because it has many properties to improve test and flavor with high nutritional value and it use in many food industry such as cake, biscuits, chocolate, caramel candy, famous Indian milk balls known as rasgulla and popular Indian sweet etc [1]. Milk has many compounds affected by temperature which can led to change sensorial quality to consumers which view of the color, viscosity and flavor [2, 3]. Whole milk powder use to manufacture many food because it has large impact to suitability for confectionary [4]. The manufacture of milk chocolate it is usually preferred the powder milk product by roller drying. Effect heat treatment on the physical and chemical properties in whole milk powder was study from many researchers. Marie showed in his study that was many damage in physical properties when stored the milk at long time and also showed damage in the color that was cause by Millard reaction which occurred during the storage [4]. From other study the effect ultrasound with the temperature on the physical properties in sheep milk and the result were recorded changes in the viscosity,  $P^{H}$  and density by different heat treatment with different time [5]. Increase of heat treatment on the milk cause increase of Millard reaction whereby Millard reaction was became very active with increase temperature [6]. Effect heat treatment and the storage on changes color in whole milk powder and the causes increase in color changes at high temperature and long storage that can causes damage in physical properties of product [7, 8]. Many thermal methods use to process food and get good result with the least possible impact on the components of food like air oven, microwave and superheated steam oven. The superheated steam is steam that has temperature above the boiling point, that mean up the boiling point the steam will be formation than the steam convert to unsaturated steam than to superheated steam [9]. Superheated steam oven its new thermal method public now to cook and drying foods and it has many good advantage such as, high heat transfer capability, produces condensation heat on coming into contact with the food, provides no oxygen environment and can be obtained under normal pressure.

Superheated was discover before 100 years ago but not development until 30 years ago specially in energy efficient [10, 11]. Superheated steam uses to dry many products continent high fat that was to exhibit the lipid oxidation by use high temperature because has less oxygen and that it prevents formation hydroperoxide [10]. The objective of this study to studies effect of superheated steam on the physical changes and lipid oxidation in reconstitute whole milk powder by use different heat treatment and different time.

# II. MATERIAL AND METHOD

Whole milk powder- The whole milk powder was supplied from Nestle company was choose (Nespray) type which purchase from the Tesco market in Penang city in Malaysia. The amounts of contents were following the standard milk powder which contented fat (28.2 g per 100 g) protein (23.6 g per 100 g) carbohydrate (39.9 g per 100 g).

**Reconstitute the whole milk powder-** The reconstitute whole milk powder was followed instructions to the consumer listed on the package. The whole milk powder (WMP) was reconstitute by use (33) g from the powder milk and added (225) ml water after that shaking on the magnetic stirrer for (10) min,

all amount of milk was prepared before applied in superheated steam.

**Superheated Steam Drying Oven-** Superheated steam drying was carried out by placing the tray containing reconstitute whole milk samples in the processing chamber of superheated steam processing system and exposed to different temperatures (150,180 and 210)  $^{\circ}$ C for (5,10,15, and 20) min respectively. superheated steam equipment was used Sharp AX-1500 with a steam generation capacity of 16 cm<sup>3</sup>/min, oven capacity of 31 L, and team engine heater of 900 W.

**Color measurement-** The color was measured by use the colorimeter (Minolta CM-3500d) made in japan. Where they were taken 10 ml from the sample and filled in the standard glass cell to colorimeter. For each sample where measurement triplicate to L (brightness), a (- green to +red component) and b (- blue + yellow) for each color values was taken on the temperature 25 °C [12].

**Viscosity and density measurement-** The viscosity was measured by use viscometer model (SV-10) made in Japan. Where was take 45ml from the sample and laid in the vial of the viscometer and taken the number of viscosity. All each values were taken at temperature 25 °C and also the values were taken triplicate. After correction the temperature of sample the density was calculated on the temperature 25 °C.

**PH measurement**- The P<sup>H</sup> was measured by use P<sup>H</sup> meter model (Mettler Toledo S20-K) made in Germany. The sample was taken at triplicate at temperature 25 °C .before start use the P<sup>H</sup> meter do the calibration by different puffer solution than where take 20 ml of the milk to measurement P<sup>H</sup>.

Acid value- After expose heating to each of sample 10 g was weight from milk sample in a conical flask. Two drops of phenolphthalein indicator were added and with 0.1 N potassium hydroxide solution (KOH) until the advent of color pink the end point. Acid value was calculated (Eq. 2) [14].

Where: AV acid value, (56.1) is equivalent weight of KOH, (V) is the volume in ml of standard volumetric KOH solution used, (C) is the exact concentration in KOH solution used (0.1 N) and (m) is the mass in grams of the test portion (10 g).

**Milk fat extraction and analysis-** Milk fat extraction was performed using the method of Oveisi, Sadeghi, Hajimahmoodi, Jannat, and Sobhani (2006) with some modification. Fat was extracted from 500 ml of reconstituted milk by adding 20 ml of 65% nitric acid into the sample. The sample was shaked and transferred to a centrifuge type Kubota 4000 (N41548-M000, Japan) at 3500 rpm for 20 min to separate the solid phase that contains fat and proteins. After the extraction, we added 20 ml of 99% ethyl alcohol and heated the mixture until boiling point. The mixture was then placed in a water bath for 10 min to denature the protein. Subsequently, 100 ml of petroleum ether was added.

The mixture was mixed well and centrifuged again at 3500 rpm at 20 min to separate the organic phase. The petroleum ether evaporated without heating. The fat was stored in 5 ml brown glass vials [15] until needed for analysis.

**Peroxide oxidation Value (POV)-** Peroxide value was determined according to AOCS official methods descripted by [14]. Wight  $1 \pm 0.05$  g of milk fats into 250 mL of conical flask with 30 mL of acitic acid – chloroform (3-2) solution swirl the flask until the sample dissolve in the solution and add 0.5 ml saturated potassium iodide (KI) solution and swirl for one minute and added 30 mL of distilled water than titrate with 0.01 N sodium thiosulfate (Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>) until the color change to light yellow than added 0.5 ml of 1% soluble starch indicator to get blue color and continued titrating until the blue color disappears. Calculate the peroxide value as meq of peroxide/kg of oil (Eq. 1)

$$PV = \frac{(S-B) \times N \text{ thiosufate} \times 1000}{\text{Weight of sample}} \dots 2$$

**Statistical Analysis-** The experimental data was subjected to one-way analysis of variance (ANOVA). Significant differences between mean values were determined using Duncan's Multiple Range test ( $P \le 0.05$ ) following ANOVA statistical analysis, which were performed using SPSS version 20- 2013 (SPSS Inc., Chicago, USA).

## III. RESULT AND DUSSCATION

Color in reconstitute whole milk powder- Effect superheated steam treatment by use different temperature and different time on the reconstitute whole milk powder (WMP) on the color. The color measured by colorimeter (Minolta CM-3500d) and the results show in table (1), reconstitute whole milk powder (WMP) recorded lower (L) and (b) values ( $P \le 0.05$ ) under high heat treatment and long time that was between (180 and 210) °C at long time (20-25) min compared with the control (Raw sample without heat treatment) lightness (L) describes the light-reflecting or transmitting capacity of an object. When the values of (L) take decrease that's mean the color will be take dark color. The reason because some reaction happens between the sugar and protein it's specially amino acids called Millard reaction and it's responsible on the brown color in the food [4, 16]. At 5 min the color not recorded significant any high changes in the three systems (L, a and b) at all temperature which can explained did not effect on temperature color on with short time [10]. At the time 10-15 min the result showed some significantly changes specially on the temperature 210 °C that was by increase the temperature accompanied increase in Millard reaction [17, 18].

	(Values of L)					
Superheated	Time of treatm	nent (min)		r	r	
steam	Control <sup>*</sup>	5	10	15	20	25
temperature						
°C						
150	$14.32^{a} \pm 0.02$	$13.99^{b} \pm 0.01$	$13.88^{b} \pm 0.04$	$13.85^{b} \pm 0.03$	$13.63^{c} \pm 0.02$	$13.44^{d} \pm 0.10$
180	$14.32^{a} 0.02$	$13.93^{b} \pm 0.01$	$13.75^{\circ} \pm 0.02$	$13.60^{d} \pm 0.02$	$13.44^{e} \pm 0.02$	$13.20^{f} \pm 0.01$
210	$14.32^{a} 0.02$	$14.23^{b} \pm 0.02$	$14.30^{ab} \pm 0.01$	$13.72^{\circ} \pm 0.01$	$12.63^{d} \pm 0.02$	$12.11^{e} \pm 0.01$
(Values of a)						
Time of treatment	nt (min)					
150	$5.66^{a} \pm 0.01$	$5.67^{a} \pm 0.01$	$5.68^{a} \pm 0.01$	$5.69^{a} \pm 0.01$	$5.80^{b} \pm 0.01$	$5.89^{\circ} \pm 0.01$
180	$5.66^{a} \pm 0.01$	$5.67^{a} \pm 0.04$	$5.72^{a} \pm 0.01$	$6.25^{b} \pm 0.01$	$6.93^{\circ} \pm 0.03$	$7.06^{d} \pm 0.03$
210	$5.66^{a} \pm 0.01$	$5.60^{a} \pm 0.07$	$5.83^{b} \pm 0.01$	$5.89^{b} \pm 0.01$	$6.69^{\circ} \pm 0.01$	$7.20^{d} \pm 0.07$
(Values of b)						
Time of treatment	nt (min)					
150	$24.20^{a} \pm 0.03$	$23.64^{b} \pm 0.01$	$23.46^{\circ} \pm 0.08$	$23.42^{\circ} \pm 0.05$	$23.05^{d} \pm 0.03$	$22.88^{d} \pm 0.07$
180	$24.20^{a} \pm 0.03$	$23.55^{b} \pm 0.03$	$22.72^{\circ} \pm 0.04$	$22.47^{d} \pm 0.03$	$19.73^{e} \pm 0.02$	$11.83^{f} \pm 0.02$
210	$24.20^{a} \pm 0.03$	$24.04^{a} \pm 0.08$	$24.16^{a} \pm 0.01$	$23.42^{b} \pm 0.24$	$21.38^{\circ} \pm 0.01$	$20.50^{d} \pm 0.03$
have a significant latters in the same row are significantly different ( $P < 0.05$ )						

Table 1: Effect superheated steam on color value (L, a and b) to reconstituted whole milk powder.

<sup>a-c</sup> Symbols bearing different letters in the same row are significantly different (P < 0.05).

\* control (raw sample).

**Peroxide oxidation value**- Lipid peroxidation is a free radical chain reaction in lipid oxidation that explains in the three terms of initiation, propagation, and termination processes. Available oxygen species which considered key factor of deterioration of polyunsaturated fatty through three different avenues: oxygen, hydrogen abstraction and free radical attack [19]. In this study the peroxide value in all samples ranged between (2.23- 4.21 meq O2/kg), were below 25 (meq of active O2/kg), That is considered an acceptable level of food. Peroxide value is measure lipid oxidation that's why associated the oxygen with alkeyl radical to produce hydroperoxide The result of effect

superheated steam time on the peroxide value show in table 2 that was no significantly different between period of time 5-15 min at temperature 150,180, 210 °C compare with control but show significantly different at long time 20 - 25 min compare with control. Peroxide value can use it as indicator to rancidity of fat by measurement the primary oxidation product (hydroperoxides). Superheated steam is recorded minimum of peroxide value 2.28 (meq O2\kg) and maximum 4.21 (meq O2\kg) that led to conclude superheated steam is mountain milk fat from formation the hydroperoxides that's why less of molecule oxygen[20].

Table 2: Effect superheated steam on POV value (meq.peroxide/kg)value to reconstituted whole milk powder

Superheated	Time of treatme	ent (min)				
steam						
temperature	Control <sup>*</sup>	5	10	15	20	25
°C						
150	$2.23^{a}\pm0.55$	$2.29^{\rm a}\pm0.59$	$2.69^{ab} \pm 0.25$	$3.98^{b} \pm 1.72$	$3.49^{ab} \pm 0.56$	$2.94^{ab} \pm 0.50$
180	$2.23^{a}\pm0.55$	$2.28^{\rm a}\pm0.55$	$2.52^{a}\pm0.49$	$2.81^{a} \pm 0.93$	3.01 <sup>ab</sup> ±0.57	$3.54^{b} \pm 0.59$
210	$2.23^{a} \pm 0.55$	$2.95^{a} \pm 0.02$	$2.85^a\pm0.08$	$3.14^{ab} \pm 0.51$	3.35 <sup>ab</sup> ±0.60	$4.21^{b} \pm 0.56$

<sup>a-c</sup> Symbols bearing different letters in the same row are significantly different (P < 0.05).

\* control (raw sample).

Acid value- The result of effect superheated steam on acid value show in table 3 that was no higher level for acid value between each of sample compare with control. The result show no significantly different between time 5-15 min at 150 and 180  $^{\circ}$ C compare with control. At the time temperature 150  $^{\circ}$ C the period time 25 min recorded significantly different with control but did not show any significantly different compare with each of treatment sample. At the high temperature 180  $^{\circ}$ C the period time show no significantly different between 5 and 25 min compare with control. At the 210  $^{\circ}$ C the result of acid value showed

compare with control and also sow significantly different between 5, 10 min compare with 15, 20 and 25 min. The level of acid value explain level of free fatty acid because the fatty acid it's found in fat or oil as unit associated with triglyceride so any higher in acid value that mean higher in free fatty acid which translates into decreased oil quality[14]. Period of time 5-15 min at all temperature in superheated steam did not recorded higher level of acid value compare with control but higher temperature with long time effect on increase acid value that mean superheated steam at below temperature 150 and 180 °C maintains the milk fat from formation free fatty acids because superheated steam is use dry steam and hydrolysis of triglyceride by heating require wet steam to broken the ester bounds between the triglyceride and fatty acids [21].

Superheated	Time of treatment (min)							
steam temperature °C	Control <sup>*</sup>	5	10	15	20	25		
150	$2.31^{ab} \pm 0.58$	$1.84^{a} \pm 0.27$	$2.14^{ab} \pm 0.36$	$2.27^{a}\pm0.08$	$2.44^{ab} \pm 0.03$	$2.62^{b} \pm .012$		
180	$2.31^a\pm0.58$	$2.00 \ ^{a} \pm 0.05$	$1.92^{a}\pm0.59$	$2.13^{a}\pm0.54$	$2.31^{a} \pm 0.62$	$2.84^{a}\pm0.08$		
210	$2.31^{ab} \pm 0.58$	2.07 <sup>a</sup> ± 0.11	$2.41^{ab} \pm 0.23$	$2.75^{bcd} \pm 0.05$	$2.86^{cd} \pm 0.08$	$3.14^{\circ} \pm 0.03$		

Table 3: Effect superheated steam on Acid value (mg KOH\g)to reconstituted whole milk powder.

<sup>a-c</sup> Symbols bearing different letters in the same row are significantly different (P < 0.05). \* control (raw sample).

**Physical properties-** The values of the viscosity show in fig 1. The result did not recorded significantly increase at the temperature (150)  $^{\circ}$ C at all the time when compared with control and also with the 180  $^{\circ}$ C at time (5-20) min but at time 25 min the result of 180  $^{\circ}$ C show significantly different compare with control. At high temperature 210  $^{\circ}$ C the viscosity recorded significant increase (p<0.05) at time (10, 15, 20, 25) min respectively as shown in Fig 1. Aguilar and Ziegler(1995) shown increase to viscosity when used different heat treatment and long time on the milk chocolate and descript that is the denaturation of why protein on the high temperature laid to increase the viscosity [5, 6].



Fig.1. Effect superheated steam on viscosity value to reconstitute whole milk powder

The values of the density show in fig 2. The result did not recorded significantly decrease at the temperature (150)  $^{\circ}$ C at time (5-20) min when compared with control but at temperature180 and 210  $^{\circ}$ C the density recorded significant

decrease (p<0.05) at time (5, 10, 15, 20, 25) min respectively as shown in Fig 1. Also increase the heat treatment with increase time effect on properties density as shown in this result decrease the density by use different treatment and different time.



Fig 2. Effect superheated steam on density value to reconstitute whole milk powder

The value of the  $P^{H}$  show on fig 3. The result did not recorded significantly change at the all temperature at time (5) min that mean the superheated stem do not effect on the PH at short time but at the (10, 15, 20 and 25) min at all temperature recorded significant decrease in the PH when compare those

values with the control and that mean the high temperature and long time lead to decrease the PH values as shown in Fig 1. Increase temperature effect on content of water in the liquid and that can be cause increase of PH [22].



Fig 3. Effect superheated steam on P<sup>H</sup> value to reconstitute whole milk powder

# IV. CONCLUSION

The present study assessed the key role of initial study of superheated steam oven on the physical changes occurring in reconstitute whole milk powder during different heat treatment and different time. The superheated steam not show significant impacts on the color (L, a, b) at 150-180 °C for 5-15 min with

slightly changes on time 20-25 min. however 210 °C recorded effect on color value for time 10-25 min.  $P^{H}$ , viscosity also do not recorded obvious changes at 150-180 °C for 5-15 min. however 210 °C time show effect for period time 10-25 min. superheated steam show effect on density value at 180-210 °C for 10-25 min. superheated steam did not show any oxidation

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activity for milk fat that was showed by result of peroxide oxidation value and acids value at 150-180 °C for 5-25 min.

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#### AUTHORS

**First Author-** Mr. Ghazwan Mahdy, Department of food science, School of Agricultural, Tikrit University, Tikrit Salah-Alddin Iraq. Email: <u>gazwanmahdy@yahoo.com</u>.

**second Author-** Dr. Tajul A. Yang, Food Technology Division, School of Industrial Technology, University Sains Malaysia, Minden 11800 Pulau Pinang Malaysia.

**Corresponding Author-** Dr.Tajul. A. Yang, Email: <u>taris@usm.my</u> Tel: +6046533888, Fax: +6046573678.
# Investigating the Effectiveness of Value Analysis Approach for Acquisition of Values in the Elementary School Social Studies Course

Asst. Prof. Dr. Ismail Gelen

Ondokuz Mayis University, Faculty of Education, Educational Curriculum and Instruction Department 55200 Samsun, Turkey ismailgelen@omu.edu.tr

*Abstract*-This research investigated the effectiveness of value analysis approach on elementary school students' value development. Seventy 5th grade students from a public elementary school in the central district of Hatay province (Turkey) participated in a 14- week study. A pre-test, post-test, control group experimental design was implemented to conduct the study. While "value analysis approach" was applied on the experimental group, traditional activities were continued by the teachers in the control group classrooms to enable students gain pre-determined values in the Social Studies curriculum. The Value Assessment Scale developed by the researchers was used to collect data. Cronbach's alpha co-efficient of the scale was calculated as 0,83. Results revealed that the experimental group had statistically higher scores on the acquisition levels of 'Cooperation', 'Academic Honesty' and 'Fairness' values over the control group. However, no differences found on the acquisition levels of the "Respect for National Anthem and Flag'.

*Keywords-* values, social studies, curriculum, value analysis approach I. INTRODUCTION

A mong many, two important aims of education are to teach valuable knowledge to the people and help them develop a good character through acquiring positive value mechanism and consciousness (Ulusoy 2007). Similarly, Lickona (1992) mentions that education enables societies raise both well-informed and beneficial members. Along the same lines, Turkish educational system aims raising people who hold moral values, are healthy mentally, physically, and morally, and have prudent emotions and good characters (MEB 2005).

Children start learning values at the first stages of their life by means of their families, circle of friends, game groups, media, local society, different institutions and a range of stimulators. The values children have at pre-school stage differ from the ones that they face in the school. It isn't wrong to say that the school has two main duties to eliminate the differences between students. The first one is supporting, arranging and designing the values of the children who start school. The second one is helping students use these values (Halstead and Taylor 2000). So, it should be expected that the education provided in schools improves the desire and capacity of making moral choices by the students according to principles accepted by the community (Gutman 1987). In this way, it is observed that the school plays a crucial role in developing values within students.

Teaching values that take important place in the educational process is an important issue, and attracts a lot of attention throughout the globe (Charlin 1996). Hence, the school is designed as the place where not only the courses are taught, but also it is arranged as an environment where positive characters and many values such as being a good person, being respectful to himself and the others are taught (MEB 2005 ASDE 1993).

The necessity of passing values to individuals in schools becomes important since it is not true to assume people as educated, if they cannot enhance acceptable and humane values in their relations with others (Ünal 1981). Education of values is essential in every stage of education, especially in nursery schools for children to embrace the values in society and put them in practice through out their lives (Balat Uyanık 2006, 16). In Turkey, value teaching approaches have become important by giving priority to values in school curriculum. Exploring the efficiency of those approaches can help educators and policy-makers plan the value education more consciously and properly (Gültekin 2007).

There are many value teaching (Doğanay 2006) approaches such as Values Clarification, Dilemmas, and Character Education (Lickona 1992) in primary school programmes (MEB 2005). The focus of this study is the Value Analysis approach. The aim of this approach is to assist the students to use logical thinking process and scientific research to cope with the problems which they face related to the values. It is to have students make decisions by problem solving (Doğanay 2006 Huitt 2003). This approach helps

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students improve by investigating and criticising the values (Kim and Traiger 2003) utilizing rational and scientific thinking (Fernandes 1999). In addition, the scope of the current study includes four values placed in fourth grade Social Studies curriculum: Respect for National Anthem and Flag, Cooperation, Academic Honesty, and Fairness.

#### **II. RESEARCH QUESTION**

In this research, following 4 hypotheses were tested:

*Hypothesis 1:* There is no statistically significant difference between post-test mean scores of the experimental and control groups on "Respect for National Anthem and Flag" sub-scale.

*Hypothesis 2*: There is no statistically significant difference between post test mean scores of the experimental and control groups on "Cooperation" sub-scale.

*Hypothesis 3:* There is no statistically significant difference between post test mean scores of the experimental and control groups on "Academic Honesty" sub-scale.

*Hypothesis 4:* There is no statistically significant difference between post test mean scores of the experimental and control groups on "Fairness" sub-scale.

#### **III. METHODOLOGY**

Current study utilizes two-group pre-test, post-test true experimental design. The research was conducted on 70 students in 5th grade from two different classes of a state elementary school in the central district "Antakya" of Hatay province, Turkey. These classes were randomly appointed to experimental (N=35) and control groups (N=35). Before the post-test, the two groups were compared in terms of their Social Studies course grades, end of term grades, Socio-Economic Status (SES) (Bacanli 1997 97-106) and Attitudes Toward Social Studies (ATSS) (Gelen 2003 163-164) course as well as their scores on the Value Defining Scale (VDS). Independent groups t-test results showed no significant differences between the groups in terms of their mean scores on any of the tests above.

#### Instruments

We developed the *Value Defining Scale (VDS)* to measure the 5th grade students' acquisition levels of the values in Social Studies Curriculum. Cronbach Alpha reliability of the scale was calculated as .83. To evaluate the construct validity of the Scale, explanatory factor analysis was run. Kaiser-Meyer-Olkin (KMO) sampling adequacy test result was .70 indicating that the data set was appropriate for factor analysis. Additionally, the instrument was reviewed by six faculty members at the College of Education in a public University to ensure the content validity. The 36 three-option Likert-type statements (Agree- Not Sure- Disagree) were included in the VDS. The instrument revealed 4 factors based on exploratory factor analysis results: "Respect for The National Anthem and Flag", "Cooperation", "Fairness", and "Academic Honesty" based on faculty reviews. Furthermore, the researchers requested the participants write four compositions related to the sub-dimensions of the VDS to support quantitative data results. Themes from those compositions were extracted and compared with the results of the quantitative analyses. The four-factor structure of the instrument explained 40,8 percent of the variation in the dataset. Table 1 indicates the statistics related to the factor structure.

Table 1. Factor structure of the value defining scale (VDS)

• Factors	• It e m N u m b e r	• F ac to r sc or es	•	• Sd
	• 3	• ,6 2 2	•	• ,64
• Respect for National Anthem and Flag	• 1 0	• ,6 6 4	•	• ,64
	• 1 1	• ,5 9 8	•	• ,60
	• 1	• ,6	٠	• ,36

		6		6 4			
	•	1 7	٠	,4 7 8	•	•	,41
	•	2 3	٠	,7 6 6	•	٠	,45
	•	2 4	•	,7 1 8	•	•	,43
	•	3 1	•	,5 1 8	•	•	,34
	•	3 2	•	,6 9 7	•	•	,46
	•	4	•	,5 2 2	•	•	,75
	•	5	•	,4 8 0	•	•	,45
	•	1 2	•	,5 6 4	•	•	,58
	•	1 3	٠	,4 7 5	•	٠	,85
• Cooperation	•	1 8	٠	,7 3 5	•	•	,42
	•	2 5	٠	,6 3 6	•	•	,60
	•	2 6	٠	,6 4 8	•	•	,49
	•	3 3	٠	,7 6 3	•	٠	,51
	•	3 4	٠	,7 5 8	•	•	,84
Academic Honesty	•	6	•	,7 6 7	•	•	,70
- Academic Honesty	•	7	•	,6 5 1	•	•	,84

	•	1 4	•	,4 1 9	•	•	,79
	•	1 9	•	,4 4 1	•	•	,47
	•	2 0	•	,6 3 2	•	•	,62
	•	2 7	•	,7 6 3	•	•	,49
	•	2 8	•	,5 2 3	•	•	,66
	•	3 5	•	,5 4 2	•	•	,75
	•	3 6	•	8 3 6	•	•	,77
	•	1	•	,6 4 1	٠	•	,83
	•	2	•	,7 5 0	•	•	,53
	•	8	•	,6 8 3	•	•	,62
	•	9	•	,5 8 9	•	•	,49
• Fairness	•	1 5	•	,4 0 9	•	•	,57
	•	2 1	•	,5 2 9	•	•	,43
	•	2 2	•	7 8 2	•	•	,65
	•	2 9	•	,4 5 0	•	•	,54
	•	3 0	•	,4 6 1	•	٠	,63

**IV. FINDINGS AND DISCUSSION** 

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The independent group t-test was conducted to determine whether there was a statistically meaningful difference between the mean scores of experimental and control groups in sub-dimensions of the VDS. The results are provided in Table 2 below.

Table 2. Independent groups t-test results between the post-test scores of sub-dimensions of VDS

Scale sub-dimensions	• Group s	• N	•	Ā	•	•	• p
• The respect for "National Anthem and	• Experi mental	• 3 5	٠	2 5, 8 2	•	•	. 00
Flag"	• Contro 1	• 3 5	•	2 4, 5 7	•		• .06
• Cooperation	• Experi mental	• 3 5	•	2 4, 8 2	•	•	• 00
• Cooperation	• Contro 1	• 3 5	•	2 2, 7 1	•		• .00
• Acadomic Honesty	• Experi mental	• 3 5	•	2 5, 1 1	•	•	• 00
Academic Honesty	• Contro 1	• 3 5	•	2 2, 2 2	•		• .00
• Foirmoss	• Experi mental	• 3 5	٠	2 5, 8 5	•	•	• 00
- F all llC55	• Contro 1	• 3 5	•	2 2, 9 7	•		00

Even though the mean of the experimental group ( $\overline{x}$ = 25,82; s=2,16) seems higher than that of the control group ( $\overline{x}$ =24,57;s=3,38) on "Respect for National Anthem and Flag" dimension as seen in Table 2, the difference is insignificant based on t-test results (t=-1,85). However, in all other sub-dimensions, experimental group had higher mean scores.

Furthermore, above table indicates that there is a statistically meaningful difference between experimental ( $\bar{x}=24,82;s=1,91$ ) and control ( $\bar{x}=22,71;s=3,13$ ) groups' post-test scores in terms of Cooperation value (t=-3,40; p<,05) This meaningful difference is in favor of experimental group. While the number of themes (Experimental=7, Control=6) developed from compositions are close to each other when Table 3 is analyzed. In other words, even if the students attribute the same meaning to Cooperation value, it seems that experimental group created an additional theme, which can be called as "Supporting Friends". They also use more sentences expressing value. In this research, we can conclude that the Value Analysis is an important approach in teaching values.

There is a statistically meaningful difference between experimental ( $\bar{x}=25,11$ ;s=2,21) and control( $\bar{x}=22,22$ ;s=3,3) groups' post-test scores in terms of Academic Honesty value (t=-4,28; p<,05) as shown in Table 1. When Table 3 is analysed, there is a difference between the number of themes (Experimental=6; Control=4) created from compositions. Additionally, the number of times mentioning that value in their compositions is higher in the experimental group (Experimental=50; Control=39). At the same time,

besides the common themes that experimental and control group students created, the experimental group students added 2 more themes called "copying others' sentences when writing a summary" and " pretending as if different sources were used for homework". These results imply that the difference in the Academic Honesty post-test scores is due to Value Analysis approach.

It is found that there is a meaningful difference in the post-test scress of the groups in favor of the experimental one (t=-5,22; p<,05). The mean score of the experimental group was calculated as 25,85 (s=1,43) which represents about 3 point difference between the control group. While the number of themes (Experimental=4; Control=3) formed from compositions are close to each other as presented in Table 2; there is a meaningful difference between the number of times (Experimental=50; Control=37) that value was expressed in compositions.

The scale dimensi ons	Themes (Experimental Group)	Themes (Control Group)	Themes
al	7		Appreciate the value of national flag
lag	es .	:38	No speaking when the Anthem plays
lati d F	eme	ncy	Love the flag and National Anthem, and have respect
and	th	of 6 cier	for them
n fo	of	ence ber	Know that it is the sign of our independence
the	Der		Say the Anthem with enthusiasm
An		Nu fre	Look carefully at "The Flag" when singing the Anthem
A	Ž	-	When singing the Anthem, pay attention
			Helping friends with their lessons
		he	Resolve their friends' problems
ion	e -	if tl ::4(	Sharing course material with their friends who left their
rat	f tl :54	er o ::6 ncy	material at home
be	r 0 icy	nes	Share food with their friends
Ő	adr nes	her	Take homework to their friends who are sick
U,	bə.	X 7 4	Show care about the problems of their friends
	Z # 4		Always support the friends
		of	To cite the source
ity		en en	To know that stealing an invention is not moral
nes	a me	l mp	Feel discomfort about invention theft
c ho	f the 7:50	Nu the Fre : 39	Cheating is not moral
ademi	luency		Copying others' sentences when writing a summaryis not moral
Ac	nu		Pretending as if different sources were used for
	ZÉ		homework is not a good thing.
			Being fair is important
S	50	of cy:	Discrimination is not appropriate
nes	of of	ss:3	Absence of justice is not a good thing
Fair	umber lemes:4 requen	Numł theme Frequ 37	
	N H H	<u> </u>	Helping others may increase fairness

#### Table 3. The frequencies and the number of themes extracted from student compositions.

As Table 3 reveals, the number of themes extracted from the compositions somewhat differed between the study groups. In all sub-

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dimensions of the VDS, students in Experimental group stated more themes than the control group. At the same time, the themes also confirm that there is no statistical difference in terms of value level on "Respect for National Anthem and Flag". The results revealed that the value analysis approach is effective in value teaching as proposed by Gültekin (2007), Bacanlı (1999) and Huitt (2003) however, our findings contradict with these conclusions when it comes to "Respect for National Anthem and Flag" team. On the other hand, considering the effect of family and society on value teaching, this result is not surprising in Turkey (Akbaş 2004 Baydar 2009). What is more, royalty to the national values is widely accepted as a value by the Turkish people (Kağıtçıbaşı 1972, 17). Sevinç (2006) observed that society does not embrace the individuals who don't share those common values.

#### V. CONCLUSION

When the results of the research are analysed, there is not a meaningful difference between the post-test mean scores of the "Respect for National Anthem and Flag" between experimental and control groups. In this situation, it can be said that the Value Aalysis approach is efficient to gain the mentioned values but that particular value can be gained by the students without Value Analysis approach. However, among post-test scores of the other values are considered the current study found meaningful differences in favor of experimental group. Consequently, it is found that the Value Analysis approach is effective to gain those values.

At this point it is crucial to mention the importance of the school's roles on teaching values. As Arweck and Nesbitt (2004) stated, the improvement of a programme in schools can be possible by including education of values. From this aspect, it is not wrong to declare two basic goals of the schools: to raise the individuals who are academically successful, and embrace basic values (Ekşi 2003). Lickona (1992) expressed that the school has the responsibility for forming the characters of the individuals while explaining the role of the schools in education. Kim and Traiger (1999, 726) expressed that the school should raise not only well-informed individuals but also ones who are morally good. Moreover, Gooddla (1992) states the necessity to embrace the idea that school is the common heritage of society and eveybody should take responsibility for it (as quoted in Sari 2007). Keeping these in mind, a word for policy makers should be stated here: The main values such as fairness, honesty, having responsibility and being respectful to others should be included in elementary school curriculum.

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## Prevalence of HBV and HIV among students and staff at the University of Jos, Nigeria: Results from a medical outreach screening program

Obekpa Solomon<sup>\*</sup>, Khatib Mahafroz<sup>#</sup>, Mbwas Mashor<sup>\*\*</sup>, Francis Arome<sup>\*\*\*</sup>, Das Neha<sup>##</sup>

\* Benue State University Teaching Hospital (BSUTH), Nigeria

\*\* Department of Pathology, University College Hospital, Ibadan, Oyo state, Nigeria

\*\*\*Kogi State School of Nursing, LokoJa, Kogi State, Nigeria

<sup>#</sup>Scientific Associate, focus scientific research center of phamax AG, Bangalore, India

##Scientific Advisor, focus scientific research center of phamax AG, Bangalore, India

*Abstract*- Human immunodeficiency (HIV) and hepatitis B virus (HBV) are both of great concern in Nigeria. This study was conducted to understand the HIV and HBV prevalence among students and staff at the University of Jos (Jos, Nigeria) through a medical outreach program in which free screening was offered to voluntary participants at the university. Serum samples from 180 individuals were assayed for the presence of HBV surface antigen, HIV-1 p24 antigen, and HIV-1/2 antibodies. HIV prevalence was 3.88% and HBV prevalence was 7.22%. In sum, the prevalence of HBV and HIV among young Nigerian adults reflects the need for establishment of clear health policy for this risk group.

Index Terms- HBV, HBsAg, HIV, Nigeria, student

#### I. INTRODUCTION

The hepatitis B virus (HBV) and human immunodeficiency virus (HIV) are today hyperendemic to Nigeria, a large and rapidly growing African economy. Both cause life-threatening conditions and are spread in similar ways, through infected blood and blood products – most notably through unprotected sexual activity and needle sharing in injection drug use (IDU). Many studies have shown that co-infection with HIV leads to a more aggressive hepatitis disease course and a higher risk of liver damage. Indeed, end-stage liver disease due to hepatitis is a leading cause of death in HIV-infected patients.<sup>1</sup> Moreover, HBV, HIV, and their co-infection can impair immune system recovery after starting antiretroviral therapy, thereby complicating treatment.

Thus, the prevalence of HIV and HBV is of great concern to health researchers, but has particular relevance to Nigeria. Globally, more than 200 million people alive today have been infected with HBV at some point in their lives.<sup>2,3,4,5,6</sup> Furthermore, every year, over 4 million acute clinical cases of HBV are recorded, and 1 million die from chronic active hepatitis, <u>cirrhosis</u>, or primary liver cancer.<sup>6</sup> While these global numbers are somewhat alarming, Nigeria, in particular, is being ravaged by this scourge: approximately 75% of its population is likely to have been exposed to the HBV at one time or the other in their life and approximately 7% of them die from its complications every year.<sup>7</sup> The prevalence of HIV stands at approximately 35 million globally, but tens of millions have already died of AIDS-related complications since the beginning of the HIV epidemic.<sup>8</sup> In Nigeria, people living with HIV number approximately 3.2 million, of whom 210,000 die due to HIV and related complications annually.<sup>9</sup> With the adult HIV prevalence at 5.0% of the population,<sup>1</sup> Nigeria is indeed at the threshold of an exponential, explosive HIV epidemic. In sum, HBV and HIV are completely intertwined as major public health problems in the country.

In addition, further analysis of the disease scenario in Nigeria shows some very alarming trends: a high risk for infection with HBV and HIV tends to be among the youth, most commonly Nigerian students. This could be explained by various economic, cultural, and social factors that lead to high-risk behaviors such as alcohol abuse, multiple partners, and IDU. Moreover, current strategies and programs in Nigeria for HIV and HBV awareness and prevention on campuses and in host communities are grossly inadequate or are often neglected. Indeed, a growing body of literature shows both a lack of awareness in this demographic and, more importantly, a scarcity of information on HIV and HBV prevalence among students. Thus, it is imperative for educational institutes and universities to implement comprehensive responses to stem the growing HIV and HBV epidemic.<sup>10,11,12</sup> HIV and HBV are, after all, preventable and so it necessary to establish their importance and track their prevalence among the youth in order to evaluate the need for implementing preventive action.

With this background, the objective of the present study was to collect primary data on HIV and HBV prevalence patterns among Nigerian students and some staff members in order to understand the dynamics of HBV and HIV infection and thereby guide the development of tailor-made intervention programs for such neglected populations in Nigeria.

#### II. MATERIALS AND METHODS

#### Study Setting and Participants

The study recruited subjects from among graduate students, postgraduate students, and staff at the University of Jos, Nigeria. This was a cross-sectional study conducted among students and staff at University of Jos, Nigeria. Data were obtained during a medical outreach program, with free screening offered to voluntary students and staff of the university. Permission was obtained from the University of Jos, Nigeria. The sample size was 180. Participation in the study was on voluntary basis; study participants were selected by a simple random sampling technique. All students and staff of the university willing to participate in the study were included in the study. Informed consent was obtained from participants with the assurance that all personally identifying information obtained would be treated with utmost confidentiality. The study was done in 2009.

#### Screening Procedure Screening tests

Serum samples from the 180 individuals were assayed for the presence of HBV antigen. Detection of HBV antigen was carried out using a One Step Strip Style HBsAg test kit (Global Diagnostic®, USA). This test is a rapid, direct binding test for the HBV surface antigen (HBsAg) and is based on the principle of sandwich immunoassay in serum. Monoclonal and polyclonal antibodies are employed to identify HBsAg specifically; this one step test is very sensitive. Detection of HIV was done with a Determine HIV-1/2 Ab/Ag Combo (Alere Medical Co Ltd, USA), which requires a simple two-step procedure for serum; it is quick and easy to use, delivering clear, dependable results. The HIV-1/2 Ab/Ag Combo detects HIV-1 p24 antigen and HIV-1 and HIV-2 antibodies. The manufacturer's instructions were strictly followed to identify the serum samples that were seropositive for HBV and HIV antibody.

#### **Test procedure**

**Screening test procedure for HBV:** For detection of HBsAg, the strip was immersed into the collected sample of serum from participants with the arrow end pointing toward the serum. It was removed after 5 s and the results were interpreted after 25 min. The sample was considered negative for HBV if only one colored band appeared in the control (C) region and no apparent band appeared in the test (T) region; the sample was considered positive if in addition to a pink-colored control (C) band, a distinct pink-colored band appeared in the test (T) region.

Screening test procedure for HIV: A sample of whole blood (50  $\mu$ L) from participants was added to the sample pad of the strip. When all the blood was transferred from the capillary tube to the sample pad, one drop of chase buffer was immediately added to the sample pad. The results were obtained in 20–30 min. If antibody is reactive then, two pink or red lines appear, one in the control area and other in the lower test area of the test unit. If a line appears on the upper test area of the test unit, then it is HIV-1 p-24 reactive.

#### 2.7. Data Analysis

Data on participants and the test results were managed using Microsoft Excel 2007. The SPSS 19 software package was used for bivariate analysis to find correlations between characteristics of participants and their state of infection. The following indicators were assessed: (i) Socio-demographic distribution of participants, (ii) number and ratio of persons infected with HBV and HIV, and (iii) number and ratio of participants infected with HBV and HIV by age and sex. The chi-square test was used to compare means and the difference was considered statistically significant for P < 0.05. All data were aggregated to ensure confidentiality.

#### III. RESULTS

#### Socio-demographic Characteristics of Blood Donors

Among the volunteers who came forward for screening, 101 (56.11%) were males while 79 (43.88%) were females. The age of the volunteers varied from 18 to 40 years with a median age of 28 years. (Table 1)

Table study particip	e1: Socio demographi pants	ic characte	eristics of the
	Categories	Total	Percentage Distribution
Age	18-20	50	32.25%
	21-23	46	29.67%
	24–26	42	27.09%
	27-30	9	5.8%
	31 and older	8	5.16%
	Age was unknown for	the rest of	the volunteers
Religion	Christian	175	97.22%
	Muslim	5	2.77%
Sex	Male	101	56.11%
	Female	79	43.88%
Occupation	Student	177	98.33%
	Others (Clergy/gardener/ staff)	3	1.66%

#### Prevalence of HBV and HIV

Of the 180 participants, 7 were positive for HIV and 13 were HBV positive only. The HIV prevalence among study participants was 3.88% and HBV prevalence was 7.22% (Table 2).

Table 2: Positiveinfection among st	cases of HIV, HBV tudy participants	V, and HIV/HVB co-
	Number of positive cases	Percentage of participants (%)
HIV	7	3.88
HBV	13	7.22
Total	20	11.1

The overall prevalence of HBV and HIV among males was 9.99 % and 3.9%, respectively. The prevalence of HBV and HIV among females was 3.79% (Table 3).

HIV	HBV
-----	-----

Sex	Positive	Negative	Total	Positive	Negative	Total
Male	4 (3.9%)	97	101 (56.11%)	10 (9.99%)	91	101 (56.11%)
Female	3 (3.79%)	76	79 (43.88%)	3 (3.79%)	76	79 (43.88%)
Total	7	173	180	13	167	180
Chi square	0.0031			2.4645	•	
Р	0.955255			0.116448		

Table 3: Gender based sero-prevalence of HBV and HIV infections among Study participants

As age was known for only 155 volunteers, from the available data for these participants, the prevalence of HBV was highest in the 24–26 age group, followed by the 18–20 and 21–23 age groups. However, the prevalence of HIV was highest in the 21–23 age group, followed by the 24–26 and 18–20 groups. Notably, no cases of HBV or HIV were found in participants aged 27 year and above (Table 4).

#### Table 4: Sero-prevalence of HBV and HIV in different age groups (for 155 volunteers)

	Hepatitis B HIV					Chi-	P	
Age group	Positive	Negative	Total	Positive	Negative	Total	square	Γ
18–20	4 (8%)	46 (92%)	50	2 (4%)	48	50	0.7092	0.399703
21–23	2 (4.34%)	44 (95.66%)	46	3 (6.5%)	43	46	0.2115	0.645599
24–26	6 (14.28%)	36	42	2 (4.76%)	40	42	2.2105	0.137072
27–30	0	17	17	0	17	17		

#### IV. DISCUSSION

The prevalence of HBV in our study was 7.22%, which is lower than that reported in previous similar studies in Nigeria. In one study at Ahmadu Bello University, Nigeria, 12.5% of students were found positive for HBsAg.<sup>13</sup> In another study of medical, nursing, and microbiology students presenting with pyrexia of unknown origin in Ibadan, Nigeria, HBsAg prevalence was found to be 14% among the microbiology students, 6.7% among the student nurses, and 13.5% among the medical students.<sup>14</sup> However, a lower HBV prevalence rate of 3.2% was reported among medical students at Lagos State University College of Medicine, Nigeria.<sup>15</sup>

The prevalence of HIV in our study was 3.88%. As it is difficult to estimate prevalence in general population, data from blood donors can often be utilized as an alternative. For HIV in Nigeria, the overall sero-prevalence has been previously reported to be 7.66% in blood donors, which is higher than our finding of 3.88% among university students and staff.<sup>16</sup> HIV sero-prevalence among blood donors in Nigeria rose from 4.25% in 2001 to peak at 12.64% in 2003, before a steep drop to 6.35% in 2004 and a gradual decline to 5.70% in 2006.<sup>17</sup> However, the prevalence of HIV was lower at 3.69% in institutions of higher education in South-east Nigeria.<sup>16</sup> Furthermore, HIV prevalence

has been observed to be even lower (3.1%) amongst Malian students<sup>18</sup> and only 1.5% among students in East Africa.<sup>19</sup>

A number of studies in different transmission groups have confirmed that age is a co-factor for disease susceptibility and progression of HBV and HIV. <sup>20</sup> In our study, the highest prevalence of HBV and HIV was amongst students in the age group of 24–26 years and 21–23, respectively. However, a previous study assessing the prevalence of HBsAg in an urban community in Jos, Nigeria, found that prevalence was highest in an even younger group (9.7% among those aged <20 years); an important point to be noted is that carriage rates were highest among students (13.2%) compared with other occupation categories.<sup>21</sup> Another study reported higher prevalence of 13.8% in students below 30 years of age, compared with only 8.3% in those aged more than 30 years.<sup>13</sup> Thus, it becomes important to evaluate the prevalence of HBsAg in students who are less than 30 years of age.

The reason for this prevalence among those aged less than 30 years is somewhat unclear from this study, as no statistically significant association was observed with respect to age. The greater prevalence in this age group could be related to higher sexual activity, increasing prominence of IDU, etc., which is a high-risk behavior for HIV and HBV infection. The considerably higher prevalence of HIV and HBV among males compared with females in our study is also notable, although the trend is not statistically significant. However, previous studies of similar demographics in other countries have found the reverse trend: A study of students at medical colleges in Saudi Arabia reported a higher HBV prevalence in females (0.78% in 18–21 age group; 0.90% in 22–30 age group) than in males (0.17% in 18–21 age group; 0.39% in 22–30 age group). Previous study findings had showed a higher prevalence of HIV infection amongst female students (4.32%) than male students (2.92%).<sup>16</sup> The higher prevalence of HIV and HBV reported among the male Nigerians than the females<sup>22,23</sup> may be explained by a higher frequency of exposure to infected blood and blood products as a result of social behavior and occupational hazards.<sup>24</sup>

The main risk factors for HBV and HIV infection among university students and staff in Nigeria include a history of blood transfusion, history of needle injection, IDU, and multiple sex partners.<sup>25,26,27,28</sup> Unfortunately, this has not been given the attention it deserves in the Nigerian healthcare delivery system, mainly due to the lack of information about HBV and HIV infection. Nevertheless, the baseline data and insights from the present study could provide a basis for further studies on this topic. In addition, further studies on the dynamics and epidemiology of HBV, HIV, and co-infection in Nigeria are necessary to explain the sex- and age-related trends.

HBV and HIV are highly infectious sexually transmitted infections and are hyperendemic to Nigeria. Therefore, there is an urgent need to step up HBV and HIV health education. To prevent and control HBV and HIV, greater priority should be assigned to initiatives aiming to raise awareness, promote partnerships, mobilize resources; formulate evidence-based policy and collect data for action; and prevent transmission and promote access to screening, care, and treatment services. Ultimately, however, the best plan may be to focus on prevention and early treatment to lessen the number of patients proceeding to complications and reduce the HBV- and HIV-related morbidity and mortality. Along with creating awareness among the population through electronic and print media, screening and vaccination of students is recommended since HBV vaccine has been shown to be protective. We propose further studies to identify factors associated with the spread of HBV and HIV in Nigeria. In conclusion, it is pertinent to state that one of the major drawbacks of this study was our inability to employ confirmatory assays such as the HBsAg confirmatory test. Regardless, our result may not reflect the true prevalence of HBV and HIV amongst students, since HBsAg marker is not detected during the window period of the infection.

#### V. CONCLUSIONS

This survey of young, healthy, educated adults at a renowned university in Nigeria showed a high prevalence of HBV and HIV infection. However, the environment plays an important role as absence of awareness and the low incomes favor transmission. In sum, the prevalence of HBV and HIV among young Nigerian adults reflects the absence of health policy for fighting these diseases. This is alarming and, when taking into account the high risk of HBV and HIV transmission in the country, immediate and appropriate actions by health authorities as well as the general population itself may be necessary to reduce the burden of disease.

#### CONFLICTS OF INTEREST

The authors declare no conflict of interests.

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#### AUTHORS

First Author – Obekpa Solomon, Benue State University Teaching Hospital (BSUTH), Nigeria
Second Author – Khatib Mahafroz, Scientific Associate, Focus Scientific Research Center of phamax AG, Bangalore, India
Third Author – Mbwas Mashor, Department of Pathology, University College Hospital, Ibadan, Oyo state, Nigeria
Fourth Author – Francis Arome, Kogi State School of Nursing, LokoJa, Kogi State, Nigeria
Fifth Author – Das Neha, Scientific Advisor, Focus Scientific

Research Center of phamax AG, Bangalore, India

## Classification of Micro Array Gene Expression using k-NN, SVM and Naive Classifiers

#### Selva Mary. G, Likhesh N. Kolhe, Kanchan D. Patil

Asst. Professor, Alamuri Ratnamala Institute of Engineering and Technology, Mumbai University, India

Abstract- Classification analysis of microarray gene expression data has been performed widely to find out the biological features and to differentiate intimately related cell types that usually appear in the diagnosis of cancer. Many algorithms and techniques have been developed for the microarray gene classification process. These developed techniques accomplish microarray gene classification process with the aid of three basic phases namely, dimensionality reduction, feature selection and gene classification. In our previous work, microarray gene classification by statistical analysis approach with Fuzzy Inference System (FIS) was proposed for precise classification of genes to their corresponding gene types.

This paper proposes an effective classification technique that uses Naïve Bayes classifier, k-NN and SVM. The dimensionality reduction of the gene expression dataset is performed by using statistical approaches. From the dimensionality reduced data, the important genes are identified and also features are extracted. The improved classifier is developed for classification and so it is trained using the classifiers. The well-trained classifier is used to the classification of micro array gene expression dataset.

*Index Terms*- Classification, k-NN, Micro Array Gene, MPCA, Naive Bayes, PCA, SVM.

#### I. INTRODUCTION

ue to wide computation and availability of cost efficient data storages, generous amount of information are being accumulated in the databases. The primary objective of the huge data collection is to determine formerly new patterns and knowledge that aid in efficient decision making process. This necessitates the invention of tools and methods to segregate information that are hidden in such databases and hence the data mining concepts developed. The tradition definition of data mining [25] is "the non-trivial extraction of implicit, formerly unknown and practically beneficial information from data in databases" [1] [2]. It is the fundamental step of Knowledge Discovery in Databases (KDD) [3] in which a defined list of patterns (or models) over the data are generated by deploying the process of computational techniques. Moreover, the inclusion of advancements in the data analysis tools lead to the discovery of more unknown, worth patterns and relationship among the data sets [7-9]. Some of the examples include Statistical models, mathematical algorithms and machine learning methods [4] [5]. Microarray technology is emerged as a robust tool to be used for tracking of genome - wide expression levels of gene [15]. Microarray technologies reveal gene ensembles, the metabolic ways fundamental to the structurally practicable organization of

an organ and its physiological function using the analysis of gene expression profiles [16]. They automate the diagnostic process and hence improve accuracy and precision of conventional diagnostic methods. They facilitate thousands of gene expressions [17] [18]. The added advantage of such microarray technology is the ability to classify the cancer types using the micro array gene expression datasets, which ultimately improve the diagnostic measures. Numerous techniques have been proposed so far for the purpose of classifying the cancer types using gene expression datasets [13] [11] [12].

This work intends to extend the work by performing a comparative analysis between the proposed statistical approach based dimensionality reduction and the conventional and popular dimensionality reduction techniques such principal component analysis (PCA) and multi-linear principal component analysis (MPCA). The comparative analysis is made in two aspects, one in terms of classification performance and the other in terms of computational complexity. The rest of the paper is organized as follows. Section 2 gives a brief introduction about the statistical approach based dimensionality reduction [26], PCA –based dimensionality reduction.

#### **II. PREVIOUS WORK**

To further substantiate and to analyze the performance, we conduct a comparative study in this work. The comparative study considers two popular dimensionality reduction techniques called Principle Component Analysis (PCA) and Multi-linear Principle Component Analysis (MPCA)<sup>[28]</sup>. The dimensionality reduction techniques replace the proposed statistical approach and perform microarray gene expression data classification. Based on the obtained results, we conduct the performance study over the combination of statistical approach with FIS, LPP with FIS and MPCA with FIS. The study results that the statistical approach with FIS outperforms the classification performance when compared to the other methods <sup>[29]</sup>.

#### **III. EXISTING SYSTEM**

In this paper existing system is Fuzzy inference system (FIS) [19]. FIS based method was accuracy efficient, however the reliability is poorer than the proposed method and ultimately, the classification performance is poorer than the proposed method. The classification performance of the fuzzy inference system (FIS) is similar to that of other classifiers, but simpler and easier to interpret. Consequently, the goal is to generate fuzzy rules based on dimensionality reduced data. Hence, fuzzy

inference is selected in our approach for classification and the fuzzy rules are utilized to train the fuzzy inference system [28]. In the existing system, it was proposed an effective classification technique that uses an enhanced fuzzy inference classifier. The dimensionality reduction of the gene expression dataset is performed by using statistical approaches. From the

dimensionality reduced data, the important genes are identified and also the fuzzy rules are generated. The improved classifier is developed for classification and so it is trained using fuzzy rules. The well-trained classifier is used to the classification of micro array gene expression dataset. Fig.1 describes the architecture of the existing system.



Fig. 1 Existing System Architecture [<sup>28]</sup>

#### LIMITATIONS

In this paper, FIS based method was accuracy efficient, however the reliability is poorer than the proposed method and ultimately, the classification performance is poorer than the proposed method. The classification performance of the fuzzy inference system (FIS) is similar to that of other classifiers, but simpler and easier to interpret. Consequently, the goal is to generate fuzzy rules based on dimensionality reduced data. Hence, fuzzy inference is selected in our approach for classification and the fuzzy rules are utilized to train the fuzzy inference system (FIS).

The generation of the Fuzzy rules is very tiresome process and the One of the disadvantages of fuzzy logic is that the rules for it are not very direct. Many experts have proposed rules over the years for this, but there are many of them. It would be impossible to follow all of these rules, since they tend to vary from researcher to researcher. All of the factors of fuzzy logic are given the same importance as long as they are going to be combined.

This causes certain sets of data to become more important than others, where this importance may not necessarily be true. There are many complexities in developing the fuzzy rules. It is also hard to develop a model from a fuzzy system. It requires more fine tuning and simulation before operational. If the rules generated were wrong once then the whole process has to be changed. The use of fuzzy logic for interpretation of gene expression data has not been explored substantially.

Initial investigations suggested that poor quality clusters are formed as a result of the fuzzification of measurements. Estimating the generalizability of these experiments is not easy because computing the quality of clusters continues to be an extremely subjective task, and diverse fuzzification systems have not been tried. The dimensionality reduction of the data has to be also included since the data gene data contains a large amount of values in them.

#### IV. PROPOSED SYSTEM

In our proposed method we will classify the Micro Array Gene Expression Data. Features are extracted in the data and extracted features are reduction using PCA, MPCA method. Selected features are passed through binary session. After the binary session, Patterns are generated using statistical approach. Then the features and patterns are passed through the classifiers. Finally Measure Performance metrics like accuracy, sensitivity, specificity, FPR, PPV, NPV, FDR and MCC and concentrated on the computational time.

FIS based method of classification was accuracy efficient, however the reliability is poorer than the proposed method and ultimately, the classification performance is poorer than the proposed method. The classification performance of the fuzzy inference system (FIS) is simpler and easier to interpret <sup>[28]</sup>. Consequently, the goal is to generate fuzzy rules based on dimensionality reduced data. The generation of the Fuzzy rules is very tiresome process and the one of the disadvantages of fuzzy logic is that the rules for it are not very direct. Many experts have proposed rules over the years for this, but there are many of them. It would be impossible to follow all of these rules, since they tend to vary from researcher to researcher. This causes certain sets of data to become more important than others, where this importance may not necessarily be true. There are many complexities in developing the fuzzy rules. It is also hard to develop a model from a fuzzy system. It requires more fine tuning and simulation before operational.

While classifying the gene data type it is more important to have accuracy and reliability rather than time complexities and space complexities. Hence we propose the new method by combining kNN and SVM classifiers to improve the accuracy of classification.



V. METHODOLOGY

Fig. 2 Proposed System Architecture <sup>[29]</sup>

### Modules

- Two main Modules
  - Training Phase
  - Load Microarray Gene Dataset
  - Feature Extraction using Dimensionality Reduction (MPCA and PCA)
  - Binary Session
  - Testing Phase
  - Pattern Generation
  - ✤ K-nearest neighbor rule and SVM
  - Naïve Bayes Classifier

#### **Training Phase**

The Fig. 4 shows the working of the system. In training process, we select all genes from the original data set but except one column and this column of genes is used for testing.

- (i) Statistical operations are performed using dimensionality reduction pseudo code
- (ii) Then binary session and pattern generation processes are performed based on the result of statistical approach.
- (iii) Finally, the fuzzy rules generation process is performed over the generated patterns.

In this proposed work, the first process is loading the microarray Gene dataset. Next phase is feature extraction and it is done by using MPCA and PCA. Binary session is carried out by threshold value. The threshold value in the binary session is used to change the values in the matrixes. It is also used to reduce the execution complexity; binary session makes the classification easier in the further gene expressions.

#### **Testing Phase**

#### Pattern Generation

The binary session process gives the results as patterns. In the binary session each binary elements are obtained as the set of matrix with each matrix. In the set of matrix the first element of the each matrix is considered as one gene pattern, the second element is considered as another gene and this process is repeated for the last value of the given matrix.

In our process we used two types of datasets for the gene expressions named AML and ALL. The generated pattern P contains column g from 1:38, whereas ALL dataset contains 1:26 and AML dataset contains 27:38.

#### K-nearest neighbor rule and SVM

The k-NN rule is used to introduce notation. In the k-NN rule the patterns which we are going to classify are symbolized as vectors in a d-dimensional Euclidean space  $R^d$ .

#### Naïve Bayes Classifier

Naïve Bayesian classifier is a simple probabilistic classifier model which is based on the Bayes Theorem with independence assumptions. The probabilistic model of the classifier is the "independent feature model". Since the probability model is a unique in nature, Naïve Bayes classifiers could be trained effectively. In several applications parameter estimation for Naïve Bayesian model uses the maximum likelihood method. Naïve Bayes classifier needs only a small amount of training data to calculate the parameter which are needed for the classifications. This is the major advantage over the Naïve Bayes classifier.

#### **ADVANTAGES**

We have included the optimization scheme based on PCA so that the data is reduced. So automatically the time and the cost complexities are much reduced. We are using other classifier such as kNN, SVM and Naïve Bayes classifier and also we are combining the classifiers in order to produce best accuracy in the classification process compared to the existing methods. Instead of the complex fuzzy rules and others we are producing simple and efficient classifiers that are supervised and produce results without many complexities.

The dimensionality reduction scheme that is included helps to produce the classification results in an exact way and also minimizes the complexities. The Bayes classifier classifies the data based on the Bayes theorem calculation which refers to the probability of the test data to occur in a particular category.

The SVM classifier classifies the data based on the hyper plane arrangement of the train data and tests the test data by finding the location at which the test data occurs. The kNN classifier classifies the data by comparing the test and the train data in the neighborhood and finding the results. Thus our proposed scheme produces better accuracy compared to the existing algorithm. Also we have compared the performance of the three classifiers and the classification results by combining the classifiers <sup>[12]</sup>.

Finally Measure Performance metrics like accuracy, sensitivity, specificity, FPR, PPV, NPV, FDR and MCC and concentrated on the computational time.

#### VI. CONCLUSION

This paper studied the performance of the proposed statistical approach based dimensionality reduction in microarray gene classification method over the popular dimensionality reduction and feature extraction methods such as MPCA - based dimensionality reduction and PCA - based dimensionality reduction. Hence, it can be asserted that the proposed dimensionality reduction method is suitable for microarray gene classification as it extracts relevant and less volume of information from the raw expression. Finally Measure Performance metrics like accuracy, sensitivity, specificity, FPR, PPV, NPV, FDR and concentrated on the computational time. It can be seen that the proposed technique has good classification accuracy compared to Fuzzy Genetic, Fuzzy Neural Network ProbPCA and PCA classifiers and fuzzy inference classifier (FIS). The results could show that the proposed system performs satisfactorily in classifying the micro array gene expression dataset

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#### AUTHORS

**First Author** – Selva Mary. G, Asst. Professor, Alamuri Ratnamala Institute of Engineering and Technology, Mumbai University, India

**Second Author** – Likhesh N. Kolhe, Alamuri Ratnamala Institute of Engineering and Technology, Mumbai University, India

**Third Author** – Kanchan D. Patil, Alamuri Ratnamala Institute of Engineering and Technology, Mumbai University, India

## **Semantic based Automated Service Discovery**

#### Likhesh N. Kolhe, Selva Mary. G, Rucha D. Pathari

Asst. Professor, Alamuri Ratnamala Institute of Engineering and Technology, Mumbai University, India

Abstract- A vast majority of web services exist without explicit associated semantic descriptions. As a result many services that are relevant to a specific user service request may not be considered during service discovery. In this paper, we address the issue of web service discovery given no explicit service description semantics that match a specific service request. Our approach to semantic based web service discovery involves semantic-based service categorization and semantic enhancement of the service request. We propose a solution for achieving functional level service categorization based on an ontology framework. Additionally, we utilize clustering for accurately classifying the web services based on service functionality. The semantic-based categorization is performed offline at the universal description discovery and integration (UDDI). The semantic enhancement of the service request achieves a better matching with relevant services. The service request enhancement involves expansion of additional terms (retrieved from ontology) that are deemed relevant for the requested functionality. An efficient matching of the enhanced service request with the retrieved service descriptions is achieved utilizing Latent Semantic Indexing (LSI). Our experimental results validate the effectiveness and feasibility of the proposed approach.

Index Terms- Web Semantic, UDDI, WSDL, Service Discovery

#### I. INTRODUCTION

The need for information technologies which are able to L support agile organizations and fast-changing business processes, has led to the wide propagation of Service-oriented Computing (SOC). Today, SOC is a multi-level approach, ranging from the engineering and operation of IT infrastructures to the usage in small Web-based applications called software mashups. One particular application area, which has heavily influenced the computer science research community, as well as the software industry, in recent years, is the Service-oriented Architecture (SOA) paradigm, where services are deployed in order to organize and implement IT architectures and, eventually, realize Business/IT alignment. Independent of the actual application area, SOC is based on services. Services are selfdescribing encapsulations of functionalities offered by software components. As services are loosely coupled and self-contained, it is possible to dynamically invoke and substitute services, e.g., in a business process, even across the borders of a single company or organization. Hence, one particular application area is the usage of services in workflows, i.e., IT-supported business processes.

One of the primary application areas of SWS is service discovery, which is essentially affected by three steps: (i) The

ability of service providers to describe their services, (ii) the ability of requesters to describe their requirements towards services, and (iii) the effectiveness of the service matchmaker, i.e., an algorithm that takes into account a request and finds the best fitting services from a set of service offers. Service matchmaking that considers semantic information is contemplated by a very agile research community, with a large number of different approaches having been proposed in recent years.

A lot of experimentation is conduced concerning the selection of elements from a service description, similarity metrics, and the combination of the resulting similarity values. State-of-the-art matchmakers are mostly quite inflexible towards differing service domains or need to be adapted manually. This is rather inappropriate as single services as well as service domains might differ to a very large degree regarding basic assumptions towards semantic descriptions of distinct service components or even the availability of a semantic-based domain model.

#### II. EXISTING SYSTEM

A majority of the current approaches for web service discovery call for semantic web services that have semantic tagged descriptions through various approaches, e.g., OWL-S, Web Services Description Language (WSDL)-S. However, these approaches have several limitations. First, it is impractical to expect all new services to have semantic tagged descriptions. Second, descriptions of the vast majority of already existing web services are specified using WSDL and do not have associated semantics. Also, from the service requestor's perspective, the requestor may not be aware of all the knowledge that constitutes the domain. Specifically, the service requestor may not be aware of all the terms related to the service request. As a result of which many services relevant to the request may not be considered in the service discovery process.

Existing service discovery approaches often adopt keywordmatching technologies to locate the published web services. This syntax-based matchmaking returns discovery results that may not accurately match the given service request. As a result, only a few services that are an exact syntactical match of the service request may be considered for selection. Thus, the discovery process is also constrained by its dependence on human intervention for choosing the appropriate service based on its semantics.

#### III. PROPOSED SYSTEM

The limitations of existing approaches, an integrated approach needs to be developed for addressing the two major issues related to automated service discovery: 1) semantic-based categorization of web services; and 2) selection of services based on semantic service description rather than syntactic keyword matching. Moreover, the approach needs to be generic and should not be tied to a specific description language. Thus, any given web service could be described using WSDL, OWL-S, or through other means. Semantic-based categorization of web services is performed at the UDDI that involves semantics augmented /classification of web services into functional categories. The semantically related web services are grouped together even though they may be published under different categories within the UDDI. Service selection then consists of two key steps: 1) parameters-based service refinement; and 2) semantic similarity-based matching. In order to address the limitations of existing approaches, an integrated approach needs to be developed for addressing the two major issues related to automated service discovery:1) semantic-based categorization of web services; and 2) selection of services based on semantic service description rather than syntactic keyword matching. In this paper, we present a novel approach for semantic based automated service discovery. Specifically, the proposed approach focuses on semantic-based service categorization and selection as depicted in Fig. 1.





#### **User Registration**

This module explains the design and implementation of user registration via web based services. This module wills also communication established between client and web based service.

#### **Service Categorization**

The semantic categorization of UDDI wherein we combine ontologies with an established hierarchical clustering methodology, following the service description vector building process. For each term in the service description vector, a corresponding concept is located in the relevant ontology. If there is a match, the concept is added to the description vector.

#### Service Refinement

The next step is service selection from the relevant category of services using parameter-based service refinement. Web service parameters, i.e., input, output, and description, aid service refinement through narrowing the set of appropriate services matching the service request.

The relationship between web service input and output parameters may be represented as statistical associations. These associations relay information about the operation parameters that are frequently associated with each other. To group web service input and output parameters into meaningful associations, we apply a hyper clique pattern discovery. These associations combined with the semantic relevance are then leveraged to discover and rank web services.

#### Semantic Matching

The parameter-based refined set of web services is then matched against an enhanced service request as part of Semantic Similarity-based Matching. A key part of this process involves enhancing the service request. Our approach for web semantic similarity-based service selection employs ontology-based request enhancement and LSI based service matching. The basic idea of the proposed approach is to enhance the service request with relevant ontology terms and then find the similarity measure of the semantically enhanced service request with the web service description vectors generated in the service refinement phase.

#### System Flowchart





#### **Modify Service Vector Algorithm:**

In this algorithm an extra relevant ontology concept is added to the initial service vector. Our approach considers all concepts for enhancing the web service description. The add step extends each service vector by additional Word Net elements [6][14].

#### Associate Ontology Cluster Algorithm:

Here the functionally similar services grouped together and a hierarchy structure is created, that is more informative than the unstructured set of clusters. The association of concepts to each cluster facilitates web service discovery by mapping to functional categories. We build a set which contains all concepts that exist in at least one service description and eliminate duplicate concepts [14].

#### **Rank Semantic Associations Algorithm:**

This algorithm is used for finding hyper clique patterns is breadth-first. It first checks all the patterns at the first level. If a pattern is not satisfied with the user-specified support and hconfidence thresholds, the whole branch corresponding to this pattern can be pruned without further checking [5].

V. RESULTS

		Home	Feedbacks	Register	Login	Contect us	
		leg istr	ation				
Name	likhesh						
Name Password	likhesh						
Name Password E-Mail	likhesh ••••• likhesh&@gma	il.com					
Name Password E-Mail Phone No	likhesh Iikhesh&@gma 8793466361	il.com					
Name Password E-Mail Phone No Address	likhesh  ikhesh8@gma 8793465361 ARMIET, <u>508</u> 0.	il.com AD38					
Name Password E-Mail Phone No Address	likhesh ••••• likhesh8@gma 8793465361 ARMIET, <u>Shab</u>	il.com					

**Snapshot No 1:- User Registration** 





**Snapshot No 3:- Weather Forecast** 

Code Number	67104	• (fost Comment	
City	Medicine Lodge KS	Wind Wind Chill	NW10G20
Weather Id. Weather Station City Temperature	15 Medicine Lodge 29.718	Relative Humidity Description Remarks	26 N/A
Pressure	, , ,	ι, <i>δ</i>	

**Snapshot No 4:- Weather Information** 

Home Logout To: Done!		U.S. Dollar Russian Rouble ? Adjust to Local Da	Give Amou te/Time Convert	nt 10 nt is :352.3710	
From	To	Price	Last Trade	Min	Max

Snapshot No 5:- Currency Service



**Snapshot No 6:- Rank Process** 

#### VI. CONCLUSION

In this project, we present an integrated approach for automated service discovery. Specifically, the approach addresses two major aspects related to semantic-based service discovery: semantic-based service categorization and semanticbased service selection. For semantic-based service categorization, we propose an ontology guided categorization of web services into functional categories for service discovery. This leads to better service discovery by matching the service request with an appropriate service description. For semanticbased service selection, we employ ontology linking (semantic web) and LSI thus extending the indexing procedure from solely syntactical information to a semantic level. Our experiments show that this leads to increased precision levels, recall levels, and the relevance scores of the retrieved services.

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#### AUTHORS

**First Author** – Likhesh N. Kolhe, Asst. Professor, Alamuri Ratnamala Institute of Engineering and Technology, Mumbai University, India

**Second Author** – Selva Mary. G, Asst. Professor, Alamuri Ratnamala Institute of Engineering and Technology, Mumbai University, India

**Third Author** – Rucha D. Pathari, Asst. Professor, Alamuri Ratnamala Institute of Engineering and Technology, Mumbai University, India

# Frequency response analysis of the gear box in a lathe machine using transfer functions

V Suma Priya <sup>1a</sup>, B V S Raghu Vamsi<sup>2b\*</sup>, E Kavitha <sup>1c</sup>, K. Srividya <sup>1d</sup>

<sup>1a</sup> – PG Student, Dept. of Mechanical Engineering, PVP Siddhartha Institute of Technology, Vijayawada
 <sup>2b\*</sup> – Assistant Professor, Dept. of Mechanical Engineering, Gudlavalleru Engineering College, Gudlavalleru
 <sup>1c</sup> – Assistant Professor, Dept. of Mechanical Engineering, PVP Siddhartha Institute of Technology, Vijayawada
 <sup>1d</sup> – Assistant Professor, Dept. of Mechanical Engineering, PVP Siddhartha Institute of Technology, Vijayawada

*Abstract*- In this research work, frequency response of the gear box in the medium duty lathe machine is studied using transfer functions. The effect of the torque acting at a particular rotor on the amplitude of vibration of the other rotors is studied. Initially, equation of motion is developed for the multi-rotor system in the gearbox and later, Laplace transforms are applied to find the transfer functions. Torque acting at various rotors is also calculated. The obtained characteristic equation and the transfer functions are solved for poles and zeros (frequencies to attenuate the inputs at every rotor) by writing programming in MATLAB. Plots of the frequency response curves are plotted by writing the programming in MATLAB and the final conclusions are drawn.

Index Terms- Frequency response curves, Laplace transforms, MATLAB, Poles, and Zeros

Symbols and notations Den – denominator of the transfer function G – shear modulus of the shaft J – mass moment of inertia Jeq – equivalent mass moment of inertia for the mating gears Kt – torsional stiffness of the shaft 1 –length of the shaft N - speed of the shaft  $\tau$  - torque acting at the rotor Z(s) – Laplace transform Z11 (num) – numerator of the transfer function (similar notation for the other functions)  $\theta$  – Angular deflection –  $\theta$  –angular acceleration

#### I. INTRODUCTION

The study of Torsional vibrations in a multi-rotor system plays an important role while designing the power transmission systems in the machines and internal combustion engines. The torque acting at a particular rotor will make it to vibrate with large amplitudes and the effect of the same torque on the vibration characteristics of the other rotors in the transmission system is also significant. When the forcing frequency becomes equal to the natural frequency of any of the rotors, a state of resonance will occur. Apart from the torque acting on the rotors, the forces developed in the mating of two gears and forces during the operation of the corresponding machine also amplifies the magnitude of vibration to a much higher value. Hence, there is a need to study the effect of these torques and additional forces on the vibration characteristics of the entire power transmission system. In this research work, the effect of torques acting at the different rotors on the other rotors is studied.

Guo Rui et. al [1] developed a 10-DOF lumped parameter model for the machine tool spindle system with geared transmission, for the purpose of analyzing the torsional vibrations caused by the gravitational torque arisen in a spindle system when machining a heavy work piece. By using the elementary method and Runge-kutte method in MATLAB, the eigen values problem was solved and the pure torsional vibration responses were obtained and examined. Wu Hao et. al [2] established a numerical model of the bending stiffness of the tapered roller bearing through mechanics and deformation analysis. On the base of the model, a new TMM (transfer matrix method) for bearing-rotor system was established; the new TMM considers the influences of the bearing structure on the vibration of the rotor system. The method is validated by analyzing the same problem (modal analysis of air-blower) using FEM. B.B. Maharathi et. al [3] presented a general formulation for the problem of the steady-state unbalance response of a dual rotor system with a flexible intershaft bearing using an 'extended' transfer matrix method, where the transfer matrix assumes a dimension of (33x33) and the formulation is validated through a computer program. M. Aleyaasin et. al [4] considered the distributed-lumped model for the analysis of the flexural vibrations of a rotor-bearing system and derived a general formula for the determinant of the tri-diagonal partitioned matrix description of the system. The obtained results are compared to those acquired from the transfer matrix method.

HU Qinghua et. al [5] developed a five degrees of freedom (5-DOF) model for aeroengine spindle dual-rotor system dynamic analysis. The proposed model mathematically formulates the nonlinear displacements, elastic deflections and contact forces of bearings with consideration of 5-DOF and coupling of dual rotors. The nonlinear equations of motions of dual rotors with 5-DOF

are solved using Runge-Kutta-Fehlberg algorithm. Vishwajeet kushwaha and Prof. N.kavi [6] used finite element methods to find the natural frequencies for different possible cases of multi-rotor and gear-branched systems. The various mode shapes for several cases are also shown to illustrate the state of the system at natural frequencies. The results obtained have been compared with Holzer's method and transfer matrix method to establish the effectiveness of finite element method for such systems.

In section-I, literature review is presented. In section-II, arrangement of gears in the gear box with the calculation of stiffness of the shaft and mass moment of inertia of the rotors is discusses. In section-III, mathematical modeling of the rotor system is presented. In section-IV, the procedure of the transfer function analysis, involving the method to derive transfer functions is presented in detail. In section-V, the results are discussed in detail with the conclusion in section-VII.

#### II. GEAR BOX ARRANGEMENT IN THE LATHE MACHINE

In this work, the gear box in a medium duty lathe machine is considered for the analysis. The frequency response of every rotor to the torque acting at the self as well as other rotors is studied, to understand the vibration characteristics of a gear box much better. The estimated details of the components in the gear box i.e. the stiffness of the shafts and moment of inertia of the rotors (gears) are presented in the table 1. The arrangement of the various rotors in the gear box adopted in this study is presented in the fig. 1. Stiffness of the shaft is calculated using the torsion equation:

$$\frac{\tau}{J} = \frac{G\theta}{l} = \frac{\sigma_t}{R} \Longrightarrow \frac{\tau}{\theta} = \frac{GJ}{l}$$
(1)

#### III. MATHEMATICAL MODELING OF MULTI ROTOR SYSTEM

The spring-mass representation of the gear box is presented in fig. 2. Wherever two gears are mating, the equivalent mass moment of inertia is calculated and it is considered to be as an equivalent rotor. The equation of motion can be derived by Newton's law as:

$$J\,\theta + K_{t}\theta = \tau \tag{2}$$

The equation of motion derived for the entire gear box is presented in as eq. (3) These equations are written in matrix form for simplicity:

$$[J][\ddot{\theta}] + [K_{\tau}][\theta] = [\tau]$$
<sup>(4)</sup>

$$[J]$$
 = inertia matrix  $[k_t]$  = stiffness matrix  $[\tau]$  = Torque matrix

Angular Acceleration matrix:

$$\begin{bmatrix} \ddot{\theta} \end{bmatrix} = \begin{bmatrix} \ddot{\theta}_1 & \ddot{\theta}_2 & \ddot{\theta}_3 & \ddot{\theta}_4 & \ddot{\theta}_5 & \ddot{\theta}_6 & \ddot{\theta}_7 & \ddot{\theta}_8 & \ddot{\theta}_9 & \ddot{\theta}_{10} & \ddot{\theta}_{11} & \ddot{\theta}_{12} & \ddot{\theta}_{13} \end{bmatrix}^{\frac{1}{2}}$$

Angular displacement matrix:

$$\begin{bmatrix} \theta \end{bmatrix} = \begin{bmatrix} \theta_1 & \theta_2 & \theta_3 & \theta_4 & \theta_5 & \theta_6 & \theta_7 & \theta_8 & \theta_9 & \theta_{10} & \theta_{11} & \theta_{12} & \theta_{13} \end{bmatrix}^T$$

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$$\begin{split} J_{eq1} \ddot{\theta}_{1} + k_{12} \left( \theta_{1} - \theta_{2} \right) &= \tau_{1} \\ J_{eq2} \ddot{\theta}_{2} + k_{12} \left( \theta_{2} - \theta_{1} \right) + k_{23} \left( \theta_{2} - \theta_{3} \right) &= \tau_{2} \\ J_{eq3} \ddot{\theta}_{3} + k_{23} \left( \theta_{3} - \theta_{2} \right) + k_{34} \left( \theta_{3} - \theta_{4} \right) &= \tau_{3} \\ J_{eq4} \ddot{\theta}_{4} + k_{34} \left( \theta_{4} - \theta_{3} \right) + k_{45} \left( \theta_{4} - \theta_{5} \right) + k_{47} \left( \theta_{4} \frac{Z_{4}}{Z_{6}} - \theta_{7} \right) + k_{48} \left( \theta_{4} \frac{Z_{4}}{Z_{6}} - \theta_{8} \right) &= \tau_{4} \\ J_{eq5} \ddot{\theta}_{5} + k_{45} \left( \theta_{5} - \theta_{4} \right) &= \tau_{5} \\ J_{eq6} \ddot{\theta}_{6} + k_{67} \left( \theta_{6} - \theta_{7} \right) &= \tau_{6} \\ J_{eq7} \ddot{\theta}_{7} + k_{67} \left( \theta_{7} - \theta_{6} \right) + k_{47} \left( \theta_{7} - \theta_{4} \frac{Z_{4}}{Z_{6}} \right) &= \tau_{7} \\ J_{eq8} \ddot{\theta}_{8} + k_{48} \left( \theta_{8} - \theta_{4} \frac{Z_{4}}{Z_{6}} \right) + k_{89} \left( \theta_{8} - \theta_{9} \right) &= \tau_{8} \\ J_{eq9} \ddot{\theta}_{9} + k_{89} \left( \theta_{9} - \theta_{8} \right) + k_{910} \left( \theta_{9} - \theta_{10} \right) + k_{912} \left( \theta_{9} \frac{Z_{10}}{Z_{12}} - \theta_{12} \right) + k_{913} \left( \theta_{9} \frac{Z_{10}}{Z_{12}} - \theta_{13} \right) &= \tau_{9} \\ J_{eq10} \ddot{\theta}_{10} + k_{910} \left( \theta_{10} - \theta_{9} \right) &= \tau_{10} \\ J_{eq11} \ddot{\theta}_{11} + k_{112} \left( \theta_{11} - \theta_{12} \right) &= \tau_{11} \\ J_{eq12} \ddot{\theta}_{12} + k_{1112} \left( \theta_{12} - \theta_{11} \right) + k_{912} \left( \theta_{12} - \theta_{9} \frac{Z_{10}}{Z_{12}} \right) &= \tau_{12} \\ J_{eq13} \ddot{\theta}_{13} + k_{913} \left( \theta_{13} - \theta_{9} \frac{Z_{10}}{Z_{12}} \right) &= \tau_{13} \end{split}$$

Torque matrix:

 $\begin{bmatrix} \tau \end{bmatrix} = \begin{bmatrix} \tau_1 & \tau_2 & \tau_3 & \tau_4 & \tau_5 & \tau_6 & \tau_7 & \tau_8 & \tau_9 & \tau_{10} & \tau_{11} & \tau_{12} & \tau_{13} \end{bmatrix}^T$ 

Inertia matrix:

	$J_{_{eq1}}$	0	0	0	0	0	0	0	0	0	0	0	0 ]
	0	$J_{eq2}$	0	0	0	0	0	0	0	0	0	0	0
	0	0	$J_{_{eq3}}$	0	0	0	0	0	0	0	0	0	0
	0	0	0	$J_{_{eq4}}$	0	0	0	0	0	0	0	0	0
	0	0	0	0	$J_{_{eq5}}$	0	0	0	0	0	0	0	0
	0	0	0	0	0	$J_{_{eq6}}$	0	0	0	0	0	0	0
[J] =	0	0	0	0	0	0	$J_{\scriptscriptstyle eq7}$	0	0	0	0	0	0
	0	0	0	0	0	0	0	$J_{_{eq8}}$	0	0	0	0	0
	0	0	0	0	0	0	0	0	$J_{_{eq9}}$	0	0	0	0
	0	0	0	0	0	0	0	0	0	$J_{_{eq10}}$	0	0	0
	0	0	0	0	0	0	0	0	0	0	$J_{\scriptscriptstyle eq11}$	0	0
	0	0	0	0	0	0	0	0	0	0	0	$J_{_{eq12}}$	0
	0	0	0	0	0	0	0	0	0	0	0	0	$J_{eq13}$

Stiffness matrix:

60

(3)

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	Γ <b>κ</b>	-K.,	0	0	0	0	0	0	0	0	0	0	0 7
	$-K_{12}$	$K_{12} + K_{23}$	-K <sub>23</sub>	0	0	0	0	0	0	0	0	0	0
	0	$-K_{23}$	$K_{23} + K_{34}$	$-K_{_{34}}$	0	0	0	0	0	0	0	0	0
				$K_{34} + K_{45} +$									
	0	0	$-K_{34}$	$\frac{Z_4}{Z_6} (K_{47} + K_{48})$	$-K_{45}$	0	$-K_{47}$	$-K_{48}$	0	0	0	0	0
	0	0	0	-K <sub>45</sub>	$K_{45}$	0	0	0	0	0	0	0	0
	0	0	0	0	0	$K_{_{67}}$	$-K_{_{67}}$	0	0	0	0	0	0
	0	0	0	$-K_{47}rac{Z_4}{Z_6}$	0	$-K_{_{67}}$	$K_{47} + K_{67}$	0	0	0	0	0	0
$\left[\mathbf{K}_{t}\right] =$	0	0	0	$-K_{48}rac{Z_4}{Z_6}$	0	0	0	K <sub>48</sub> + K <sub>89</sub>	$-K_{_{89}}$	0	0	0	0
	0	0	0	0	0	0	0	$-\mathcal{K}_{_{89}}$	$\begin{aligned} & K_{89} + K_{910} + \\ & \frac{Z_{10}}{Z_{12}} \Big( K_{912} + K_{913} \Big) \end{aligned}$	-K <sub>910</sub>	0	$-\mathcal{K}_{_{912}}$	-K <sub>913</sub>
	0	0	0	0	0	0	0	0	$-K_{_{910}}$	$K_{_{910}}$	0	0	0
	0	0	0	0	0	0	0	0	0	0	<b>K</b> <sub>1112</sub>	- <b>K</b> <sub>1112</sub>	0
	0	0	0	0	0	0	0	0	$-K_{912}rac{Z_{10}}{Z_{12}}$	0	- <b>K</b> <sub>1112</sub>	$K_{1112} + K_{912}$	0
	0	0	0	0	0	0	0	0	$-K_{_{913}}rac{Z_{_{10}}}{Z_{_{12}}}$	0	0	0	K <sub>913</sub>

#### IV. TRANSFER FUNCTION ANALYSIS - PROCEDURE

These are the functions, which helps to study the effect of torque  $T_i$  acting at the rotor  $R_j$ . The procedure to find the transfer functions is given in detail below:

- Initially derive the expression for equation of motion for the each rotor.
- Apply Laplace transform to them and convert them into *s*-form.
- Find the transfer functions and characteristic equation for the each rotor, corresponding to each torque.
- Write the program to plot the frequency response curves in MATLAB.

Step-1 presented in the above section i.e. eq. (3). Step-2: Laplace transforms:

Applying Laplace transforms to the eq. (4), we get

$$\left[Js^{2}+K\right]\left[z(s)\right]=\left[\tau(\tau(s))\right]$$

(5)

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Where,

	$\int J_{eq1}S^2 + K_{12}$	$-K_{12}$	0	0	0	0	0	0	0	0	0	0	0
	$-K_{12}$	$J_{eq2}S^2 + K_{12} + K_{23}$	$-K_{23}$	0	0	0	0	0	0	0	0	0	0
	0	$-K_{23}$	$J_{eq3}S^2 + K_{23} + K_{34}$	$-K_{34}$	0	0	0	0	0	0	0	0	0
				$J_{eq4}S^2 + K_{34} + K_{45}$									
	0	0	- <i>K</i> <sub>34</sub>	$+\frac{Z_4}{Z_6}(K_{47}+K_{48})$	- <i>K</i> <sub>45</sub>	0	- <i>K</i> <sub>47</sub>	- <i>K</i> <sub>48</sub>	0	0	0	0	0
	0	0	0	$-K_{45}$	$J_{eq5}S^2 + K_{45}$	0	0	0	0	0	0	0	0
	0	0	0	0	0	$J_{eq6}S^2 + K_{67}$	$-K_{67}$	0	0	0	0	0	0
	0	0	0	$-K_{47}rac{Z_4}{Z_6}$	0	- <i>K</i> <sub>67</sub>	$J_{eq7}S^2 + K_{47} + K_{67}$	0	0	0	0	0	0
$\left[JS^2 + K\right] =$	0	0	0	$-K_{48}rac{Z_4}{Z_6}$	0	0	0	$J_{eq8}S^2 + K_{48} + K_{89}$	-K <sub>89</sub>	0	0	0	0
									$J_{eq9}S^2 + K_{89} + K_{910}$				
	0	0	0	0	0	0	0	$-K_{89}$	$+\frac{Z_{10}}{Z_{12}}(K_{912}+K_{913})$	$-K_{910}$	0	$-K_{_{912}}$	-K <sub>913</sub>
	0	0	0	0	0	0	0	0	$-K_{910}$	$J_{eq10}S^2 + K_{910}$	0	0	0
	0	0	0	0	0	0	0	0	0	0	$J_{eq11}S^2 + K_{1112}$	$-K_{1112}$	0
	0	0	0	0	0	0	0	0	$-K_{912} \frac{Z_{10}}{Z_{12}}$	0	$-K_{1112}$	$J_{eq12}S^2 + K_{1112} + K_{912}$	0
	0	0	0	0	0	0	0	0	$-K_{913}\frac{Z_{10}}{Z_{12}}$	0	0	0	$J_{eq13}S^2 + K_{913}$
7	-matrix is	given as $[z(s)]$	$= \begin{bmatrix} z_1(s) & z_2(s) \end{bmatrix}$	$z_3(s)  z_4(s)  z_5(s) = z_5(s)$	$s) z_6(s) z_7$	$(s)  z_8(s)$	$z_9(s)  z_{10}(s)  z_{11}$	$(s)  z_{12}(s)  z_{13}(s)$	$s)]^{T}$				
L	114411/110	51, 511 45	Γ ( ( ))] Γ22	2.38 22.38	22.38 22.3	38 22.38	70.6 70.6	70.6 70.6	70.6 52.42 5	2.42 52.42	$2 ]^T$		
Т	orque mat	rix is given as	$\lfloor \tau(\tau(s)) \rfloor = \lfloor -$	s s	s s	S	s s	s s	s s	s s	-		

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Step-3: Deriving for transfer functions.

From  $\left[JS^2 + K\right]$  matrix, we will get transfer functions by applying below procedure and transfer functions are arranged in a matrix as Transfer function matrix shown below.

 $Z_{11}$  represents the effect of torque  $\tau_1$  acting at rotor 1 on the rotor 1 itself. Similarly,  $Z_{119}$  represents the effect of torque  $\tau_9$  acting at rotor 9 on the rotor 11.

$\int z_{11}$	$Z_{12}$	$Z_{13}$	$Z_{14}$	$Z_{15}$	$Z_{16}$	$Z_{17}$	$Z_{18}$	$Z_{19}$	$Z_{110}$	$Z_{111}$	$Z_{112}$	$z_{113}$
Z <sub>21</sub>	$Z_{22}$	$Z_{23}$	$Z_{24}$	$Z_{25}$	$Z_{26}$	$Z_{27}$	$Z_{28}$	$Z_{29}$	$Z_{210}$	$Z_{211}$	$Z_{212}$	$Z_{213}$
Z <sub>31</sub>	$Z_{32}$	$Z_{33}$	$Z_{34}$	$Z_{35}$	$Z_{36}$	$Z_{37}$	$Z_{38}$	$Z_{39}$	$Z_{310}$	$Z_{311}$	$Z_{312}$	$Z_{313}$
<i>z</i> <sub>41</sub>	$Z_{42}$	$Z_{43}$	$Z_{44}$	$Z_{45}$	$Z_{46}$	$Z_{47}$	$Z_{48}$	$Z_{49}$	$Z_{410}$	$Z_{411}$	$Z_{412}$	$Z_{413}$
Z <sub>51</sub>	$Z_{52}$	$Z_{53}$	$Z_{54}$	$Z_{55}$	$Z_{56}$	$Z_{57}$	$Z_{58}$	$Z_{59}$	$Z_{510}$	$Z_{511}$	$Z_{512}$	$Z_{513}$
Z <sub>61</sub>	$Z_{62}$	$Z_{63}$	$Z_{64}$	$Z_{65}$	$Z_{66}$	$Z_{67}$	$Z_{68}$	$Z_{69}$	$Z_{610}$	$Z_{611}$	$Z_{612}$	$Z_{613}$
Z <sub>71</sub>	$Z_{72}$	$Z_{73}$	$Z_{74}$	$Z_{75}$	$Z_{76}$	$Z_{77}$	$Z_{78}$	$Z_{79}$	$Z_{710}$	$Z_{711}$	$Z_{712}$	$Z_{713}$
Z <sub>81</sub>	$Z_{82}$	$Z_{83}$	$Z_{84}$	$Z_{85}$	$Z_{86}$	$Z_{87}$	$Z_{88}$	$Z_{89}$	$Z_{810}$	$Z_{811}$	$Z_{812}$	$Z_{813}$
Z <sub>91</sub>	$Z_{92}$	$Z_{93}$	$Z_{94}$	$Z_{95}$	$Z_{96}$	$Z_{97}$	$Z_{98}$	$Z_{99}$	$Z_{910}$	$Z_{911}$	$Z_{912}$	$Z_{913}$
<i>z</i> <sub>101</sub>	$Z_{102}$	$Z_{103}$	$Z_{104}$	$Z_{105}$	$Z_{106}$	$Z_{107}$	$Z_{108}$	$Z_{109}$	$Z_{1010}$	$Z_{1011}$	$Z_{1012}$	$Z_{1013}$
<i>z</i> <sub>111</sub>	$z_{112}$	$Z_{113}$	$Z_{114}$	$Z_{115}$	$Z_{116}$	$Z_{117}$	$Z_{118}$	$Z_{119}$	$Z_{1110}$	$Z_{1111}$	$Z_{1112}$	$Z_{1113}$
<i>z</i> <sub>121</sub>	$Z_{122}$	$Z_{123}$	$Z_{124}$	$Z_{125}$	$Z_{126}$	$Z_{127}$	$Z_{128}$	$Z_{129}$	$Z_{1210}$	$Z_{1211}$	$Z_{1212}$	$Z_{1213}$
$z_{131}$	$z_{132}$	$Z_{133}$	$Z_{134}$	$Z_{135}$	$Z_{136}$	$Z_{137}$	$Z_{138}$	$Z_{139}$	$Z_{1310}$	$z_{1311}$	$Z_{1312}$	$z_{1313}$

Let us consider

$$Z_{11} = \frac{\det \left[ 12 \times 12 \right]}{\det \left[ 13 \times 13 \right]}$$

det $[12 \times 12]$  = By elimination of 1<sup>st</sup> row & 1<sup>st</sup> column of  $[JS^2 + K]$  matrix.

$$Z_{12} = \frac{\det[12 \times 12]}{\det[13 \times 13]}$$

det $[12 \times 12]$  = By elimination of 1<sup>st</sup> row & 2<sup>nd</sup> column of  $[JS^2 + K]$  matrix.

Similar procedure is followed for the remaining transfer functions.

 $det[12 \times 12] = denominator = den$  $det[13 \times 13] = numerator = num$ 

#### Sample calculations for transfer functions:

 $Z_{11} = \frac{z_1}{\tau_1} = \frac{z_{11}num}{den} \qquad \tau_1 = \frac{22.38}{s} \qquad Z_{11} = \frac{z_{11}num \times 22.38}{den \times s}$ 

 $Z_{11}num \times 22.38 = Z_{11}num = 2.05e^{-45}s^{24} + 1.01e^{-32}s^{22} + 4.57e^{-21}s^{20} + 8.13e^{-10}s^{18} + 68.76s^{16} + 2.88e^{12}s^{14} + 1.01e^{-32}s^{14} +$  $+ 6.19e^{22}s^{12} + 6.73e^{32}s^{10} + 3.26e^{42}s^8 + 4.610e^{51}s^6 + 2.24e^{60}s^4 + 2.32e^{68}s^2 + 7.43e^{74}s^{10} + 2.52e^{68}s^{10} + 2$ 

 $Den = 5.02e^{-49}s^{27} + 2.48e^{-36}s^{25} + 1.12e^{-24}s^{23} + 1.910e^{-13}s^{21} + 0.02s^{19} + 7.06e^8s^{17} + 1.53e^{19}s^{15}$  $+1.66e^{29}s^{13}+8.02e^{38}s^{11}+1.17e^{48}s^{9}+5.63e^{56}s^{7}+6.23e^{64}s^{5}+3.74e^{71}s^{3}+1.49e^{76}s^{6}+1.49e^{76}s^{7}+1.49e^{7}+1.49e^{7}+1.49e^{7}+1.49e^{7}+1.49e^{7}+1.49e^{$ 

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Step-4: Plotting Frequency response curves

Once the transfer functions are derived, then the programming is written to plot the frequency domain behavior of each transfer function, using MATLAB. Frequency domain behavior means identifying the magnitude and phase characteristics of each transfer function, showing how they change as the frequency of the forcing function is varied over a frequency range. Each transfer function is evaluated in the frequency domain

by evaluating it as  $s = j\omega$ , where w – is the frequency of the forcing function, radians /sec. For plotting the frequency response, different methods are available.

In this work, transfer functions are given as input, in the form of 'num' and 'den' for the each and 'bode' command with no left hand arguments is used by choosing the frequency range and the graphs plotting magnitude and phase generating automatically. On x-axis, range of frequencies is taken and on the y-axis, magnitude of vibration and phase angles are plotted. The obtained response curves are tabulated below with the titles as their transfer functions.

#### V. ANALYSIS OF FREQUENCY RESPONSE CURVES

From the results it has been observed that

- The peak points on the response curves indicate the poles and the valley points on the curves indicates the zeros. The poles are the roots of the characteristic equation. They show the frequencies where the system will amplify the inputs. All the transfer functions will have same characteristic equation i.e. denominator ('den'). The poles depend only on the distribution of mass and stiffness throughout the system under analysis. But not on where the toques are applied or where the displacements are measured. The zeros are the roots of the numerator of a given transfer function. Zeros show the frequencies where the system will attenuate inputs. They are different for different transfer functions. Some transfer functions may have no zeros.
- In the low frequency range (< 1000 rad / sec), the response of all transfer functions  $\begin{bmatrix} Z_{ij} \end{bmatrix}_{\forall i=j}$ , i=j=1, 2, 3 ....13, the response curve profiles are similar and presents higher gain. This is because of all the

rotors acted upon by the torque directly and the rigid body motion is falling off at the  $\binom{1}{\omega}$  rate. In that operating range, all the rotors are running out of phase with the applied torque.

In the high frequency range (> 1000 rad / sec), the response of all transfer functions  $\begin{bmatrix} Z_{ij} \end{bmatrix}_{\forall i=j}$ , i=j=1, • 2, 3 ....13, the response curve profiles are similar and presents lesser gain. This is because of all the rotors acted upon by the torque directly and the rigid body motion is observed to be falling off at the

 $\begin{pmatrix} 1/\omega^3 \end{pmatrix}$  rate. In that operating range, all the rotors are running out of phase with the applied torque.

When the effect of the torques acting on the rotors  $[R]_{j>1}$ , on the rotor R<sub>1</sub>, is considered, all the response curves are looking alike for the transfer functions,  $z_{16} - z_{113}$ . At the higher frequencies, the rigid body motion is falling off at the  $\left(\frac{1}{\omega^{11}} - \frac{1}{\omega^{17}}\right)$  rate with different gains. In that operating range, the rotor  $R_1$  is running in phase with some torques and out of phase with remaining torques. At the lower frequencies, the effect of all the torques (except  $\tau_1$ ) is similar and the rigid motion is falling off at the  $\binom{1}{\omega}$  rate with same gains.

When the effect of the torques acting on the rotors  $[R]_{j_{i}} \neq 2$ , on the rotor R<sub>2</sub>, is considered, all the response curves are looking alike for the transfer functions,  $z_{26} - z_{211}$  and for the transfer functions,  $Z_{212} - Z_{213}$ . At the higher frequencies, the rigid body motion is falling off at the  $\binom{1}{\omega^9} - \frac{1}{\omega^{15}}$  rate and at the  $\binom{1}{\omega^5} - \frac{1}{\omega^9}$  rate with lesser but different gains. In that operating range, the rotor  $R_2$  is running in phase with some torques and out of phase with

remaining torques. At the lower frequencies, the effect of all the torques (except  $\tau_2$ ) is similar and the rigid motion is falling off at the  $\begin{pmatrix} 1/\omega \\ \end{pmatrix}$  rate with same gains.

- When the effect of the torques acting on the rotors  $[R]_{j,j} \neq 3$ , on the rotor  $R_3$ , is considered, all the response curves are looking alike for the transfer functions  $Z_{31} - Z_{35}$  and for  $Z_{36}, Z_{37}$  and for  $Z_{38} - Z_{313}$ . At the higher frequencies, the rigid body motion is falling off at the  $\left(\frac{1}{\omega^5} - \frac{1}{\omega^9}\right)_{\text{rate and with the}} \left(\frac{1}{\omega^{11}} - \frac{1}{\omega^{13}}\right)_{\text{rate with lesser but different gains. In that}}$ operating range, the rotor R<sub>3</sub> is running in phase with some torques and out of phase with

forces affecting the vibrating characteristics. This increases the amplitude of vibration also. At the lower frequencies, the effect of all the torques (except  $\tau_3$ ) is similar and the rigid motion is

remaining torques. These many variations are because of mating of two gears, which develops

falling off at the  $\binom{1}{\omega}$  rate with same gains.

When the effect of the torques acting on the rotors  $[R]_{j,j} \neq 4$ , on the rotor R<sub>4</sub>, is considered, all the response curves are looking alike for the transfer functions  $Z_{41}, Z_{42}$  and for  $Z_{43}$ ,  $Z_{44}$  and for  $Z_{45} - Z_{48}$ , and for  $Z_{49} - Z_{413}$ . The magnitude of vibration is high for the transfer functions  $Z_{43}, Z_{44}$ , which is because of the mating of gears resulting in the increasing of forces and amplitudes. At the higher frequencies, the rigid body motion is falling off at the  $\binom{1}{\omega^5} - \frac{1}{\omega^9}$  rate with lesser but different gains. In that operating range, the rotor  $R_4$  is running in phase with some torques and out of phase with remaining torques. At the

lower frequencies, the effect of all the torques (except  $\tau_3^3, \tau_4$ ) is similar and the rigid motion is falling off at the  $\binom{1}{\omega}$  rate with same gains.

When the effect of the torques acting on the rotors  $[R]_{j,j} \neq 5$ , on the rotor R<sub>5</sub>, is considered, all the response curves are looking alike for the transfer functions  $Z_{51} - Z_{53}$  and for  $Z_{54}, Z_{55}$ and for  $Z_{56} - Z_{513}$ . At the higher frequencies, the rigid body motion is falling off at the  $\left(\frac{1}{\omega^9} - \frac{1}{\omega^{13}}\right)$  rate with lesser but different gains. In that operating range, the rotor R<sub>5</sub> is running in phase with some torques and out of phase with remaining torques. At lower

frequencies, the effect of all the torques (except  $\tau_5$ ) is similar and the rigid motion is falling off at the  $\binom{1}{\omega}$  rate with same gains.

When the effect of the torques acting on the rotors  $[R]_{j,} j \neq 6$ , on the rotor  $R_6$ , is considered, all the response curves are looking alike for the transfer functions  $Z_{61} - Z_{65}$  and for  $Z_{66}, Z_{67}$ and for  $Z_{68} - Z_{613}$ . At the higher frequencies, the rigid body motion is falling off at the  $\left(\frac{1}{\omega^7} - \frac{1}{\omega^{15}}\right)$  rate with lesser but different gains. In that operating range, the rotor R<sub>6</sub> is

running in phase with some torques and out of phase with remaining torques. At lower

frequencies, the effect of all the torques (except  $\tau_6$ ) is similar and the rigid motion is falling off at the  $\binom{1}{\omega}$  rate with same gains.

- When the effect of the torques acting on the rotors  $[R]_{j,j} \neq 7$ , on the rotor  $R_7$ , is considered, all the response curves are looking alike for the transfer functions  $Z_{71} - Z_{73}$  and for  $Z_{74}, Z_{75}$ and for  $Z_{76}, Z_{77}$ , and for  $Z_{78} - Z_{713}$ . At the higher frequencies, the rigid body motion is falling off at the  $\left(\frac{1}{\omega^5} - \frac{1}{\omega^{11}}\right)$  rate with lesser but different gains. In that operating range, the rotor R7 is running in phase with some torques and out of phase with remaining torques. At lower frequencies, the effect of all the torques (except  $\tau_7$ ) is similar and the rigid motion is falling off at the  $\binom{1}{\omega}$  rate with same gains.
- When the effect of the torques acting on the rotors  $[R]_{j,} j \neq 8$ , on the rotor R<sub>8</sub>, is considered, all the response curves are looking alike for the transfer functions  $Z_{81} - Z_{83}$  and for  $Z_{84} - Z_{87}$  and for  $Z_{89} - Z_{813}$ . At the higher frequencies, the rigid body motion is falling off at the  $\binom{1}{\omega^5} - \frac{1}{\omega^{11}}$  rate with lesser but different gains. In that operating range, the rotor  $R_8$  is running in phase with all the torques. At lower frequencies, the effect of all the torques

(except  $\tau_8$ ) is similar and the rigid motion is falling off at the  $\binom{1}{\omega}$  rate with same gains. Due to the generation of forces developed during mating, at rotor R<sub>9</sub>, it has a significant effect in

amplifying the amplitudes at rotors R<sub>8</sub>, R<sub>9</sub>, R<sub>12</sub>, and R<sub>13</sub>.

When the effect of the torques acting on the rotors  $[R]_{j_1}$ ,  $j \neq 9$ , on the rotor R<sub>9</sub>, is considered, all the response curves are looking alike for the transfer functions  $Z_{91} - Z_{97}$  and for  $Z_{97} - Z_{98}$  and for  $Z_{99} - Z_{913}$ . At the higher frequencies, the rigid body motion is falling off at the  $\binom{1}{\omega^5} - \frac{1}{\omega^{13}}$  different rates and with lesser but different gains. In that operating range, the rotor R<sub>9</sub> is running in phase with all the torques. At lower frequencies, the effect of

all the torques (except  $\tau_9$ ) is similar and the rigid motion is falling off at the  $\binom{1}{\omega}$  rate with same gains. Due to the generation of forces developed during mating, at rotor R<sub>9</sub>, it has a significant effect in amplifying the amplitudes at rotors R<sub>8</sub>, R<sub>9</sub>, R<sub>12</sub>, and R<sub>13</sub>.

When the effect of the torques acting on the rotors  $[R]_{j,j} \neq 10$ , on the rotor R<sub>10</sub>, is considered, all the response curves are looking alike for the transfer functions  $Z_{101} - Z_{107}$  and for  $Z_{108} - Z_{109}$  and for  $Z_{1011} - Z_{1013}$ . At the higher frequencies, the rigid body motion is falling off at the  $\left(\frac{1}{\omega^7} - \frac{1}{\omega^{13}}\right)$  different rates and with lesser but different gains. In that operating range, the rotor  $R_{10}$  is running in phase with all the torques. At lower frequencies, the effect of all the torques (except  $\tau_{10}$ ) is similar and the rigid motion is falling off at the

 $\begin{pmatrix} 1/\omega \end{pmatrix}$  rate with same gains.

When the effect of the torques acting on the rotors  $[R]_{j,j} \neq 11$ , on the rotor  $R_{11}$ , is considered, all the response curves are looking alike for the transfer functions  $Z_{111} - Z_{117}$  and

for  $Z_{118} - Z_{1113}$ . At the higher frequencies, the rigid body motion is falling off at the  $\left(\frac{1}{\omega^{11}} - \frac{1}{\omega^{17}}\right)_{rate}$  and at the  $\left(\frac{1}{\omega^5} - \frac{1}{\omega^9}\right)_{rate}$  with different rates respectively and with

lesser but different gains. In that operating range, the rotor  $R_{11}$  is running in phase with some of the torques and out of phase with the remaining torques. At lower frequencies, the effect of

all the torques (except  $\tau_{11}$ ) is similar and the rigid motion is falling off at the  $\binom{1}{\omega}$  rate with same gains.

- When the effect of the torques acting on the rotors  $[R]_{j,} j \neq 12$ , on the rotor  $R_{12}$ , is considered, all the response curves are looking alike for the transfer functions  $Z_{121} - Z_{128}$  and for  $Z_{129} - Z_{1211}$  and for  $Z_{1213}$ . At the higher frequencies, the rigid body motion is falling off at the  $(\frac{1}{\omega^7} - \frac{1}{\omega^{11}})$  and at the  $(\frac{1}{\omega^5} - \frac{1}{\omega^7})$  different rates respectively and with lesser but different gains. In that operating range, the rotor  $R_{12}$  is running in phase with the torques  $(\tau_1 - \tau_8)$  and out of phase with the remaining torques  $(\tau_9 - \tau_{13})$ . At lower frequencies, the effect of all the torques (except  $\tau_{12}$ ) is similar and the rigid motion is falling off at the rate with same gains.
- When the effect of the torques acting on the rotors  $[R]_{j_i}$ ,  $j \neq 13$ , on the rotor  $R_{13}$ , is considered, all the response curves are looking alike for the transfer functions  $Z_{131} - Z_{137}$  and for  $Z_{138} - Z_{1312}$  and for  $Z_{1313}$ . At the higher frequencies, the rigid body motion is falling off at the  $(\frac{1}{\omega^9} - \frac{1}{\omega^{15}})$  and at the  $(\frac{1}{\omega^5} - \frac{1}{\omega^7})$  different rates respectively and with lesser but different gains. In that operating range, the rotor  $R_{13}$  is running in out of phase with the torques  $(\tau_1 - \tau_7)$  and in phase with the remaining torques  $(\tau_8 - \tau_{12})$ . At lower frequencies, the effect of all the torques (except  $\tau_{13}$ ) is similar and the rigid motion is falling off at the  $(\frac{1}{\omega})$  rate with same gains.

#### VI. CONCLUSION

This study reveals that there is a need to study the effect of torques acting at a particular rotor on another rotor and the affect is significant. At lower forcing frequencies, all the rotors are exhibiting same behavior irrespective of the magnitude of torques acting at different rotors and the rate of fall of rigid body motion is (1/)

 $\binom{1}{\omega}$ . At higher forcing frequencies, rotors are exhibiting different behaviors with the fall in rigid body motion  $\binom{1}{\omega} - \binom{1}{\omega}$ 

at the  $(\frac{1}{\omega^5} - \frac{1}{\omega^{15}})$  rate. The gain in amplitude is also varying from rotor to rotor and the effect of forces generated in the mating of gears is also a reason for that.

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S.No	Shaft	Stiffness of the shaft K, in N-m/rad	S.No	Moment of inertia, J in kg-m <sup>2</sup>
1	S12	79521.56	1	J <sub>o</sub> = 5.593×10 <sup>-3</sup>
2	S23	2395628.02	2	$J_1 = 2.571 \times 10^{-4}$
3	S34	106028.75	3	$J_2 = 1.553 \times 10^{-4}$
4	S45	212057.50	4	J <sub>3</sub> = 1.607 <sup>×</sup> 10 <sup>-5</sup>
5	S67	4021238.59	5	J <sub>4</sub> = 1.973×10 <sup>-5</sup>
6	S47	5089380.09	6	J₅ = 1.598 <sup>×</sup> 10 <sup>-5</sup>
7	S48	103059947	7	$J_6 = 4.817 \times 10^{-5}$
8	S89	90881.78	8	$J_7 = 1.850 \times 10^{-4}$
9	S910	1272345.02	9	J <sub>8</sub> = 7.707×10 <sup>-4</sup>
10	S1112	10553338.57	10	J₅ = 2.397 <sup>×</sup> 10 <sup>-3</sup>
11	S912	636172.51	11	J <sub>10</sub> = 9.633×10 <sup>-6</sup>
12	S913	4690372.69	12	J <sub>11</sub> = 7.253×10 <sup>-4</sup>
			13	$J_{12} = 4.415 \times 10^{-4}$
			14	$J_{13} = 4.415 \times 10^{-4}$
			15	J <sub>14</sub> = 0.0111
			16	$J_{15} = 9.633 \times 10^{-5}$

#### Table. 1



#### Fig 1: Layout of gear box in all geared lathe



Fig 2. Spring-mass representation of the gear box

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Bode Diagram

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Magnitude (

400





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#### AUTHORS

First Author – V Suma Priya, PG Student, PVP Siddhartha Institute of Technology, Vijayawada, sumapriya995@gmail.com Second Author – B V S Raghu Vamsi, M.tech, Assistant Professor, Gudlavalleru Engineering College, Gudlavalleru bvsraghuvamsi@hotmail.com Third Author – E Kavitha, M.Tech, Assistant Professor, PVP Siddhartha Institute of Technology, Vijayawada, kavithavarikola@gmail.com Fourth Author – K Srividya, M.Tech, Assistant Professor, PVP Siddhartha Institute of Technology, Vijayawada,

srividya\_kode@yahoo.com

**Correspondence Author** – B V S Raghu Vamsi, bvsraghuvamsi@hotmail.com, bvsraghuvamsi@gmail.com, Contact number: +919492508145

# Burden of human papillomavirus infections and associated cancers in the North Africa region

Yassine Zouheir<sup>1, 3</sup>, Samira Daouam<sup>2</sup>, Taoufiq Fechtali<sup>3</sup>

<sup>1</sup>Laboratory of Viral Oncology, Pasteur Institute of Morocco

<sup>2</sup>Independent researcher, Casablanca, Morocco

<sup>3</sup>Laboratory of Neurosciences, Integrated diseases and natural Substances, Faculty of sciences and Technics, Mohammedia, Hassan II University,

Morocco.

Abstract- The North Africa region is characterized by countries that have common cultures and religion and that are more conservative sexual behavior compared to Occidental countries. In this paper, we provide the available information on the burden of Human papillomavirus (HPV)-related cancers (cancer of the cervix, anal cancer, vaginal cancer, vulvar cancer and cancer of the pharynx), as well as available data on the prevalence and distribution of HPV types among men and women with an HPV related cancer, for the countries of the North Africa region (NA). The countries in the NA region show a generally low incidence of cervical cancer (ASR: 6.6/100,000). HPV prevalence (%) in the general population women with normal cytology varied from 10.3 in Egypt to 14.6 in Tunisia. The incidence of anogenital cancers other than cervix, as well as the incidence of Pharynx cancer (excluding Nasopharynx) is very low among populations of NA region. There is a lack of available data concerning the epidemiology of HPV in the anogenital cancers associated with HPV in this region. Changes in sexual behavior among the younger generations as well as the location of NA region as an area of sub-Saharan immigrants transition to Europe could change this data on epidemiology of HPV related cancers, so it might be necessary to install large population-based surveys on HPV prevalence among all countries in NA region, mainly for Cervical cancer which is the second most common cancer in NA women.

*Index Terms*- Human Papillomavirus, anogenital cancers, HPV prevalence, North Africa.

#### I. STUDY DESIGN

The present study employed an initial literature review of peer-reviewed articles in PubMed, ScienceDirect, and WHO databases. Original research articles written in French, data from institutional reports, and regional meeting abstracts were included in this extensive review. Oncology experts in the Maghreb region were contacted, and data was considered as eligible when the prevalence or other epidemiological figures in the Northern African countries were available. The aim of this study was firstly to summarize data in a region-specific manner, and secondly, to provide genuine and accurate data to the reader. In total, more than (100) papers were evaluated from which 23 studies were included in final analyses.

#### II. INTRODUCTION

Cancer is normally classified as a leading noncommunicable disease, however, a significant proportion of it is caused by infectious agents [1]. The International Agency for Research on Cancer (IARC) Monographs program has classified a number of infectious agents as carcinogenic to humans including human papillomavirus (HPV) and other virus as well as bacteria [2]. The consistency of association of a given infectious agent and a specific malignancy ranges from essentially 100% to 0.4% depending on the infectious agent, the cancer and the geographic location [3].

The North Africa region (NA) is characterized by populations having similar cultures and religions and that have a more conservative sexual behavior compared to the countries of the west. The incidence of HPV related cancers is estimated to be relatively low, although it is difficult to assess exactly because national cancer registries are absent in many countries of the NA region. However, changes in sexual behavior among the younger generations as well as the location of NA region as an area of sub-Saharan immigrants transition to Europe could change this data on epidemiology of HPV related cancers. Cervical cancer is the large studied cancer. The available data is large and sufficient in all NA countries (Morocco, Algeria, Tunisia, Libya and Egypt), and this is probably due to the position of this cancer (2<sup>nd</sup> after breast cancer) among women in this region.

#### III. PAPILLOMAVIRUS IN CERVICAL CANCER

HPV is the most common sexually transmitted genital infection worldwide. Cervical cancer (CxCa) is the third most common cancer worldwide among women, with an annual incidence of more than 527,000 new cases (ASR: 14) and an annual mortality of 265,653 (ASR: 6.8). Incidence varies significantly between regions of the world ranging from 4.4 in Western Asia to 42.7 per 100,000 per year in Eastern Africa. Globally, the burden of cervical cancer incidence and death is highest in less developed countries: overall, 85% of cases occur in developing countries, where it accounts for 13% of all cancers diagnosed in females [4].

In contrast to other developing countries in the world, the countries in the NA region show a generally low incidence of CxCa (ASR: 6.6). Noteworthy, cervical cancer is the second most common cancer among women in Morocco, the third in both Algeria and Tunisia. Egypt differs in this respect where

cervical cancer is not one of the leading cancers among women [5]. In addition, an East-West gradient exists for CxCa, with Egypt harbouring the lowest incidence at 1.0, followed by 4.8 in



seen in Figure 1.

Figure 1 : CxCa incidence and mortality in NA countries (ASR) [5]

HPV is admittedly responsible for almost 100% of all cervical cancer cases [3]. Various factors influence the prevalence and distribution of HPV genotypes, such as patient age, cytology stage, and geographical regions. Human papilloma viruses are a group of more than 150 related viruses, and categorized into low-risk and high-risk types, according to their potential for causing cancer. HPV-16 and 18, the two vaccine-preventable types, contribute to over 70% of all cervical cancer cases, between 41%-67% of high-grade cervical lesions and 16-32% of low-grade cervical lesions. After HPV-16/18, the six most common HPV types are the same in all world regions, namely 31, 33, 35, 45, 52 and 58; these account for an additional 20% of cervical cancer cases worldwide [6-9]. Known risk factors for progression from cervical infection to cancer include smoking, multiple sexual partners, long-term hormonal

contraceptive use, co-infection with other pathogens (HIV, *Chlamydia trachomatis* and Herpex Simplex type-2), immunosupression, and some dietary deficiencies [10]. In NA, the average prevalence of HPV is 21.3%. Although the studies on the prevalence of HPV in this region are not abundant, there is enough data to suggest that the prevalence of HPV varies from: 5-12% in the low-risk general population (GP), 20-49% in the -risk groups such as prostitutes, 25-90% of cases in cervical intraepithelial neoplasia (CIN) and 61%-98% of cases in CxCa. HPV16 is the most common type in all NA countries with a prevalence rate of 59%, followed by HPV-18 found in 8.6 – 17% of diagnoses. HPV45 ranked third with a prevalence of 5% [11]. The incidence of HPV across the general population in NA varies between 10.3 and 14.6 per 100,000 (Table 1).

Tunisia, 8.5 in Algeria, 9.4 in Libya, and 14.3 in Morocco as

•							
	Morocco	Algeria	Tunisia	Libya	Egypt		
HPV prevalence (%) in the general population (women with normal cytology)	<b>n</b> 10.5	10.5	14.6	10.7	10.3		
Prevalence (%) of Normal cytology	2.9	9	5.2	5.1	5.1		
HPV 16 and/or HPV Low-grade lesions	20.9	18.5	18.5	18.5	18.5		

40

79.2

40

77.1

Table 1: HPV prevalence in different cell types [12]

#### IV. ANOGENITAL CANCERS OTHER THAN THE CERVIX

women

High-grade lesions

Cervical cancer

18

with:

among

HPV is the major cause of other ano-genital cancers (anal, vulvar, vaginal and penile), yet there is few published data on HPV-caused ano-genital cancers other than cancer of the cervix [13].

Anal cancer has a low incidence among the general population with an average rate of 1 per 100,000 population worldwide (27,000 new cases each year). Women have higher incidences of this cancer than men, and the incidence increases

among women with cervical dysplasia and cervical cancer, persons infected by HIV, men having sex with men (MSM) and transplant recipients. Interestingly, anal cancer is more frequent in developed regions [14-16].

40

78.4

40

78.4

40

78.4

These cancers can be for the most part: squamous cell carcinoma, adenocarcinomas, or basaloid and cloacogenic carcinomas.

In 2008, *de Martel et al.* reported the rarity of vulvar cancer among women, with 27,000 estimated new cases in 2008, representing about 4% of total gynaecological cancers. Developed countries harbor about 60% of vulvar cancer cases worldwide.

Vaginal cancer is rare, with only 13,000 new cases in 2008 representing 2% of gynaecological cancers, with the highest rate (68%) occuring in less developed countries. Penile cancer is rare too among men worldwide with an annual incidence of 22,000 new cases. A high correlation between this cancer and cervical

cancer exists, with the less developed countries harboring the highest incidence worldwide [1].

NA countries show a very low incidence of these cancers with an absence of data in many countries (Libya and Morocco) concerning some cancers (Table 2).

	Table 2: Incidence	(ASR) of	different and	ogenital	cancers by	cancer 1	registry	and sex in	1 NA	countries
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	Egypt (Gharbiah) [ <mark>17, 18</mark> ]	Tunisia (Sousse) [ <u>17, 18]</u>	Algeria [ <u>4</u> , <u>17-19]</u>	Libya [ <u>20</u> ]	Morocco
Anal cancer	0.4	0.2	Algiers: Male:3.1 ;Fem ale: 2.5 Setif : Male : 0.1;Female:0.1	Male: 0.2 Female: 0.1	-
Vulvar cancer	0.7	0.3	Algiers : 0.1 Setif : 0.0	-	-
Vaginal cancer	0.2	0.4	Algiers:0.1 Setif :0.2	-	-
Penile cancer	0.0	0.0	Algiers : 0.0 Setif : 0.0	Male: 0.0 Female: -	-
Pharynx cancer (excluding Nasopharynx)	Male: 0.7 Female: 0.6	Male: 0.9 Female: 0.5	Male: 0.5 Female: 0.4	Male: 0.2 Female: 0.3	Male: 0.5 Female: 0.3

In Morocco, the epidemiology of anal cancer is not well known. Between 2000 and 2007, a survey was conducted in the University Hospital, Ibn Sina, Rabat, showed that only 20 cases of anal cancer were found during this period. This number represented a very low portion (0. 22%) of total hospitalizations, 2.4% of all digestive cancer and 7.5% of colorectal cancers. The mean age of anal cancer patients was 60 years (min: 33– max: 87 years), male to female ratio was 4. The most common clinical symptoms were anal pain (80%), rectum bleeding (60%) [21].

Other particular cases of anal cancer were reported in Morocco as mucinous adenocarcinoma of the anus which is a rare malignancy (3–11% of all of the anal carcinomas [22]). Out of the 28 anal adenocarcinomas presented to the Hepatogastroenterology Department of the University Hospital Centre of Marrakech from 2000 to 2009, three cases were diagnosed as primary mucinous adenocarcinoma. All patients were males with an average age of 68 years [23].

<u>Belbaraka</u> et al. conducted a retrospective study of 17 patients with anorectal melanoma diagnosed between January 1998 and December 2007. The provided informations showed that the mean age of patients was 58 years, the males were more exposed as females (sex ratio: 12 men per 5 women) and the most common symptom was rectal bleeding [24].

#### V. CONCLUSION

Generally, the countries of the NA region show a low incidence of HPV-related cancers. However, there is a lack of available data concerning the epidemiology of HPV in the anogenital cancers associated with HPV in this region. Acquisition of new sexual behavior among the younger generation as well as the location of NA region in the road of sub-Saharan immigrants to Europe could change this data on epidemiology of HPV-related cancers, so it might be necessary to install large population-based surveys on HPV prevalence among all countries in NA region, mainly for Cervical cancer which is the second most common cancer in NA women.

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#### AUTHORS

**First Author** – Yassine Zouheir, laboratory of Viral Oncology, Pasteur Institute of Morocco and laboratory of Neurosciences, Integrated diseases and natural Substances, Faculty of sciences and Technics, Mohammedia, Hassan II University, Morocco. **Second Author** – Samira Daouam, Independent researcher, Casablanca, Morocco. samiradaouam@gmail.com **Third author** – Taoufiq Fechtali, Laboratory of Neurosciences, Integrated diseases and natural Substances, Faculty of sciences and Technics, Mohammedia, Hassan II University, Morocco. toufiqr@yahoo.com

**Correspondence Author** – Yassine Zouheir, yassinezouheir@gmail.com, (+212)606253030.

## Absorption and luminescence studies of Dy<sup>3+</sup> doped Phosphate glass

### M.Reddi Babu<sup>a,b</sup>, N.Madhusudhana Rao<sup>a</sup>, A.Mohan Babu<sup>a,b</sup>, L.Ramamoorthy<sup>b</sup>

<sup>a</sup>School of Advanced Sciences, VIT University, Vellore, TN, India <sup>b</sup>Department of Physics, C R Engineering College, Tirupati - 517506, AP, India

Abstract- Absorption and emission properties of  $Dy^{3+}$  doped phosphate glass with the chemical composition of 55.5  $P_2O_5$  + 14.5 SrO + 14 K<sub>2</sub>O + 9 Al<sub>2</sub>O<sub>3</sub> + 6 KF +1.0 Dy<sub>2</sub>O<sub>3</sub> have been investigated. The density and refractive index of the prepared glass were determined by Archimedes principle and using an Abbe refractometer, respectively. Optical absorption spectra were recorded on a Hitachi U-3400 spectrometer in the wavelength of 250-2500 nm. The intensity parameters ( $\Omega_2$ ,  $\Omega_4$  and  $\Omega_6$ ) are determined from the Judd-Ofelt analysis have been used to calculate radiative transition probabilities (A<sub>R</sub>), life times ( $\tau_R$ ) and branching ratios ( $\beta_R$ ) from the exited <sup>4</sup>F<sub>9/2</sub> level to the lower levels of Dy<sup>3+</sup> ion.

*Index Terms*-  $Dy^{3+}$  ion, Phosphate glass, Rare Earths, JO parameters

#### I. INTRODUCTION

**R**are-earth doped composites are the treasury of optical materials because of they have been extensively used in the preparation of solid state lasers, optical amplifiers, phosphors, memory and display devices. Number of rare-earth doped glasses were prepared using the selected network formers, network modifiers and intermediates by the different researchers [1-10]. The optical properties of rare earth (RE) ions doped in different crystalline and glass matrices are of current interest because they exhibit characteristic lasing transitions.

The host glass plays an important role in the development of RE doped optical devices. In the search of different host glasses, the oxide glasses were identified as the most stable host for practical applications due to their high chemical and thermal stability. Among the various oxide glasses, the phosphate based glasses are identified as good hosts for many RE ions because of their high stimulated emission cross sections, weak upconversion luminescence and lesser probability for energy back transfer which are suitable for various luminescence applications.

In addition, phosphate glass is an excellent material due to its good chemical stability, ion exchange ability, high gain coefficient and wide bandwidth capability. Also, it is very easy to prepare these glasses in different compositions as they also preserve useful properties upon the introduction of significant amount of rare earth ions. In phosphate glasses,  $Al_2O_3$  is often added to modify the glass structure that improves the physical properties and mechanical strength [11].  $P_2O_5$  based multicomponent glass systems have tremendous potential applications in optical devices such as laser devices, optical amplifiers, fluorescent lamps [11-15]. Among different rare-earth ions, the  $Dy^{3+}$  ion has been identified as the most efficient ion for obtaining the lasing action, frequency up-conversion and optical fiber amplification [16]. In the present work, we report the absorption and luminescent properties of  $Dy^{3+}$  doped  $P_2O_5$ -SrO-K<sub>2</sub>O-Al<sub>2</sub>O<sub>3</sub>-KF glasses obtained from the absorption, emission and decay measurements.

#### II. MATERIALS AND METHOD

#### 2.1 Sample preparation

Dy<sup>3+</sup> doped phosphate glass with molar compositions of  $55.5 P_2O_5 + 14.5 SrO + 14 K_2O + 9 Al_2O_3 + 6 KF + 1.0 Dy_2O_3$  (labeled as PKFSADy10) were prepared by conventional melt quenching technique using the reagent grade Al(PO\_3)<sub>3</sub>, Sr(PO\_3)<sub>2</sub>, KH<sub>2</sub>PO<sub>4</sub>, KF and Dy<sub>2</sub>O<sub>3</sub> chemicals. About 10 gm of batch composition was thoroughly crushed in an agate mortar and the homogeneous mixture was taken in a platinum crucible and heated in an electric furnace at a temperature of 1075  $^{\circ}$ C for 45 min. The molten sample was air quenched by pouring onto a preheated thick brass plate. To remove the thermal strains, the glass sample was annealed for 10 hours at  $350^{\circ}$ C and allowed to cool to room temperature (RT).

#### 2.2 Physical and optical measurements

The density of the glass sample is determined by the Archimedes method using distilled water as immersion liquid. The refractive index (n) was measured on an Abbe refractometer using sodium lamp as light source with 1 – bromonaphthaline ( $C_{10}H_7Br$ ) as contact liquid. Absorption spectra were recorded on a spectrophotometer (Hitachi U-3400) in the wavelength region of 250-2500 nm with a spectral resolution of 1 nm. Emission spectra were obtained by exciting the samples with the 457.9 nm line of an Ar<sup>+</sup> laser. The photoluminescence was detected with a double monochromator equipped with a photo-multiplier tube (PMT) with a spectral resolution of 0.06 nm. For lifetime measurements, a mechanical chopper in conjunction with a multi-channel scalar was employed.

#### III. THEORTICAL BACKGROUND

The optical absorption spectra of rare-earth ions provide the information regarding the energy level positions and the intensities of various absorption bands to understand their radiative properties. The quantitative computation of the intensities of these transitions has been developed by Judd [17] and Ofelt [18] and their theory is called Judd - Ofelt theory. The radiative properties such as radiation transition probability ( $A_R$ ),

total radiative transition probability (A<sub>T</sub>), radiative life time ( $\tau_R$ ), branching ratio ( $\beta_R$ ) and stimulated emission cross-emission ( $\sigma(\lambda_P)$ ) have been calculated using the equations available in the literature [19-26].

#### IV. RESULTS AND DISCUSSION

#### 4.1 Physical properties

The prepared  $Dy^{3+}$  doped phosphate glass has been found to be optically transparent without any formation of bubbles and strains. Using the general chemical formulae, the density (d) and refractive index (n), rare-earth ion concentration (N) and optical path length (l) measured of the glass are presented in the Table 1.

#### 4.2 Absorption spectra and energy level analysis

The optical absorption spectra of  $Dy^{3+}$  doped phosphate glass recorded in the UV-VIS and NIR regions are shown in the Figs.1 (a) & (b) respectively, The absorption bands observed at 1685, 1276, 1095, 900, 801, 752, 473, 452, 425, 385, 377, 364 and 349 nm are assigned to different transitions from the <sup>6</sup>H<sub>15/2</sub> ground state to the <sup>6</sup>H<sub>11/2</sub>, <sup>6</sup>F<sub>11/2</sub>, <sup>6</sup>F<sub>9/2</sub>, <sup>6</sup>F<sub>5/2</sub>, <sup>6</sup>F<sub>3/2</sub>, <sup>4</sup>F<sub>9/2</sub>, <sup>4</sup>I<sub>15/2</sub>, <sup>4</sup>G<sub>11/2</sub>, <sup>4</sup>I<sub>13/2</sub>, <sup>4</sup>M<sub>19/2</sub>, <sup>4</sup>P<sub>3/2</sub> and <sup>6</sup>P<sub>7/2</sub> excited states respectively. It is observed that the most intense transition  ${}^{6}H_{15/2} \rightarrow {}^{6}F_{11/2}$  is centered at around 1276 nm.

Table 2 presents the experimental ( $E_{exp}$ ) and calculated ( $E_{cal}$ ) free-ion energy level positions of PKFSADy10 glass along with other host glasses [27-29]. The energy level analysis has been carried out by a f-shell empirical program [30] and the best-fit set of free-ion parameters of have been determined by minimizing the difference between the observed and calculated energies by the standard least-square fit method using the initial free-ion values of  $Dy^{3+}$ : LaCl<sub>3</sub> [31]. Among various interactions that contribute to total free-ion Hamiltonian, the major contribution

occurs from the interelectronic (F<sup>k</sup>) and the spin-orbit ( $\stackrel{(, \zeta)}{\rightarrow}$ ) interactions which govern the <sup>2S+1</sup>L<sub>J</sub> level positions. The rest of the terms will only give corrections to the energy of these levels without removing their degeneracy. Hence, during the fitting process, out of 20 free-ion parameters, the only parameters that

were allowed to vary are  $F^K$  and  $\checkmark$ . Four of the atomic parameters  $(M^2,\,M^4,\,P^2$  and  $P^6)$  were constrained according to  $M^2$  = 0.56  $M^0,\,M^4$  = 0.38  $M^0,\,P^4$  = 0.75  $P^2,\,P^6$  = 0.50  $P^2$ . The values of  $T^2$  = 301,  $T^3$  = 12,  $T^4$  = 14,  $T^6$  = -299,  $T^7$  = 386,  $T^8$  = 350,  $M^0$  = 2.50, and  $P^2$  = 501 were fixed in the parameterization. The best fit free-ion parameter values evaluated for PKFSADy10 glass are compared in Table 3. The hydrogenic ratios,  $F^2/F^4$  (~1.42) and  $F^2/F^6$  (~2.03), are more or less same in all the glass systems presented in Table 3, which indicate that the radial integral part of the f-orbitals of  $Dy^{3+}$  ions remains unchanged even though the glass compositions are changed. This could be due to the fact that the 4f shell of  $Dy^{3+}$  ions is strongly shielded by the 5s^2 and 5p^6

$$\sum F^{K}$$

orbitals and the total electrostatic effects  $\overline{K}$  experienced by the Dy<sup>3+</sup> ion glass is found to be greater than that of PKBAFDy10 [27] and PKBADy10 [28] and PKAZFDy10 [29] glasses.

The nature of bonding properties in the host glass has been calculated from nephelauxetic ratio ( $\beta$ ) and the bonding parameter ( $\delta$ ) is defined as [32,33],  $\delta = [(1 - \overline{\beta})/\overline{\beta}] \times 100$ 

$$\overline{\beta} = \frac{(\sum_{n} \beta)}{N}$$

where N, here  $\beta$  is called nephelauxetic ratio =  $E_c/E_a$ ;  $E_c$  and  $E_a$  are the energies of the corresponding transitions in the complex and aquo-ions, respectively and N represents the number of levels that are used to compute the  $\overline{\beta}$  values. Based on the local environment, the  $\delta$  value may be positive or negative which represents covalent or ionic bonding. Table 3 also presents

the values of  $\beta$  and  $\delta$  for PKFSADy10 glass along with other Dy<sup>3+</sup> ion doped glass systems [27-29]. The experimental and theoretical oscillator strengths calculated from the JO theory for the Dy<sup>3+</sup>doped PKFSADy10 glass are presented in Table 4. The evaluated J-O parameters are  $\Omega_2 = 6.21 \times 10^{-20} \text{ cm}^2$ ,  $\Omega_4 = 1.58 \times 10^{-20} \text{ cm}^2$  and  $\Omega_6 = 1.38 \times 10^{-20} \text{ cm}^2$ . Table 5 compares the JO parameters obtained in the present work with those obtained for the other glass systems. For PKFSADy10 glass, the magnitude of parameters follow the trend as  $\Omega_2 > \Omega_4 > \Omega_6$ . In general, the JO parameters provide information on the nature of bonding between RE ion and surrounding ligands as well as the symmetry of the environment around the Ln ions.

The JO parameters determined from the absorption spectra have been used to predict radiative properties such as, radiative transition probabilities(A<sub>R</sub>), lifetimes( $\tau_R$ ), branching ratios( $\beta_R$ ) and peak stimulated emission cross-sections ( $\sigma_R$ ) of Dy<sup>3+</sup> ions in the titled glass for fluorescent levels for the emission  ${}^{4}F_{9/2} \rightarrow {}^{6}H_{J}$  (I=11/2.13/2.15/2) transitions are presented in Table 6.

#### 4.3 Luminescence and decay time measurements

Fig. 2 shows the emission spectra of PKFSADy10 glass which consists of three bands at 663 nm, 574 nm and 480 nm corresponding to the  ${}^{4}F_{9/2} \rightarrow {}^{6}H_{11/2}$ ,  ${}^{4}F_{9/2} \rightarrow {}^{6}H_{13/2}$  and  ${}^{4}F_{9/2} \rightarrow {}^{6}H_{15/2}$  transitions, respectively. From the emission spectra the peak positions ( $\lambda_{p}$ ), effective linewidths ( $\Delta_{eff}$ ) and branching ratios ( $\beta_{R}$ ) have been determined and are given in Table 6 along with  $\beta_{R}$  values predicted from the JO theory. The luminescence decay from the  ${}^{4}F_{9/2}$  level of Dy<sup>3+</sup> ions measured with an excitation of 457.9 nm is shown in Fig. 3. The lifetime of the  ${}^{4}F_{9/2}$  level has been obtained by taking the first e-folding time.

#### 4.4 Radiative properties

The luminescence quantum efficiency ( $\mathcal{I}$ ) is defined as the ratio of the number of photons emitted to the number of photons absorbed. For lanthanide ion systems it is equal to the ratio of the experimental lifetime ( $\tau_{exp}$ ) to the predicted radiative lifetime ( $\tau_R$ ) of the excited level as given by

$$\eta = \frac{\tau_{\exp}}{\tau_R}$$

The quantum efficiency ( $\eta$ ) of the  ${}^{4}F_{9/2}$  fluorescent level has been found to be 65% and the non-radiative decay rate ( $W_{nr}$ ) for the  ${}^{4}F_{9/2}$  level is given by,

$$W_{nr} = \frac{1}{\tau_{\exp}} - (A_R)_{JO}$$

where  $(A_R)_{JO}$  is the total radiative transition probability determined through JO analysis. The  $W_{nr}$  for  ${}^{4}F_{9/2}$  level of  $Dy^{3+}$ ions is found to be 457 s<sup>-1</sup>. In this work, the experimental value of branching ratio  $(\beta_{exp})$  for  ${}^{4}F_{9/2} \rightarrow {}^{6}H_{13/2}$  transition is found to be maximum and is in good agreement with the predicted value  $(\beta_{exp})$ .

#### V. CONCLUSIONS

The electronic structure of  $Dy^{3+}$  ions in phosphate glasses has been deduced from absorption spectra by means of a free-ion Hamiltonian model. The intensities of absorption bands of  $Dy^{3+}$ ions in phosphate have also been analyzed with the help of Judd-Ofelt theory. A fairly good agreement between the radiative properties calculated on the basis of the JO theory and experimental values has been noticed. The decay curve of the  ${}^{4}F_{9/2}$  level of  $Dy^{3+}$  in the phosphates glass has been found to be non-exponential.

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#### AUTHORS

**First Author** – M. Reddi Babu, School of Advanced Sciences, VIT University, Vellore, Tamilnadu, India. Email Id: <u>reddibab@gmail.com</u>

**Second Author** – Dr. N.Madhusudhana Rao, School of Advanced Sciences, VIT University, Vellore, Tamilnadu. Email Id: nmrao@gmail.com

**Third Author** – Dr. A.Mohan Babu, Dept. of Physics, C R Engineering College, Tirupati, Chittoor Dt. India E mail Id: <u>mohanphy57@gmail.com</u>

**Fourth Author** – Prof. L.Ramamoorthy Dept. of Physics, C R Engineering College, Tirupati, Chittoor Dt. India. E mail Id: <u>lrmphysics@yahoo.co.in</u>

\***Correspondence Author** – Dr. A.Mohan Babu, Dept. of Physics, C R Engineering College, Tirupati, Chittoor Dt. India E mail Id: <u>mohanphy57@gmail.com</u>



Fig. 1 Optical absorption spectra of PKFSADy10 glass in (a) UV-VIS and (b) NIR regions



Fig. 2 Emission spectrum of PKFSADy10 glass



Fig. 3 Decay profile for  ${}^4F_{9/2}$  level of PKFSADy10 glass.

Table 1 Physical properties of 1.0 mol % Dy<sup>3+</sup>-doped PKFSADy10 glass.

Properties	PKFSADy10							
Refractive index, n	1.532							
Density, $d (g \text{ cm}^{-})$	2.795							
Concentration, $C (10^{20} \text{ ions cm}^{-3})$	2.622							
Optical path length l (cm)	0.312							
	PKFSADy10		PKBAFDv10 [27]		PKBADv10 [28]		PKAZDv10 [29]	
-----------------------------------	------------------	------------------	------------------	------------------	------------------	------------------	------------------	------------------
Transition	[Presen	t work]	PKDAFI	Dy10[27]	PKDAD	y10 [28]	FKALD	y10 [29]
	E <sub>exp</sub>	E <sub>cal</sub>	E <sub>exp</sub>	E <sub>cal</sub>	E <sub>exp</sub>	E <sub>cal</sub>	E <sub>exp</sub>	E <sub>cal</sub>
<sup>6</sup> H <sub>15/2</sub>	0	42	0	43	0	-3	0	12
<sup>6</sup> H <sub>13/2</sub>		3560	3665	3544		3556		
<sup>6</sup> H <sub>11/2</sub>	5932	5934	5935	5896	5931	5928	5995	5975
<sup>6</sup> F <sub>11/2</sub>		7755	7836	7799		7722	7874	7884
<sup>6</sup> H <sub>9/2</sub>	7834	7835	7826	7769	7819	7831		
<sup>6</sup> F <sub>9/2</sub>	9130	9004	9120	9116	9124	9050	9132	9109
<sup>6</sup> H <sub>7/2</sub>		9289		9204		9285		
<sup>6</sup> H <sub>5/2</sub>		10366		10268		10362		
<sup>6</sup> F <sub>7/2</sub>	11106	11068	11104	11067	11038	11036	11,186	11,104
<sup>6</sup> F <sub>5/2</sub>	12490	12514	12419	12494	12407	12482	12,500	12,556
<sup>6</sup> F <sub>3/2</sub>	13281	13318	13291	13294	13280	13284	13,351	13,361
<sup>6</sup> F <sub>1/2</sub>		13884		13851		13851		
<sup>4</sup> F(3) <sub>9/2</sub>	21134	21173	21128	21122	21142	21128	21,142	21,176
<sup>4</sup> I(3) <sub>15/2</sub>	22095	22162	22198	22189	22075	22157	22,075	22,125
${}^{4}G(4)_{11/2}$	23513	23545	23507	23515	23474	23500	23,529	23,512
<sup>4</sup> M <sub>21/2</sub>		25204		25244		25268		
${}^{4}\mathrm{K}(1)_{17/2}$		25831	25880	25890		25826	25,907	25,897
<sup>4</sup> I(3) <sub>13/2</sub>		25867		25833		25854		
<sup>4</sup> F(3) <sub>7/2</sub>	25918	25882		25790	25907	25859		
<sup>4</sup> M <sub>19/2</sub>	26477	26376	26448	26443	26455	26426	26,385	26,348
<sup>4</sup> P(2) <sub>3/2</sub>	27468	27437	27465	27465		27330	27,473	27,431
<sup>6</sup> P <sub>5/2</sub>		27580		27640	27473	27439		
<sup>4</sup> I(3) <sub>11/2</sub>		28112				28098		
<sup>6</sup> P <sub>7/2</sub>	28634	28677				28551	28,653	28,689
${}^{4}M_{15/2}$		28700				28738		

# Table 2 Comparison of experimental $(E_{exp})$ and calculated $(E_{cal})$ energies $(cm^{-1})$ of PKFSADy10 glass along with different glasses.

Table 3 The best fit free ion parameters (in cm<sup>-1</sup>), net electrostatic field ( ${}^{K}$ ), hydrogeneic ratios ( $\mathbf{F}^2/\mathbf{F}^4 \& \mathbf{F}^2/\mathbf{F}^6$ ), the average nephelauxetic ratio ( $\overline{\beta}$ ) and bonding parameter ( $\delta$ ) of Dy<sup>3+</sup> complexes.

Parameters	<b>PKFSADy10</b> [Present work]	PKBAFDy10[27]	PKBADy10[28]	PKAZFDy10[29]
E <sub>AVG</sub>	56545	56537	56456	56,498
$F^2$	94009	94252	93490	93,743
$F^4$	66257	64954	66878	66,398
$F^6$	46257	45786	45799	45,992
ζ	1969	1942.5	1969	1977
$\sum_{K} F^{K}$	206523	204992	206167	206,133
$F^2 / F^4$	1.42	1.45	1.40	1.41
$F^2 / F^6$	2.03	2.06	2.01	2.03
$\overline{\beta}$	1.0058	1.0042	1.0043	1.0031
δ	-0.5767	-0.416	-0.424	-0.309

Transition	f <sub>exp</sub>	<b>f</b> <sub>cal</sub>
<sup>6</sup> H <sub>11/2</sub>	1.44	1.69
<sup>6</sup> F <sub>11/2</sub>	10.8	10.77
<sup>6</sup> F <sub>9/2</sub>	3.3	3.22
<sup>6</sup> F <sub>7/2</sub>	2.18	2.48
<sup>6</sup> F <sub>5/2</sub>	2.1	1.1
<sup>6</sup> F <sub>3/2</sub>	0.3	0.2
<sup>4</sup> F <sub>9/2</sub>	0.11	0.19
${}^{4}I_{15/2}$	0.68	0.57
<sup>4</sup> G <sub>11/2</sub>	0.11	0.11
${}^{4}M_{19/2}$	2.89	0.79

# $\begin{array}{ll} Table \ 4 & Experimental \ (f_{exp}) \ and \ calculated \ (f_{cal}) \ oscillator \ strengths \ (x10^{-6}) \ of \ PKFSADy10 \ glass. \end{array}$

System	$\Omega_2$	$\Omega_4$	$\Omega_6$	Trend	Reference
PKFSADy10	6.21	1.58	1.38	$\Omega_2\!>\!\Omega_4\!>\!\Omega_6$	Present work
PKBAFDy10	12.34	2.67	2.30	$\Omega_2 \! > \! \Omega_4 \! > \! \Omega_6$	[27]
PKBADy10	9.72	3.08	1.66	$\Omega_2 \! > \! \Omega_4 \! > \! \Omega_6$	[28]
PKAZFDy10	14.11	3.07	1.95	$\Omega_2 \!>\! \Omega_4 \!>\! \Omega_6$	[29]

Table 5 Comparison of the JO parameters  $(\times 10^{-20} \text{ cm}^2)$  of PKFSADy10 glasss with other Dy<sup>3+</sup> doped glass.

Table 6 Emission peaks  $(\lambda_p, nm)$ , effective band widths  $(\lambda_{eff}, nm)$ , radiative transition probabilities  $(A_R, s^{-1})$ , peak stimulated emission cross-sections  $(\sigma(\lambda_p), \times 10^{-22} cm^2)$ , and experimental and calculated branching ratios $(\beta_R)$  for the  ${}^4F_{9/2} \rightarrow {}^6H_J$  levels of PKFSADy10 glass.

Level					β	R
$^{4}\mathrm{F}$ 9/2 $ ightarrow$	$\lambda_{ m p}$	$\Delta\lambda_{ m eff}$	$\mathbf{A_R}$	σ(λ <sub>p</sub> )	Ехр	Cal
<sup>6</sup> H <sub>11/2</sub>	663	51	67	1.41	0.01	0.079
<sup>6</sup> H <sub>13/2</sub>	574	10	540	33.54	0.56	0.645
<sup>6</sup> H <sub>15/2</sub>	480	18	109	1.79	0.429	0.13

# A Modified Hardware-Efficient H.264/AVC Motion Estimation Using Adaptive Computation Aware Algorithm

# Dr.S.Rajkumar

Associate Professor/ ECE Dept, Arulmigu Meenakshi Amman College of Engineering, Vadamavandal (Near Kanchipuram)

Abstract- In order to increase transmission efficiency of the real world video sequences, Motion estimation (2) plays an vital role. An improved version of the reconfigurable block motion estimation algorithm (3) is proposed in this paper. The new algorithm uses a small cross-shaped search patterns to speed up the motion estimation of stationary and quasi- stationary blocks. Also we propose a pipelining method for SAD unit to minimize clock delays with minimum area overhead. Our approach increases speed and enhance the throughput for Codec design. We propose a new method "Block Motions matching technique (BMM)" (2) where compression takes place at both Spatial and Temporal domain. In BMM, images are sub divided into micro blocks of 16x16 matrices and it is checked with nearby blocks. Also this method is applied for video compression techniques. The advantage of BMM over existing system is that it compresses block level compression instead of pixel level compression that improves execution speed and adapt for fast processing.

*Index Terms*- Field-programmable gate array (FPGA), H.264/AVC, motion estimation, multipath search algorithm very large-scale integration (VLSI) architecture, video coding.

#### I. INTRODUCTION

A video signal represented as a sequence of frames of pixels contains vast amount of redundant information that can be eliminated with video compression technology enhancing the total transmission and hence storage becomes more efficient. To facilitate interoperability between compression at the video producing source and decompression at the consumption end, several generations of video coding standards have been defined and adapted by the ITU-G and VCEG etc... Demand for high quality video is growing exponentially and with the advent of the new standards like H.264/AVC it has placed a significant increase in programming and computational power of the processors.

In H.264/AVC, the motion estimation (3) part holds the key in capturing the vital motion vectors for the incoming video frames and hence takes very high processing at both encoder and the decoder. Motion estimation techniques form the core of H.264/AVC video compression and video processing applications. It extracts motion information from the video sequence where the motion is typically represented using a motion vector (x, y). The motion vector indicates the displacement of a pixel or a pixel block from the current location due to motion. This information is used in video compression to find best matching block in reference frame to calculate low energy residue to generate temporally interpolated frames. It is also used in applications such motion compensated deinterlacing, video stabilization, motion tracking etc...

Due to the great innovation of display and information technology, the stringent requirement of data capacity is drastically increased in human life. This trend makes a significant impact on storage and communication evolution. The data compression technique is extensively applied to offer acceptable solution for this scenario, some images like satellite images or medical images have very high resolution. Such high resolution images have large file size and computation time required to process such high quality images is more. Hence compression of images and video has become need of hour. The image can be compressed using lossy or lossless compression techniques. In the lossy image compression technique, the reconstructed image is not exactly same as the original image. The lossless image compression can remove redundant information and guarantee that the reconstructed image is without any loss to original image. Different image compression techniques (5) are suggested by the researchers, but the technique with high data compression with low loss is always preferred. Because of the advancement in Internet, world has come very close and can afford and avail the services such as medical, tourism, education etc., remotely. Data compression is the key in giving such fast and efficient communication. It has made large impact on service sector to provide best services to all sections of society. High code efficiency is measurement parameter for performance of data compression system.

#### II. MODIFICATION IN THE EXISTING SYSTEM

In existing system an adaptive computationally scalable ME algorithm and its hardware architecture are proposed. The ME algorithm employs a two-level hierarchical search to support wider search ranges. At the fine level, the algorithm checks MVs taken from previously coded neighboring macro blocks and selects between three strategies to adapt to local motion activity. The estimation can be terminated at any point, which enables the encoder to trade the number of search points for the compression efficiency. The hardware architecture applies a novel dataflow where the interpolation of fractional positions follows the coarse-level FS and precedes the fine level ME (1). Motion estimation and compensation are performed simultaneously as all residuals forwarded to the computation of block difference measure are buffered ready for the next coding steps. Instead of the selection of the best MV, the architecture selects the set (at least eight) of

candidate MVs to forward them to the rate-distortion (RD) analysis to select the best partition mode and MV(s). This approach allows more compression-efficient coding. Additionally, the architecture (8) supports the compensation for both inter- and intra-predictions. Hence, there is no need to employ separate resources to compute residuals. The order of checked MVs is not constrained and can be adapted according to a desired search strategy.

#### III. THE PROPOSED SYSTEM

In this motion estimation, search patterns have a large impact on the searching speed and quality of the performance. Based on motion vector distribution characteristics of real world video sequences, we propose a new cross-diamond search (NCDS) algorithm (6) using cross search patterns before large/small diamond search patterns in this paper. In multipath search pattern we use NCDS rather than DS. Because NCDS employs halfway technique to achieve significant speedup on sequence with (quasi-) stationary blocks. NCDS employs modified partial distortion criterion (MPDC) (4), which results in fewer search points with similar distortion. NCDS provides faster searching speed and smaller distortions (5) (7) than other popular fast block-matching algorithms.

#### 2.1. Multipath search algorithm

Multipath search (MPS) is a computationally scalable ME algorithm, which exploits spatial correlations between MVs and selects the search strategy according to estimated block motion activity and available computational resources. The initial MV is selected from the prediction set that contains MVs of left, upper left, upper, and upper right neighboring macro blocks, and the middle of the search area. The point that gives the smallest SAD is used as the starting SP. In the algorithm description, SP is considered as an MV checked for a  $16 \times 16$  luma macro block and a RP. Although MPS can be applied to wide search ranges, the cost of hardware resources would be significant. Therefore, it is better to use a hierarchical search to narrow the MPS range.

#### 2.2. Strategy Selection

The search strategy following the prediction set is selected on the basis of the estimated motion activity measured as the standard deviation (Std. Dev) of MVs of spatially neighboring MBs with respect to their median. Based on experiments, the Std. Dev threshold value is set to three to distinguish between highand moderate/low- motion activity. For the sake of its wide range, three step search (TSS) is selected to track high- motion activity MBs. For the rest of MBs, the diamond search (DS) algorithm (1) (2) is selected. However, since the large diamond search pattern (5) used by DS is rather sparse, kite- cross diamond search (KCDS) (6) is employed when the number of SPs remaining after the evaluation of the prediction set (*Number*  *of SPs*) for Integer-Pel ME (IPME) is smaller than 10 (actually 26 if Fractional-Pel ME is also taken into account).



Fig 1: strategy selection

KCDS uses a denser search pattern than DS and that is better suited to track small/moderate motion when theMPS procedure embeds some basic search strategies. Integer-Pel ME distinguished by dashed boxes can be interrupted at any SP to perform Fractional-Pel ME. If TSS is selected as the first strategy, it is not repeated later for the same search center for High-motion activity of MBs. For the rest of MBs, the new cross diamond search (NCDS) (6) algorithm is selected. However, since the large diamond search pattern used by DS is rather sparse, kite-cross diamond search (KCDS) (5)(6) is employed when the number of SPs remaining after the evaluation of the prediction set (Number of SPs) for Integer-Pel ME (IPME) is smaller than 10 (actually 26 if Fractional-Pel ME is also taken into account). KCDS uses a denser search pattern than NCDS and, thus, is number of SPs is small.



#### IV. MODIFIED HARDWARE ARCHITECTURE



In improved version of the reconfigurable motion estimation algorithm we propose the new diamond cross search algorithm (6) that uses a small cross-shaped search patterns to speed up. Also we propose a pipelining method for SAD unit to minimize clock delays with minimum area overhead.

#### 4.1. CDS Algorithm

#### 4.1.1 Cross-Diamond Searching Patterns

The DS algorithm uses a large diamond- shaped pattern (LDSP) (1) and small diamond-shaped pattern (SDSP) (2), as depicted in Fig. 1. As the motion vectors distribution possesses over 96% CCB characteristics in the central 5 DCB areas, an initial CSP, as shown in Fig1, is proposed as the initial step to the DS algorithm, and is termed the CDS algorithm.

#### 4.1.2 The CDS Algorithm

CDS differs from DS by: 1) performing a CCB CSP in the first step and 2) employing a halfway- stop technique for quasistationary or stationary candidate blocks. Below summarizes the CDS algorithm (7).



**Step (i) Starting:** A minimum BDM is found from the nine search points of the CSP located at the center of search window. If the minimum BDM point occurs at the center of the CSP, the search stops. Otherwise, go to Step (ii).

Step (ii) Half-diamond Searching: Two additional search points of the central LDSP closest to the current minimum of the central CSP are checked, i.e., two of the four candidate points locatedat. If the minimum BDM found in previous step located at the middle wing of the CSP, i.e., or, and the new minimum BDM found in this step still coincides with this point, the search stops. (This is called the second-step stop Otherwise; go to Step (iii).

**Step (iii) Searching:** A new LDSP (9) is formed by repositioning the minimum BDM found in previous step as the center of the LDSP. If the new minimum BDM point is still at the center of the newly formed LDSP, then go to Step (iv) (Ending); otherwise, this step is repeated again.

**Step (iv) Ending:** With the minimum BDM point in the previous step as the center, a new SDSP is formed. Identify thenew minimum BDM point from the four new candidate points, 3 which is the final solution for the motion vector.

The proposed CDS algorithm is compared against five traditional BMAs: FS, 3SS, 4SS, N3SS, and DS, in four aspects. They are:

1) Average number of search points per block and its speedup ratio with follows SAD16 which performs the SAD on one respect to the FS;

$$SAD(V_i) = \sum_{x=0}^{M} \sum_{y=0}^{N} |S_l(x, y) - S_{l-1}(x + dx, y + dy)|$$

2) Average MAD per pixel;

- 3) Average distance from the true motion vector per block;
- 4) Probability of finding the true motion vector per block.

The "true" motion vectors are regarded as those found in FS. The first two aspects provide the prediction quality and searching speed improvement. The last two methods show how far from and the percentage of finding the true motion vectors, but they are independent of the first two aspects. That means that a motion vector far away from the optimal could even give better quality within the search area.

4.2 Pipelining method for SAD

The most commonly used matching criterion is the sum of absolute differences (SAD), which is chosen for its simplicity and ease of hardware implementation (9). In these fast algorithms (10), only selected subsets of search positions are evaluated using SAD. As a result, these algorithms usually produce suboptimal solutions but the computational saving over FS is significant. When it comes to hardware implementation on the other hand, the number of SAD calculations is not the only criterion for the choice of a motion estimation algorithm. Other criteria, such as algorithm regularity, suitability for pipelining and parallelism, computational complexity and number of gates which directly affect power consumption and cost of hardware, are also very important. Due to these reasons, there have been several implementations of the full search and hierarchal search which are very regular.



Fig 3: parallel processing of SAD values

5.0.	C (1 T ) 1010/1/2001/
How Status	Successful - Thu Apr 10 18:44:48 2014
Quartus II Version	9.0 Build 132 02/25/2009 SJ Web Edition
Revision Name	DE2_Default
Top-level Entity Name	DE2_Default
Family	Cyclone II
Device	EP2C35F672C6
Timing Models	Final
Met timing requirements	Yes
Total logic elements	181 / 33,216 ( < 1 % )
Total combinational functions	181 / 33,216 ( < 1 % )
Dedicated logic registers	114 / 33,216 ( < 1 % )
Total registers	114
Total pins	425 / 475 ( 89 % )
Total virtual pins	0
Total memory bits	0 / 483,840 ( 0 % )
Embedded Multiplier 9-bit elements	0/70(0%)
Total PLLs	1/4(25%)

5.2 Timing analysis report:

For an M x N block, where Sl(x,y) is the pixel value of frame l at relative position x,y from the macro block origin and Vi = (dx, dy) is the displacement vector, SAD can be computed as row of an macro block (16x1). By iteration or parallel execution of the SAD16 operation (8), the complete SAD for the 16x16 macro block can be performed

#### V. RESULT ANALYSIS

#### 5.1 Area & Power Analysis Report:

SAD value computed between current reference frames shows complete execution to identify compression vectors. There are 9 pixels are read from current memory block and 9 from reference memory block. It SAD value is executed using comparator. Based on SAD point value (7), FSM controller moves centre point pixel axis to minimum SAD point. This process is executed for the complete frame and motion vectors are loaded into vector memory. Similarly the synthesis result for proposed area and power analysis result were generated using Cyclone II EP2C35F672C6 family (10) and in the area analysis, my logic utilizes 181 logical elements which is 1% of total available LE's and other parameters are total registers 114 and total pins 425/475(89%). In power analysis, Total Thermal Power dissipation is 176.70mW out of which core dynamic thermal power dissipation is 9.41mW, core static thermal power dissipation is 80.15mW & input/output thermal power dissipation is 87.14mW.

PowerPlay Power Analyzer Status	Successful - Wed Apr 16 20:11:26 2014	
Quartus II Version	9.0 Build 132 02/25/2009 SJ Web Edition	
Revision Name	DE2_Default	
Top-level Entity Name	DE2_Default	
Family	Cyclone II	
Device	EP2C35F672C6	
Power Models	Final	
Total Themal Power Dissipation	176.70 mW	
Core Dynamic Thermal Power Dissipation	9.41 mW	
Core Static Thermal Power Dissipation	80.15mW	
1/O Thermal Power Dissipation	87.14 mW	
Power Estimation Confidence	Low: user provided insufficient toggle rate data	

-	😂 CI	assic Tin	ning Analyzer Tool						
I	Reg	Registered Performance tpd tsu tco th Custom Delays							
I	Clo	Clock: VGA_Audio_PLL:p1 altpll:altpll_componentl_clk1							
I			Value						
ł	From AUDIO_DAC:u4ILRCK_1X_DIV[3]								
1	To	To AUDIO_DAC:u4ILRCK_1X							
1	Cle	ock perio	d 2.853 ns						
ł	Fre	equency	350.51 MHz						
	200 250 300 150 400 50 450 0 MHz 500								
F	nax Summai	Ŋ					·-0		
	Fmax	Restricted Fmax	Clock Name	Note					
1	350.51 MHz	350.51 MHz	VGA_Audio_PLL:p1 atpll:atpll_componentl_clk1						

The Timing analysis report shows, Clock period : 2.853 ns & Frequency : 350.51 MHz

The timing analysis of the method minimizes clock delays with minimum area overhead. My approach increases the design speed and enhances the throughput for Codec design

#### VI. CONCLUSION

The proposed architecture implements combination of the hierarchical search and the MPS adaptive search algorithm, allowing more compression-efficient coding. The design needs the lowest gate count among the referred designs. The memory consumption is relatively high, especially when the number of RPs increases. In this project to speed up the search, a new cross diamond search algorithm (6) based different Evolutionary Computing Techniques is proposed. Traditional fast block matching algorithms are easily trapped into the local minima resulting in degradation on video quality to some extent after decoding. Since these Evolutionary Computing Techniques are suitable for achieving global optimal solution. Because NCDS employs half way technique to achieve significant speedup on sequence with (quasi-) stationary blocks. NCDS employs modified partial distortion criterion (MPDC), which results in fewer search points with similar distortion. NCDS (2) provides faster searching speed and smaller distortions than other popular fast block- matching algorithms and also we use pipelining method for SAD unit to minimize clock delays with mi

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#### AUTHORS

**First Author** – Dr.S.Rajkumar, Associate Professor/ ECE Dept, Arulmigu Meenakshi Amman College of Engineering, Vadamavandal (Near Kanchipuram), rajakumar.elango@gmail.com

# **Extraction of Niobium from Tin Slag**

<sup>1</sup>Odo, J.U., <sup>2</sup>Okafor, W.C., <sup>3</sup>Ekpe, S.O. and <sup>4</sup>Nwogbu, C. C.

<sup>1</sup>Department of Metallurgical and Materials Engineering, Nnamdi Azikiwe University, Awka <sup>2</sup>Department of Mechanical Engineering, Anambra State University, Uli <sup>3</sup>Delightsome Pearls International School, Port Harcourt <sup>3</sup>Enugu State Science, Technical and Vocational Schools Management Board

*Abstract*- Tin slag a waste product of tin smelting contains many important metals such as niobium, tantalum, manganese, iron, aluminum, titanium, etc. Niobium metal which is one of the important metals found in tin slag has successfully been extracted using leaching and electrothermal method. The tin slag was crushed and ground to very fine particle sizes of nanometer level using laboratory ball mill, piston and mortar. The particles were sieved and 150nm and 180nm particle sizes range were used for this experiment. The samples were subjected to two leaching processes using hydrochloric acid and sodium hydroxide. The residues from the leaching processes were subjected to carbonchlorination at 300oC to produce Niobium oxide. The purity of Niobium metal extracted was calculated to up to 95% which means that tin slag from Nigerian Tin Smelting Company is a good source of high quality Niobium metal.

*Index Terms*- Tin slag, Niobium, carbonchlorination, leaching, extraction, particles, reaction

## I. INTRODUCTION

Niobium is not found in a free state in nature but occurs invariably in the oxidized state in combination with tantalum which it resembles closely both in physical and chemical properties and to which for most applications, it is slightly inferior. No naturally occurring radioactive isotope exists and those certifiably produced have short half- life periods for example, niobium 95, used as gamma emitter, has a half-life of thirty-five days[7,8]. The main source of niobium in the world in the early sixties was columbite/tantalite [(FeMn)(Nb,Ta)<sub>2</sub>O<sub>6</sub>], but for now the major source of niobium is pyrochore (NaCa<sub>2</sub>NbO<sub>6</sub>F)[11]. Niobium and tantalum are known to cooccur with cassiterite deposits[10]. These minerals are commonly found in interior parts of alkali rock complexes, frequently in association with minerals with such elements as titanium, thorium, uranium and the rate earths. In Brazil, where extensive deposits averaging over 2% Nb<sub>2</sub>O<sub>3</sub> are being mined, the occurrences are in alluvial deposits resulting from in situ weathering of syenlte carbonatite rocks, leaving an enriched concentration of magnetic, apatite and pyrochlore. In Canada, this deposit averages about 0.7% Nb<sub>2</sub>O<sub>5</sub> content [2, 6, 9].

Shortages of niobium-bearing ores, particularly during the Korea war and shortage from its previous principal source of niobium-bearing carbonate deposits in Norway and correspondingly high prices have encouraged exploration resulting in the discovery of substantial new deposits, mostly pyrochlore associated and from degradated products of minerals like by-products of mining for other commodities, mainly tin "cassiterite" [9,10,13].

#### **1.1Properties of Niobium**

Niobium is metallic in nature and crystallizes in a bodycentered cubic system and has a density of 8.6g/cm3 at 20°C with a chemical symbol, Nb. It melts and boils at 268°C and 4927°C respectively. Metallic niobium can be prepared by feed electrolysis of Potassium Niobium Fluoride, K<sub>2</sub>NbF or reduction of the oxide by active metals or carbon. Niobium is inert to almost all inorganic acids except hydrofluoric acid. Other physical properties of niobium are tabulated in the Table 1 [13].

#### Table 1. Physical properties of Niobium.

Properties	Value
Refractive index	1.80
Heat Capacity	6.087cal/mole°C g at 100°C
Coefficient of Linear	
thermal expansivity	7.1 x 10% Cal at 20°C
Entropy	10.49 cal/mole K at 400K
Electrical resistivity	15.22x10 <sup>-6</sup> ohms/cm
Electrical conductivity	13.2% 1Acs at 5 18°C
Work function	4.01eV
Positive ion emission	5.25eV
Lattice constant at °C	3.3004A
Atomic diameter	2.94A

Some notable chemical properties of this element are as shown Table 2.

Table 2. Chemical properties of Niobium [12].

Name	Niobium
Symbol	Nb
Atomic number	41
<u>Atomic weight</u>	92.90638(2)
Standard state	solid at 298 K
Group in periodic table	5
Group name	(none)
Period in periodic table	5
<u>Block in periodic table</u>	d-block
<u>Colour</u>	grey

Classification Metallic	

The purity of the sample affects these physical properties. The cold worked metal has strength in the range from 75,000 to 150,000 psi, whereas the values for annealed specimen are 48,000 - 59,00 psi with an elongation as high as 49% and hardness of less than 40 Rockwell E. Strain-aging occurs within the temperature range  $300 - 495^{\circ}$ C. The main difference between niobium and tantalum are in their physical properties.

Niobium resembles tantalum very closely in its properties and is only slightly in most cases in resistance to chemical attack. It is soft and ductile when pure and is contaminated in industrial atmospheres and unattacked by most gases below 200°C. At 350°C it will start to oxidized in air and more readily in oxygen. It exhibits a predominant and highest valence of 5<sup>+</sup> but values of  $3^+$  and  $4^+$  are also well known. It reacts with nitrogen above 300°C and is embrittled by hydrogen above 25°C but nascent embritttlement can occur at room temperature. Fluorine and hydrofluoric acid gas also react with niobium metal. At ordinary temperatures niobium will completely resist acid, and it is not affected by mixed attack by mixture of acids such as aqua regia. There is measurable attack on constant- boiling mixture of hydrochloric acid at the boiling point and by concentrated sulfuric acid at 50°C but well above 175°C the concentrated acid dissolves the metal completely. The attack on this metal by hydrofluoric acid can be increased by adding nitric acid or hydrogen peroxide. Niobium has affinity for oxygen at elevated temperature [1, 2, 3].

#### 1.2 Applications of Niobium

Niobium can be applied in various forms to achieve its proper use. Despite its cost and difficulty in extraction, its properties permit it to be applied as follows: nuclear power reactor, boiling water reactor, super conductivity, chemical resistance, fast fuel breeder reactor, jet engine, boilers, and missile motors production, production of austenitic stainless steels, etc.

Although niobium is somewhat inferior in chemical resistance, it may well replace tantalum for less exacting duties, such as for the lining of some chemical plant, as its density is half that of tantalum, whereas the cost of as rolled sheet or in fabricated form is almost the same on a weight basis.

Niobium metal can be formed and fabricated by practically all-metallurgical and engineering techniques and is available as ingots, bars, rods, and wires. As niobium has such affinity for oxygen and nitrogen cold-working is rarely feasible. Annealing in vacuum or in an inert atmosphere of argon or helium at  $130 - 140^{\circ}$ C and recrystallization at the temperature, it is possible to work-hardened a work-piece of niobium metal. The scrap can be converted back to powder by grinding after embrittlement in hydrogen or, if sufficiency ductile be pressed into bar- shaped bales and used as feedstock in an electro-beam melting furnace. Its powders are used to make consumable electrode.

Ferro niobium is one of the master niobium - bearing alloys. It can be produced from its bearing ore. It is used to improve the quality of structural steels. It is effective as a grain refiner and increases yield and tensile strengths. Its compounds are used in the coatings of electrodes used for welding stabilized stainless and alloy steels. Niobium in the form of ferroalloy containing about 55% Nb is used extensively in the manufacture of austenitic stainless steel to inhibit intergranular corrosion caused by the precipitation of chromium carbide at the grain boundaries. It is twice as effective as tantalum which is also present in the ferroalloy up to 8% due to lesser atomic weight. To be effective, it is added so that the niobium content is ten times that of the carbon.

The exhibitition of the super conductivity by niobium permits its application in radar applications as a superconductive electronic device used in general field of cryogenics.

Niobium I, thermal neutron - capture cross section value and chemical attack resistance made it suitable for use for the design of nuclear power reactor and alloyed with zinconium it is used in experimental boiling water reactor. Its alloy with vanadium is used as the fuel cladding material in the fast breeder reactor. Niobium and tantalum are used to replace carbon as the filaments in early days in incandescent electric lamps only to be superceeded by use of tungsten after few years later[4, 5, 12].

### **1.3 Extraction of Niobium**

Most commercial extraction and refining processes for the preparation of niobium consist of series of distinct operations listed below but sometimes more than one step can be carried out as a single operation.

- The opening of ores and the distribution of the metallic components.
- The separation of niobium from tantalum and other components.
- The preparation of a pure niobium compound (halide, salt or oxide).
- The reduction to metallic niobium.
- The refining, consolidation and fabrication of the metal.

The ores of niobium and tantalum are extremely stable and considerable energy is required to open them. This can be effectively achieved by direct attack with 70-80% hydrofluoric acid with or without the addition of nitric acid. In graphite - lined vessels fitted with reflux devices to minimize acid losses of well over 90%, this feat can be achieved by using concentrated sulphuric acid(9%  $H_2SO_4$ ) at temperatures of 300 - 400°C will attack finely ground columbite and most ores which contain niobium. The reaction is exothermic and is best carried out in vessels made of iron or silicon - iron. The product must be hydrolyzed with an excess water to precipitate the earth acids which after filtration, can be dissolved readily in hydrofluoric acid.

The extraction is concluded after benefaction processes through fractional crystallization of their complex fluorides method, aluminothermic method, carbothermic method and electronic method. In 1957, niobium powder was prepared by reaction of niobium pentachloride with hydrogen at 650°C or by electrolysis of niobium fluoride or niobium chloride from a molten alkali halide bath[5, 6, 8]. The principal process for producing niobium metal at present is based on the aluminothermic of the pentoxide. A massive regulus containing approximately 2% aluminum and 1% oxygen is obtained by this exothermic reaction in a sealed refractory - lined open crucible. The heat of the reaction is sufficient to yield liquid niobium and aluminum products that are immiscible and are separated before solidifying. The volatile aluminum, nitrogen and oxide impurities are subsequently removed by electron - beam melting. Slag resulting from the treatment of tin ores often contain useful quantities of niobium but also include large proportion of silica which makes extraction uneconomic if dissolution in hydrofluoric acid is to be used. A process is claimed whereby silica can be eliminated by using aqueous alkali under pressure followed by acid leaching. Substantial quantities of the slag are also treated by reduction with carbon in an electric furnace to give a mixture of the carbides of the metals present. A synthesis ore can then be prepared by calcinations. Initially, conventional methods used for the extraction niobium from tin slag consist of full dissolution with HF, HF<sup>+</sup>, H<sub>2</sub>SO<sub>4</sub> or smelting in electric furnaces. Currently, these processes are limited either by economic or by environmental considerations [3, 4, 5].

#### II. MATERIALS AND METHODS

The slag was subjected to an impact crusher to reduce the size in order to boast subsequent reaction. Following the crushing process, grinding was instigated to further reduce the size of the lumps. This was done with a pestle and mortar. The ground slag was sieved in grates and sieves with calibrated openings. The sample was subjected to leaching after it had been screened. The beneficiation process itself produced valuable component released in form of concentrates while the impurities were removed as tailings.

In the case of this research sample, this un-reactive nature of niobium was essentially utilized in the process. Its low tendency to be attacked by the leaching reagent enabled its dissociation from other component during beneficiation thus upgrading its valuable portion to promote its extractability. The beneficiation was performed as thus:

25g of two sieved sizes 0.18mm > samples > 0.015mm and < 0.15mm (150nm) were measured into two different beakers A and B respectively. A 50ml of con hydrochloric acid, HCl was measured into the two beakers. The following reactions were observed.

Reaction 1:- On introduction of samples < 0.018mn > 0.150mm into beaker B, a violent corrosive reaction which lasted for about 45 minutes was observed releasing a fume of pungent, unpleasant yellowish green gas which was identified as chlorine. This reaction left the beaker stained.

Reaction 2: In the case of beaker A with samples, < 0.015mm < 0.15mm a less violent corrosive reaction compared to that of beaker B was observed with release of release of lesser fumes. The reaction lasted for about 90 minutes only. The beaker which was occasionally agitated was observed to have been stained.

The possible reactions within the leaching stage were as follows. First degree leading with hydrcloric acid, HCl that yields the low grade concentrates.

$\longrightarrow$ 2NbO <sub>2</sub> Cl + 2H <sub>2</sub> O
$2TaO_2Cl + 2H_2O$
$\longrightarrow$ MnCl <sub>2</sub> + 2H <sub>2</sub> O
FeCl <sub>2</sub> + $3H_2O$ +Cl <sub>2</sub> (g)
$\Box$ CaCl <sub>2</sub> + 2H <sub>2</sub> O
$\blacksquare$ SiCl <sub>4</sub> + 3H <sub>2</sub> O
$\square$ 2AlCl <sub>5</sub> + 4H <sub>2</sub> O (fluxing action)
$_{\text{TiCl}_4} + 3H_2O$
3SnCl <sub>4</sub> + 3H <sub>2</sub> O

At the end of the reaction the contents of both beakers were filtered and the residues were divided into two parts and each part was subjected to a second degree leaching with concentrated sodium hydroxide, NaOH. 50ml of concentrated NaOH was introduced into the beaker containing the two different residues. At about 10 minutes later, a non-violent corrosive reaction was observed and a fairly pungent unpleasant odour different from chlorine was released. This was also observed on the other sample after 20 minutes. The reaction which was left for 48 hours before filtration turned the sample greenish. The residue hereby obtained was treated with de-ionized water and dried over a Bunsen burner.

Second degree of leaching with NaOH, that is subsequent leaching of low grade concentrate with NaOH.

$2Nb_2OCl + 2NaOH + H_2O$	$Nb_2O_5 + 2NaCl + 2H_2O$
$2TaO_2OCl + 2NaOH + H_2O$	$Ta_2O_5 + 2NaCl + 2H_2O$
$MnCl_2 + 2NaOH + H_2O$	$MnO + 2NaCl + 2H_2O$
$FeCl_2 + 2NaOH + H_2O$	$FeO + 2NaCl + 2H_2O$
$CaCl_2 + 2NaOH + H_2O$	$CaO + 2NaCl + 3H_2O$
$SiCl_4 + 4NaOH + H_2O$	$SiO_2 + 4NaCl + 4H_2O$
$2\text{AlCl}_3 + 6\text{NaOH} + \text{H}_2\text{O}$	$Al_2O_3 + 6NaCl + 3H_2O$
$SnCl_4 + 4NaOH + H_2O$	$SnO_2 + NaCl + 3H_2O$

The extraction of niobium from niobium oxide was conducted by eletrothermally heating the sample in a round bottom flask which was air tight and accommodated an inlet and openings. The inlet permits the samples; concentrates of A and B to come in contact with  $N_2$ ,  $Cl_2$  and CO which were passed into a container while the flask was being heated. This heating of the two separate concentrates elapsed over 100 minutes with that of A releasing a vapour of Nb<sub>2</sub>O<sub>5</sub> at a faster time to the outlet via a fractionating column. The condensate was dried and it yielded silver white powder which is the colour of niobium. This was later analyzed using Atomic Absorption Spectrometer (AAS) and gave a value of 78.8% of Nb<sub>2</sub>O<sub>5</sub>

#### III. RESULTS AND DISCUSSION

Table 3.1 Chemical compositions of raw tin slag residues of first and second leaching processes.

Oxide/ Compound	Raw Tin Slag	1 <sup>st</sup> Leaching with HCl(<0.150 mm) particle size	1 <sup>st</sup> Leaching with HCl (>0.150mm but< 0.180mm) particle size	2 <sup>nd</sup> Leaching with NaOH(<0.150m m) particle size	2 <sup>nd</sup> Leaching with NaOH(>0.150m m but< 0.180 mm) particle size
AlaOa	5 10	2 90	2 40	0.17	2 10
Ta <sub>2</sub> O <sub>5</sub>	20.8	31.9	25.6	59.1	42.2
PbO	2.50	0.66	0.73	0.49	0.48
SnO <sub>2</sub>	0.37	0.30	0.30	0.15	0.22
FeO	14.0	10.2	10.2	3.20	0.15
MgO	1.20	0.50	0.54	0.25	0.50
Na <sub>2</sub> O	3.50	2.50	1.10	1.40	1.00
K <sub>2</sub> O	0.86	0.56	0.51	0.03	0.47
CaO	2.80	0.40	0.36	0.16	0.25
Nb <sub>2</sub> O <sub>5</sub>	14.1	16.1	15.3	28.4	23.25
MnO <sub>2</sub>	1.70	0.80	1.00	0.12	0.60

Note: Letter H signifies high grade leaching with HCl and NaOH while low grade leaching with only HCl is denoted with letter L. These results were obtained by a combination of metal analysis using of photometer wet analysis and atomic absorption spectrometer.

# **3.1 Summary Flow Chart**

The summary to the process is as follows. Niobium extraction flow chart is as below.



The above Table shows the chemical composition of raw tin slag, residues from both first and second leaching process using hydrochloric acid and sodium hydroxide. From the result obtained the chemical composition of the raw tin slag obtained indicates that the slag has the following oxides: aluminium oxide (Al<sub>2</sub>O<sub>3</sub>), tantalum oxide (Ta<sub>2</sub>O<sub>5</sub>), iron oxide (FeO), lead oxide (PbO), magnesium oxide (MgO), tin oxide (SnO<sub>2</sub>), sodium oxide (Na<sub>2</sub>O), potassium oxide (Ka<sub>2</sub>O), calcium oxide (CaO), niobium oxide (Nb<sub>2</sub>O<sub>5</sub>), manganese oxide (MnO<sub>2</sub>) and others as trace as its constituents..

Two leaching processes were carried out to reduce the percentages of the unwanted minerals and hence increase that of tantalum oxide and niobium oxide. First leaching was carried out using hydrochloric acid and tin slag particles of particle sizes less than 0.15mm and those greater than 0.15mm and those greater than 0.15mm but less than 180mm. The use of hydrochloric acid in the first leaching process was for it to provide the necessary reactive surface on the sample since it provides hydrogen ions (oxonium) in aqueous solutions. This produced the proton necessary for exchange of the reaction activity and the chemical reduction/leaching. The second leaching process was carried out in concentrated sodium hydroxide using tin slag particle sizes of less than 0.15mm and those greater than 0.15mm but less than 0.18mm. Sodium hydroxide is an alkali or basic hydroxide soluble in water and gives hydroxide ions in aqueous solutions capable of accepting protons. On analysis of the results of the two leaching processes carried out, it was discovered that there were higher reduction of the unwanted oxide in the process carried out with bigger grain sizes, while the percentage of the unwanted oxide were decreasing while that of tantalum oxide and niobium oxide were increasing. The higher percentages of niobium oxide and tantalum oxide in the beaker with larger particle sizes indicates that the solution /leachants were able to penetrate in between the particles better and the removal of those unwanted particles were high because of higher reaction rate/activity. The percentages of tantalum oxide and niobium oxide recovered from the residues after the second leaching process were 59.1% and 28.4% respectively. The niobium oxide which is the wanted mineral was later subjected to wet process of extraction by washing and drying.

After metallurgical extraction process, analysis of the residue using Atomic Absorption Spectrometer (AAS) showed that 78.8% of Niobium oxide was obtained. The 78.8% of niobium oxide was then subjected to mathematical calculation using molecular formular and atomic weights of the elements contained by oxide thus:

Obtained % Nb<sub>2</sub>  $O_5 = 78.8\%$ 

The atomic weight of the constituents of  $Nb_2 \ O_5\,$  equals: Nb=93g

 $O_2 = 16g$  with respect to the atomic hydrogen weight.

Molar mass of Nb<sub>2</sub> O<sub>5</sub> =  $(93 \times 2 + 16 \times 5)g = 78.8\%$ 

$$186 + 80 = 266g = 78.8\%$$

 $\therefore$  1 gram 78.8/266 = 0.2962406  $\approx 0.30$ 

Portion of Niobium =  $186/266 \times 78.8 = 55.10075 \approx 55.10\%$ Then mass niobium in the Nb<sub>2</sub> O<sub>5</sub>  $188/266 \approx 0.6992481$  $0.6992481 \times 100 = 69.93\%$  Quantity of niobium extracted from 25g of tin slag = 6.7g  $= 6.725 \times 100 = 26.8\%$ 

 $\therefore$  Recovery % = 6.7/25 x 100 = 26.8%

This is a good result as far as extraction of niobium is concerned. The density of niobium obtained by the displacement in water is: Density = mass/volume 6.7/0.82 = 8.17g/cm<sup>3</sup>

Therefore to obtain the percentage purity, the theoretical density of the niobium at  $20^{\circ}$ C is 8.57g/m<sup>3</sup>.

Therefore % purity = real density/ theoretical x 100%

 $= 8.17/8.57 \text{ x } 100 \approx 95.3\%$ 

Hence the percentage impurity = 4.67%

#### IV. CONCLUSION

The extraction of the high grade niobium oxide is economically and technologically feasible using double leaching and consequent wet extraction process. The percentage purity of niobium metal extracted from the tin slag was 95.33% which indicates that high valuable minerals of tantalum and niobium are possible to be extracted from tin slag. Tin slag which is a waste product of tin extraction can be gainful recycled and niobium and tantalum metals recovered from it instead of throwing the slag away. This can also be a useful means of reducing the hazard of solid wastes to the environment thereby helping in the environmental management problem. The recycling and recovery of these valuable metals from the tin slag could generate employment opportunities and improve the social and economic life of the host community and increase the export potentials of the nation.

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# AUTHORS

**First Author** – Odo, J.U, Department of Metallurgical and Materials Engineering, Nnamdi Azikiwe University, Awka, Email: drjuodo@gmail.com

**Second Author** – Okafor, W.C, Department of Mechanical Engineering, Anambra State University, Uli, Email:

profdatao@gmail.com

**Third Author** – Ekpe, S.O, Delightsome Pearls International School, Port Harcourt

Fourth Author - Nwogbu, C. C, Enugu State Science,

Technical and Vocational Schools Management Board

# Lived Experiences of Individuals with Chronic Renal Failure Undergoing Hemodialysis in Selected Hospitals

Roderick C. Suminta, MAN, RN, PT<sup>\*</sup>, Maria Theresa G. Suminta, MAN, RN<sup>\*\*</sup>

<sup>\*</sup> Union Christian College, Philippines & Shaqra University, Saudi Arabia <sup>\*\*</sup> Union Christian College, Philippines & Security Forces Hospital, Saudi Arabia

Abstract- Different themes emerged from the lived experiences of the 36 co - researchers, here referred to individually with their fictitious names. The following are the themes and their respective meaning: A) Desensitizing information - Initial reactions of the condition: counting the days left, full of disbelief, unbearable, unacceptable, Why me!, What have I done?, and difficult to explain; (B) Holistic disease experience - individual symptomatic experience: Fluid restrictions, Easy fatigability, Vomiting, fever and abdominal pain, Edema /heaviness, Gasping for breath, Increased / decreased blood pressure, fragile, easily fatigued and weak, lost my appetite, think more often, afraid to die and difficulty urinating, weak and body pains; (C) racing against the waves - coping with the illness and support systems: hemodialysis treatments, medications, self - discipline, compliance to restrictions, available financial support, familial bonds, prayers and strong faith and internet learning; (D) Self in relation to family and society - perception of relationship to others: closer family ties, religious freedom, psychological resilience, friendship rekindled, reunion with friends, words of encouragement, informal support group and lost companionship; (E) Rocky roads to wellness - aggravating circumstance/s: financial incapacitation, acquired debts, presence of other medical conditions, worsening symptoms, distant dialysis centers and skipping of dialysis treatments and (F) Quality of life - sense of productivity: typical routine was severely changed, a lot of dramatic changes, restrictions are abound and ability to go to the market and cook foods and do most of the household chores.

Based on the preceding findings, the following recommendations were made:

- 1. Continued research focused on the lives of chronically ill patients, as well as exploration of the caregivers' perspective, to determine how they continue with their lives is needed.
- 2. Moreover, the establishment of evidenced based practice for the promotion of the enhancement of the quality of life of other chronically ill individuals should also be taken into account.
- 3. A follow up study can be conducted to further view the co-researchers' lives after this study.
- 4. Finally, the proposed Health Teaching Guide be adopted by nurse managers for them to discover its usefulness and effectiveness as a health teaching guide to individuals with chronic renal failure undergoing hemodialysis to reinforce any knowledge that these individuals have on their conditions.

*Index Terms*- Hemodialysis, Health Teaching Guide, Hemodialysis Patient, Lived Experiences

#### I. INTRODUCTION

The world today is overwhelmed with advances in technology with the prime goal of promoting the general well – being of people. A wide array of devices and machines were ultimately developed to serve one common goal, to help people recover from seemingly hopeless scenarios exemplified in many terminal illnesses. In the field of medicine, numerous countless advances have been proven to be effective in prolonging life of terminally ill people. Dialysis in its various forms has been taken as one of the most common measures to help people cope with kidney disease, primarily the end – stage renal disease (ESRD).

According to the Department of Health, kidney diseases, especially end stage renal disease (ESRD), are already the 7th leading cause of death among the Filipinos. One Filipino develops chronic renal failure every hour or about 120 Filipinos per million population per year. More than 5,000 Filipino patients are presently undergoing dialysis and approximately 1.1 million people worldwide are on renal replacement therapy. Reliable estimates reveal that the number of these patients will double in 2010. In the past, chronic glomerulonephritis was the most common cause of chronic renal failure. Today, diabetes mellitus and hypertension have taken center stage in the causation of ESRD which together account for almost 60% of dialysis patients. The cost of medical treatment for kidney disease is really exorbitant, beyond the reach of ordinary patients. Renal transplantation is limited due to the expense and the shortage of donors. The best that can be done at present is to focus efforts on the prevention of progression of renal diseases. Strict blood pressure and glycemic control and adoption of " healthy lifestyle" play a major role in reducing if not totally controlling the epidemic of renal failure and this could be achieved through proper education. (http://www.nkti.gov.ph)

Since the 1960s, when hemodialysis first became a practical treatment for kidney failure, much have been learned about how to make hemodialysis treatments more effective and minimize side effects. In recent years, more compact and simpler dialysis machines have made home dialysis increasingly attractive. But even with better procedures and equipment, hemodialysis is still a complicated and inconvenient therapy that requires a coordinated effort from the whole health care team, including the nephrologist, dialysis nurse, dialysis technician, dietitian, and social worker. The most important members of the health care team are nurses and the patient's family. By learning about the

treatment, a patient can work with the health care team to give the best possible results, and can lead a full, active life (NIH, 2006).

Unfortunately, treating kidney failure is a burden borne not only by the patient, but by the entire family. A family member or caregiver is needed to care for the patient, attend to medications and meals, and assist in providing treatment, whether by performing dialysis itself with peritoneal disease (PD) or accompanying the patient to hemodialysis (HD) facility. Commonly, a family member has to stop working to care for the dialysis patient. The patient is too weak to provide self-care and loses independence. Patients who cannot afford treatment rely on other family members to look for the needed funds. Children stop schooling, savings are used up, objects of value are sold, and all the earnings of those who work are used to pay for dialysis. This results to families that are impoverished because of a single patient with kidney failure who needs treatment. The cost of treatment therefore is not limited to the cost of dialysis. Rather, the cost is multiplied a hundredfold, and becomes the burden of an entire family (Dañguilan, 2008).

Different aspects in the life of a hemodialysis patient are also affected. Psychologically, hemodialysis patients may have a tough time accepting their condition. This involves their emotions that may greatly affect on how they will cope to the stressful events in their life brought by the situation caused their disease. Hemodialysis patients' psychological status can be a great factor for them to overcome the stress that they are going through. Social aspect involves the interaction of hemodialysis patients to people that surrounds them. Support is very important for people going through stressful circumstances. This support can give courage to hemodialysis patients for them to never lose hope in life and be able to surpass their present situation. Spiritual aspect involves the beliefs of patients to supreme beings. This belief gives them upliftment to their inner being. Physiologically, a hemodialysis patient undergoes a series of changes. These changes affect their physical state and may have a long - term effect in their life (Paraiso, Manigsaca, Romero and Turla, 2009).

Chronic renal failure / end – stage renal disease (ESRD) was dubbed as a "worldwide public health crisis" noting that the rate of new cases (Mason, 2005). The thought of having a chronic disease such renal failure can trigger an enormous grief response in an individual. As defined, grief is a dynamic process that changes in nature. It does not represent a rigid linear progression in emotions and thoughts as behavior but a continual move across different phases or stages. Being diagnosed with chronic renal failure does not only place a person to worry on financial demands but more than not, that person experiences psychological distress (Caronan, 2001).

Chronic renal failure can be treated by renal replacement therapies, such as hemodialysis, transplantation, and peritoneal dialysis (ERA-EDTA Registry, 2006). Transplantation has become the answer to many patients with kidney failure. Kidney transplantation affords patients with kidney failure good health sufficient to resume their normal lives. With this second chance at life, a better lifestyle commonly emerges. Patients become smarter eaters, refrain from smoking and alcohol, and take better care of themselves. Dialysis remains an excellent option, but for those who have been transplanted, life just got better (Dañguilan, 2008).

Renal Replacement Therapy is the major form of treatment for patients with ESRD. It is either artificial and intermittent (hemodialysis and peritoneal dialysis) or biologic and continuous (kidney transplantation), both of which aim to replace some of the functions of the diseased kidneys such as removing excess wastes and fluids, and keeping the balance of electrolytes appropriate. While not a cure, it is a life-sustaining process to keep you live as best as you can (http://www.stluke.com.ph).

### II. IDENTIFY, RESEARCH AND COLLECT IDEA

Initial contact was initiated to meet with key hospital administrators, nurse managers and respondents, taking into account some of the problems associated with data collection like the possibility of reluctance of patients to take part in the interview process and of the hospital administrators to allow their patients to take part in the study. Of the three (3) foreseen hospitals, one declined to allow their patients to participate in the research study. To counteract these negative aspects, ethical and legal considerations were given utmost importance.

Using a Road Map as a guide as it embodies a collective representation of lived experiences, data collection was performed using semistructured interviews and story – telling in the dialysis u nits of selected hospitals in La Union. Interviews with patients receiving hemodialysis treatments in a free standing dialysis center was recorded with permission from the informants, transcribed verbatim, and analyzed using phenomenological methods. The overall theme of (1) personal meaning of chronic renal failure while undergoing dialysis treatment, (2) managing and monitoring health, (3) lifestyle consequences, (4) family impact, and (5) informal support structures were derived into account during the interview process.

Participants were asked about their experiences of chronic renal failure by using the following five questions: (1) I have no experience of chronic renal failure; how would you explain to somebody like me what it's like to live with chronic renal failure? (2) What helps you to live with chronic renal failure? (3) What changes chronic renal failure had brought in to your life? (4) What makes it harder to live with chronic renal failure? (5) What support systems / solutions have you found to deal with these problems, and is there anything else you can think of that would make life better for people with chronic renal failure?



Figure 1 Road Map

#### III. WRITE DOWN YOUR STUDIES AND FINDINGS

### **Results and Discussion**

Primary Reflections: Primary Experiences and Thematic Reflection

#### First level of discussion/interpretation

The researcher's interest in this study has been nurtured by acquaintance to friends and colleagues working in the dialysis units of several hospitals in La Union and Pangasinan as well as his exposure as a nurse caring for patients suffering from kidney problems. Notably, the researcher's grandfather (from the mother side) died from kidney disease. What are the circumstances that could lead to kidney failure? What do patients with chronic renal failure undergoing hemodialysis think and feel regarding their illness and the economic preparations and consequences of such treatments? How do they and their families adjust to their conditions and to the economic outcome of hemodialysis treatment? How it affects their way of living? These were the concerns this study looked into.

In the analysis of the lived experiences of individuals with chronic renal failure undergoing hemodialysis, the researcher used the modified van Kaam method as described by Donna Hathorn (2009) for data analysis. The researcher found this eight step approach effective in organizing, analyzing, and synthesizing the data. Specific themes were drawn from the data collected.

Step One: Listing and Preliminary Grouping

The researcher listed and conducted a preliminary grouping of the data by transcribing each audio file verbatim. The researcher did not skip over any statement or word from the transcription, and considered each phrase equally relevant. This is known as horizonalization, viewing each statement as having equal value.

Step Two: Reduction and Elimination

The researcher did data reduction by constantly reading every transcript and eliminating statements that did not answer the guiding question. Overlapping, cyclic, and vague expressions were also eliminated. The remaining statements became the invariant constituents (the meaning units or horizons) of the experience, and described the phenomenon in exact descriptive terms. As participants were added, the invariant constituents increased. The researcher have provided an example of how the data was reduced to the composite invariant constituents that answered the guiding question: "How would you explain to somebody like me what it's like to live with chronic renal failure?"

Step Three: Clustering and Thematizing the Invariant Constituents

The researcher clustered the invariant constituents and defined the "core themes of the experience".

#### Table 1: Themes and Definitions of the Lived Experience of Patients with Chronic Renal Failure Undergoing Hemodialysis

themes	definition
Desensitizing information	Initial reaction of the condition
Holistic disease experience	individual symptomatic
	experience
racing against the waves	Coping with the illness
	Support systems
Self in relation to family and	Perception of relationship to
society	others
Rocky roads to wellness	Aggravating circumstance/s
Quality of life	Sense of productivity

Step Four: Final Identification of the Invariant Constituents and Themes by Application: Validation

The researcher checked the invariant constituents and the themes against each individual transcript to make sure the theme was expressed either overtly or was well-matched with the constituents. This process helped determine the congruency of the experience.

Step Five: Construction of Individual Textural Description

For each participant the researcher described what the patient experienced using excerpts from the transcript. This was done essentially by explaining the themes in a narrative format. This process helped the researcher to understand "what" the patient experienced.

Step Six: Construction of Individual Structural Description

For each participant the researcher incorporated into the textural description a structure explaining how the experience occurred. As the researcher wrote the textural description, the researcher reflected on the conditions that precipitated what the client experienced. This process helped the researcher to understand "how" the experience occurred. The researcher used "acts of thinking, judging, imagining, and recollecting, in order arriving at core structural meanings".

By using imaginative variation, imagining the experience occurring in a variety of structures, the researcher perceived the experience occurring in different circumstances and identified the conditions that accompanied the experience. This helped the researcher understand how the clients' experience came to be what they were and the conditions that were met to develop actions.

Step Seven: Construction of a Textural – Structural Description

For each participant the researcher merged the two narratives (textural and structural) that were created from steps five and six. The finished narrative description included the researcher's understanding of "what" (texture) occurred, and "how" (structure) the experience occurred for each participant. After an exhaustive imaginative and reflective study, the researcher explained the experience according to how the researcher understood it, from his vantage point, and described the essence of the experience.

Step Eight: Composite Description Textural-Structural

The researcher used synthesis to create a composite textural and structural description. This process helped him to determine the essence of the overall experience. For example, the coresearchers' feelings and attitudes toward their condition varied and changed according to the circumstances or structure of the situation within their family or society. The co-researchers' various attitudes toward their condition when they perceived that quality patient care was threatened or when hemodialysis session is impossible.

#### **Thematic Presentation**

Data analysis revealed the co-researchers' varied lived experiences. The researcher gained an understanding of what outlook the clients experienced and how various emotions and experiences arise. On the process, six (6) themes emerged with holistic disease experience on the central focus. These themes are as follows and are described thereafter: a)*desensitizing truth, b*) *holistic disease experience, c*) *racing against the waves, d*) *rocky roads to wellness, e*) *esprit de corp: self in relation to family and f*) society and quality of life.



#### Figure 2: Thematic Representation of Lived Experiences of Individuals with Chronic Renal Failure Undergoing Hemodialysis

# **Desensitizing Truth**

The participants expressed in unison an extreme initial disbelief that their kidneys started to fail and that they have to undergo a series of hemodialysis treatment in order to sustain and prolong life. For example, Mandy stated, "It's abrupt! I just can't believe it happened. It's present now and there's nothing that can be done." The clients' reaction was influenced by the belief that once on hemodialysis treatment, a lot of restrictions have to be imposed and that death is imminent.

### **Holistic Disease Experience**

Indications of kidney failure can vary from person to person. Someone in early stage kidney disease may not feel sick or notice symptoms as they occur. When kidneys fail to filter properly, waste accumulates in the blood and the body. If the disease progresses, symptoms become noticeable (if the failure is of sufficient degree to cause symptoms). Kidney failure is often accompanied by noticeable symptoms. The respondents verbalized invariant experiences with chronic renal failure or end – stage renal disease (ESRD).

#### **Racing Against the Waves**

Man has an inert nature to make adjustments whenever he is surrounded by stressors, much more so if chronic illness struck him. In the fight against chronic renal failure, patients often face a seemingly insurmountable problem that can range from psycho – physical to economic difficulties. Technologically wise, more often than not, patients will always find ways to remain standing battling the disease. Hemodialysis treatments provided in some hospitals in La Union offer an unwavering hope that life can be sustained or prolonged.

#### **Rocky Roads to Wellness**

The reality that the respondents have to follow a strict regimen of a combined medical, dietary and hemodialysis treatments frequently complicate their situation. Continuous dialysis treatment sessions mean more financial demands that must be met in order to obtain such regimen and this commonly makes matters worse as more families continue to acquire debts. Consequently, many of the respondents acquire their condition from a pre-existing medical condition and that respondents feel recurrence of disturbing symptoms.

# Esprit de Corp: Self in Relation to Family and Society

The disease experience, no matter how much drastic changes it caused to the respondents, had brought in several good aspects in their lives. Some of the respondents even become closer to their friends, who offer unsolicited support.

# **Quality of Life**

Admissibly, chronic kidney failure has brought drastic changes in the lives of the respondents. Majority of the respondents are at their productive years.

# IV. CONCLUSION

# **Secondary Reflections: Eidetic Reduction**

Exploring the previously discussed themes by relating the researcher's own personal insights with the experiences of his co-researchers, the secondary reflection or eidetic reduction has been reached.

The first eidetic insight is that patients suffering from chronic renal failure develop resilience through supportive family structures. This can be viewed from the indomitability of the human spirit. True enough, even relatives abroad would lend a helping hand and offer assistance to affected family members.

Co - researchers are pretty much aware that they acquire their disease from various reasons: genetic outcome, hereditary factors, unhealthy lifestyle practices, pre-existing medical condition and improper fetal programming. Thus, they claim that their condition runs in the family. Some would consider their case as an outcome of lifestyle they lived as a possible reason. One co-researcher even believed his condition arises from the fact that he was a post-menopausal baby where at later stage of life, some body parts will eventually fail. Most of the time, notwithstanding the deteriorating state and lack of financial resources, families of chronic renal failure patients have dealt with their infirmity with an optimististic attitude that is, an attitude of acceptance as an alternative to denial or the feeling that one has to stressfully fight against an event. Family relationships serve as a strong foundation to patients' lives. Caring for each other is indeed so much a part of the values of the Filipino family. Filipino values are, for the most part, centered at maintaining social harmony, motivated primarily by the desire to be accepted within a group. While there is strength of the family, though government support is commonly seen as rather weak or negligible, majority of the co-researchers are benefiting from social support and services provided by the government. Only a fraction of the co-researchers wish that they may also avail such aids from the state.

Another insight is that chronic renal failure patients are transformed from a state of illness to a state of health through stronger family ties, prayers, healing and spirituality. During the disease process, the chronic renal failure patient goes through an experience of fear, denial, regret, self – pity, desperation, hopelessness and a desire to die. But with advancements in medical science and technology, devices such as the dialysis machine offers hope. Emerging low from bouts of illnesses, patients discover the path to wellness through the power of stronger family ties, prayer, healing by faith and spirituality matched with technological advancements.

#### **Third Reflections: Transcendental Reductions**

Based on the content of the experiences of co-researchers, the insights validated by co-researchers themselves, and through review of literature, the researcher studied the concealed meaning of these experiences and arrived at the third level of reflection, the transcendental reduction.

Beyond the sensible and evident individual outlook, there is a need for a holistic approach to compassionately care for clients with chronic renal failure and that a humanitarian society equipped with a unique struggle to maintain health and wellness of the society through educational and informative sessions. This is the fruit of the third reflection – a fully established mechanism bound with shared goal of a well – informed society and productive community. Thus the struggle for health is the struggle to decrease incidence of chronic renal failure and increase health awareness.

# Symbolic Reflection

Symbolically, the lived experiences of individuals with chronic renal failure undergoing hemodialysis can be compared first to a situation where a man is contentiously watching the waves as it endlessly kissed and punish the shore. It reflects the reactions of clients when faced with such insurmountable condition. It connotes the resilience, serenity and strong faith that co-researchers show as if everything will be alright (at the right time).

# Recommendations

Although conclusions from this research study cannot be generalized beyond the sample, the consumer of qualitative research findings should determine the degree to which they can relate to the findings from a practical point of view. Based on the findings of this study, the researcher strongly recommended the following for action:

- 5. Continued research focused on the lives of chronically ill patients, as well as exploration of the caregivers' perspective, to determine how they continue with their lives is needed.
- 6. Moreover, the establishment of evidenced based practice for the promotion of the enhancement of the quality of life of other chronically ill individuals should also be taken into account.
- 7. A follow up study can be conducted to further view the co-researchers' lives after this study.
- 8. Finally, the proposed Health Teaching Guide be adopted by nurse managers for them to discover its usefulness and effectiveness as a health teaching guide to individuals with chronic renal failure undergoing hemodialysis to reinforce any knowledge that these individuals have on their conditions.

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#### AUTHORS

**First Author** – Roderick C. Suminta, MAN, RN, PT (Union Christian College, Philippines & Shaqra University, Saudi Arabia)

**Second Author** – Maria Theresa G. Suminta, MAN, RN, (Union Christian College, Philippines & Security Forces Hospital – Dammam, Saudi Arabia)

# The Impact of Morbid Obesity on Patient Outcomes after Total Knee Replacement Arthroplasty: A Matched Prospective Study

# Prateek S. Joshi, Jawahir A. Pachore

Department of Orthopaedic Surgery, Shalby Hospitals, Ahmedabad, Gujarat, India

### Abstract

Context:

There are currently no published studies analyzing outcomes of total knee arthroplasty (TKA) in Morbidly Obese (MO) Indian patients

Aim:

To compare short-term outcome of TKA in MO with Non Obese (NO) patients

Settings and Design:

Prospective matched case-control study of 40 TKA in each MO and NO patients from September 2012 to June 2013

Methods and Material:

All 40 NO and MO patients who underwent TKA were followed up for 12 months & clinical and radiological outcomes were evaluated.

Statistical analysis:

SPSS Version 21.0 (Levene's Test, Chi- square test and students T test).

Results:

Mean age of MO was 61 and NO was 64 years. Females were predominant in both groups with 62.5% in MO and 60% in NO group. Average BMI in NO was 27.5 and was 44.2 in MO group. Mean ICU stay & hospital stay was 0.15 and 0.25 days & 5.17 and 5.22 days in NO and MO groups respectively. Fixed bearing posterior stabilized implant was used in 90% and 70% in MO and NO group respectively. In 40 MO 7(17.50%) had no comorbidity. 33(82.50%) had different illnesses. In 40 NO 11(27.50%) had no comorbidity and 29(72.50%) had comorbidities. In MO VAS score improved from  $7.38\pm0.78$  to  $2.51\pm1.35$  and in NO from  $7.49\pm0.85$  to  $1.62\pm0.95$ . In MO WOMAC score improved from  $17.75\pm5.82$  to  $75.05\pm8.57$  and in NO from  $22.57\pm7.45$  to  $82.05\pm7.16$ . The functional Score of MO and NO improved from  $16.25\pm5.15$  to  $68.87\pm16.89$  and from  $20.62\pm9.21$  to  $80.75\pm8.43$  respectively. In NO, average varus of  $2.02^{0}$  changed to average values of  $4.5^{0}$ . In MO group average varus of  $2.35^{0}$  changed to average values of  $4.5^{0}$ . In MO patients, 33(82.50%) had no complications, 4(10%) had Restricted Flexion while 4(10%) had Superficial Infection.

Conclusion: Anticipation & prevention of technical difficulties & complications leads to better outcome of TKA in MO patients **Key terms**: total knee arthroplasty, obesity, morbidly obese, joint arthroplasty. Text

# I. INTRODUCTION

The Quetelet index, also known as body mass index (BMI), is defined as weight in kilograms divided by height in meters squared<sup>1</sup>. It relates well with body-fat percentage and is preferred method for assessment of magnitude of potential health risks associated with excessive body weight<sup>2</sup>. Obesity is defined as BMI more than 30 kg/m2 where normal BMI is 18.5 to 25 kg/m2, overweight being 25 to 30 kg/m2 and morbid obese defined as BMI more than  $40 \text{kg/m2}^1$ . Morbid Obese people have many orthopaedic problems like osteoarthritis (OA)<sup>3</sup>, low back pain, gout, poor mobility. Prevalence of osteoarthritis in obese patients is more in comparison to normal weight people <sup>2,4,6</sup>. Thus many people undergoing total knee arthroplasty (TKA) are obese and a subset of them are Morbidly Obese (MO)<sup>2,4,6</sup>. BMI, being an indicator of obesity, can be a reliable predictor of surgical outcome in TKA<sup>5</sup>. There are several studies in the literature evaluating the results of TKA in the obese patient<sup>7-15</sup>, few have described the results in the MO and no published study has evaluated outcomes of TKA in MO patients in Indian population

In order to assess the influence of morbid obesity on the outcome of TKA, we have designed a prospective study comparing short-term clinical and radiological outcome of TKA in MO and matched group of Non Obese (NO) patients.

#### II. SUBJECTS AND METHODS

Ours is a prospective case control study involving 40 patients in each MO (15-male, 25-female) and NO group (16-male, 24-female) out of total 4514 TKA surgeries performed between September 2012 to June 2013. All patients were operated between September 2012 to June 2013 at our tertiary care referral orthopaedic centre. MO patients (BMI>40kg/m<sup>2</sup>) who underwent unilateral primary TKA for osteoarthritis were included in case group. Patients with BMI less than 30kg/m2 undergoing primary unilateral TKA for osteoarthritis were excluded from both groups. After written informed consent all the patients were evaluated clinically in detail. Data was collected from history, thorough physical examination, blood & other investigation parameters. Their pre-operative VAS, WOMAC score, ASA score, KSS scores were recorded [*Fig. 1*].



Figure 1: Preoperative clinical photograph

The VAS is a psychometric response scale. Operationally, it is usually a horizontal line, 100 mm in length, anchored by word descriptors at each end. The patient marks on the line the point that they feel represents their perception of their current state. The VAS score is determined by measuring in millimetres from the left hand end of the line to the point that the patient marks. The WOMAC (Western Ontario and McMaster Universities Arthritis Index) score measures five items for pain (score range 0-20), two for stiffness (score range 0-8), and 17 for functional limitation (score range 0-68). ASA (American Society of Anesthesiologists) classification is a system for assessing the fitness of cases before surgery. The categories included are as below.

- 1. Healthy person.
- 2. Mild systemic disease.
- 3. Severe systemic disease.
- 4. Severe systemic disease that is a constant threat to life.
- 5. A moribund person who is not expected to survive without the operation.
- 6. A declared brain-dead person whose organs are being removed for donor purposes.

Knee society score (KSS) is scoring system which includes Knee score (0-100) and Functional score (0-100). Knee score includes pain, range of motion, stability, deformity whereas functional score includes walking distance, climbing stairs & need for walking aid. Pre-operative standing weight bearing AP X-rays and lateral X-rays were taken. Coronal plane alignment was measured with goniometer clinically and with computer software from X-rays. Patients in control group were matched as much closely as possible to study group with relation to age, sex, pre-operative VAS score, KSS, WOMAC score. After written informed consent all patients were operated by senior arthroplasty surgeons under spinal anaesthesia [*Fig. 2*].



Figure 2: Intraoperative surgical preparation

Cefuroxime 1.5 gm half hour before surgical incision and 12 hourly for next two doses followed by oral cefuroxime 500 mg for next five days were administered. We didn't use antithrombolytic agents to reduce surgical blood loss in any patients. Post-operatively all Patients were started on physiotherapy protocol involving knee mobilization and DVT prevention exercises. In high risk patients Inj.

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Clexane 0.4ml SC was given for a week post operatively followed by oral rivaroxaban once a day 10 mg for three weeks. Sutures were removed 2 weeks after surgery. Post operative X-rays were done to assess implant position, coronal plane alignment with help of computer software.

All patients were followed up immediate post op period and 12 months post op period. At 12 months post op period all patients underwent detailed clinical and radiological evaluations. VAS, WOMAC, KSS scores were recorded. Any complication occurring from the time of operation till post op 12 months was recorded.

All data was analyzed using SPSS Version 21.0. Statistical test used were Levene's Test for Equality of Variances, Chi- square test and students T test.

III. RESULTS

Results are summarized in Fig. 3, Fig. 4, Table I, II & III.



Figure 3: Age and BMI distribution in both groups

MO group had more (but not statistically significant, p=0.0707, p>0.05) varus deformity than NO group patients. Post operative alignment in normal weight group patients was more towards ideal valgus alignment in comparison to MO group.





Figure 4: Co-morbid illness and complications in both groups

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This difference was statistically significant (p<0.05). Across all 40 subjects, on average, alignment was observed to have changed from varus to valgus after operation. Comparing Pre op and Post op alignment for both groups, alignment was found to change by 4.92 degrees towards valgus in MO patients while in NO patients it was found to change by 6.57 degrees towards valgus, which was statistically significant (p<0.05).

Results	Non-Obese	Morbidly Obese	P value
	64(49-77) years	61(46-92) years	
Age	(Median- 64, Mean- 63.62, Mode-70)	(Mean-60.72, Mode-55, Median-59.50)	-
Candan	M-16(40%)	M-15 (37.5%)	
Gender	F-24 (60%)	F- 25(62.5%)	-
	27.58 kg/m2	44.20 kg/m2	
BMI	(Range- 18.7- 29.97,	(Range- 40-57, Mode- 40.01, Median- 42.21).	-
	mode 29.80, Median 28.61)		
Tourniquet	7	3	>0.05
Drain	3	3	1.00
Side	R-21 L-19	R-22 L-18	1.00
Abbreviations	M- male F- female		
	R-right L- left		

Table	I:	Results
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Table II: Results

		Morbidly	Р
Results	Non-Obese	Obese	value
Hospital stay	5.225 days	5.175 days	0.69
ICU stay	0.15 days	0.25 days	0.52
	Varus of		
	2.02	Varus of 2.35	
Pre-op	Val 8 Neu 8	Val 6 Neu 4	
alignment	Var 24	Var 30	0.07
	Valgus of		
	4.55	Valgus of 2.57	
Post-op		Neu 7 Var 1	
alignment	Val 40	Val 32	< 0.05
	FB PS 28,		
	RPPS 6,	FBPS 36,	
	STEMMED	CRMB 1	
	4	STEMMED 1	
	ALL POLY		
Implant	2	ALL POLY 2	-
Co-morbidity	29	33	>0.05
Complication	2	7	< 0.05
Abbreviations	val- valgus	FBfixedbearing	
	var- varus		
		RP- rotating	
	neu - neutral	platform	
	MB mobile	CR- cruciate	
	bearing	retaining	

#### IV. DISCUSSION

We are witnessing an obesity epidemic throughout the world which is expected to worsen in future. In India, according to ISHKS joint registry<sup>16</sup>, 34,478 TKAs across India since October 2006. Out of 34,478 TKAs, average body mass index was 29.1 (Range: 18.1 to 42.9). This trend suggests that in near future arthroplasty surgeons are more and more likely to have MO patients as candidates for knee replacement surgery. Obese patients have an estimated risk of between 9-13% of developing osteoarthritis of the knee for each additional kilogram of body mass. With each 5 kg of weight gain, their risk of developing osteoarthritis increases by 35% <sup>17</sup>.

#### Table III: Results

Results	Non-Obese	Morbidly	P value
		Obese	

# 134

ASA	1 20 2 20 3 0	1 2 2 36 3 2	-
VAS	Pre-op 7.49±0.85	Pre-op 7.38±0.78	0.552
	Post-op 1.62±0.95	Post-op 2.51±1.35	0.001
WOMAC	Pre-op 22.57 ± 7.45	Pre-op 17.75 ± 5.82	0.002
	Post-op 82.05 ± 7.16	Post-op 75.05 ± 8.57	0.0001
FUNCTIO NAL SCORE	Pre-op 20.62 ± 9.21	Pre-op 16.25 ± 5.15	0.011
	Post-op 80.75 ± 8.43	Post-op 68.87± 16.89	0.0001
KNEE SCORE	Pre-op 20.55 ± 9.55	Pre-op 14.63 ± 6.32	0.002
	Post-op 70.48 ± 6.22	Post-op 61.13 ± 6.82	0.0001

In our study too mean age of patient undergoing TKA was lower in MO group (61 years, range 46-92 years) than in NO group (64years, range 49-77 years).

Fifty per cent of middle-aged obese healthy women with unilateral radiographically demonstrated knee OA developed osteoarthritis in the contralateral knee within two years, a 5-fold higher incidence than NO women in the same age range<sup>18,19</sup>. In our study, out of total 40 patients, there were 25 females in MO group and 24 females in NO group, hence confirming significantly high prevalence of OA in female population.

MO patients who undergo TKA face larger number of associated comorbidities than NO individuals and hence more postoperative complications and worse outcomes. Miric<sup>20</sup>, Namba<sup>21</sup> & Nuñez<sup>22</sup> studied TKA in obese populations and they came to conclusion that obese patients have significantly high co-morbid illnesses, hence, inferior results with more complications post operatively. In our study, 33 MO patients had comorbidities whereas 29 patients had comorbidities in NO group. In MO, more patients were in ASA grade 2 and 3 in comparison to NO group (MO- ASA grade II in 36, grade III in two and I in two; in NO- ASA grade I in 20 and II in 20), however they were not statistically significantly more, which suggests that overall prevalence of comorbid illnesses was significantly high in both groups. In our study mean hospital (MO-5.22 NO-5.17 days, p=0.689) and ICU stay (MO-0.25 NO-0.15 days, p=0.516) remained statistically not different among both group.

In 1998 Winiarsky<sup>23</sup> studied 40 MO patients who underwent TKA, 22% presented problems with wound healing, 10% developed infection and 8% had an avulsion, from the tibial insertion, of the medial collateral ligament during surgery. In our short term study we found significant superficial wound infection in 10% of MO patients in comparison to 2.5% of NO patients (p<0.05). All patients with superficial wound infection were treated with repeated dressing. Culture from wound was negative for bacterial growth in all four cases. None required joint debridement. Four MO patients had restricted knee flexion at 12 months which was partially attributed to excess fat accumulation at posterior aspect of calf and thigh. One NO patient with past history of IHD had myocardial infarction post operatively. He was treated by intervention cardiologist. None of patients from both groups had MCL avulsion, patella tendon avulsion, neuro-vascular injury.

In our study, anatomical axis was more towards varus in MO (pre-op average alignment was varus of  $2.35^{\circ}$ , Valgus in 6 Neutral in 4 Varus in 30 patients, Post-op average alignment was valgus of  $2.57^{\circ}$ , Neutral in 7 Varus in one and Valgus in 32 patients) than in NO(pre-op average alignment was Varus of  $2.02^{\circ}$ , Valgus in 8 Neutral in 8 & Varus in 24 patients and post-operative average alignment was Valgus of  $4.55^{\circ}$  with all 40 patients having valgus). Varus anatomical alignment in MO was statistically significant (p<0.05) in comparison to NO group.

Winiarsky<sup>23</sup> found significantly worse (p<0.00005) outcomes after TKA in MO patients compared to the other categories of patients. However, in our study both groups didn't have statistically significantly different pre-operatively VAS and Knee functional score but International Journal of Scientific and Research Publications, Volume 4, Issue 11, November 2014 ISSN 2250-3153

WOMAC and knee score were statistically different. Postoperatively VAS, WOMAC, functional and knee score were statistically significantly better in NO group than MO group. However, there was statistically significant improvement in MO group in all four categories from pre-operative to post-operatively. Good outcome in our study is probably because of short duration of follow-up. Long term outcomes remain to be studied.

#### Recommendations:

- Inform patients of the greater risks associated with surgery in presence of morbid obesity.
- Use of intramedullary tibial cutting guides, low pressure tapered tourniquet cuffs which are easier to fit to the patient's thigh, and devices that enable the leg to be held in different degrees of flexion slotted-base leg positioner, short tibial rods (45-50 mm) which increase the area of contact and reduce the load of the bone under the tibial plate, either posterior stabilized implants or, in the event of instability or extreme axial deviation, rotating hinge prostheses, trabecular metal tibial components that provide early anchoring of the tibial implant to the bone
- Being careful towards soft tissue- MCL, patellar tendon, preventing injuring them, femur cut first if dislocating tibia is difficult.
- Special attention towards DVT prevention postoperatively.

### V. CONCLUSION

Although TKA in MO patients is technically difficult and is known to have more complications and inferior results, the surgery should not be denied to them as they will still have significant subjective improvement in lifestyle after the surgery. Better knowledge of technical difficulties, complications and their prevention by surgeon will lead to satisfactory outcome of TKA in MO patients.

*Limitation of our study:* 

Short duration is the limitation of our study. Long term studies involving multiple centres are required to come to more comprehensive conclusion regarding outcome of TKA in morbidly obese patients in Indian population.

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#### AUTHORS

#### First Author- Prateek S. Joshi

M.B.B.S., Diploma Orthopaedics, DNB trainee, Department of Orthopaedic Surgery, Shalby Hospitals, Ahmedabad, Gujarat, India.

#### Second Author- Jawahir A. Pachore

M.B.B.S., Diploma Orthopaedics, FCPS, DNB, Mch Orth(Liverpool), Department of Orthopaedic Surgery, Shalby Hospitals, Ahmedabad, Gujarat, India.

#### Correspondence Author- Prateek S. Joshi

Email- <u>prateekortho@yahoo.com</u> Phone no- +91 9574233369

# **Tumours of the Eyelid- A Histopathological Study of 86 Cases in a Tertiary Hospital.**

Dr Ramya B S<sup>\*</sup>, Dr. Dayananda S Biligi<sup>\*\*</sup>, Dr Chinmayee J T<sup>\*\*\*</sup>, Dr A r Raghupathi<sup>\*\*\*\*</sup>

\*Assistant professor, Department of pathology, Bangalore Medical College and Research Institute, Bangalore, Karnataka, India.

\*\*Professor, Department of pathology, Bangalore Medical College and Research Institute, Bangalore, Karnataka, India.

\*\*\*Assistant professor, Department of ophthalmology, Bangalore Medical College and Research Institute, Bangalore, Karnataka, India.

\*\*\*\*Professor& HOD, Department of pathology, Bangalore Medical College and Research Institute, Bangalore, Karnataka, India.

#### Abstract-Background and aim

Eyelid oncology is of growing importance whose early diagnosis saves the visual system. Overview of eyelid tumours guides ophthalmologists to design for optimal therapy. We carried out the study to assess the incidence of eyelid neoplasms with respect to age, sex, location and histopathological type.

#### **Materials and methods**

Retrospectively we studied 86 cases of eyelid tumours from September 2008 to march 2011, carried out through histopathological confirmation.

#### **Results**

A total of 138 cases of ocular neoplasms were seen, among which eyelid tumours accounted the maximum with 86 cases (62.31%). The most common age group affected was between 51-60 yrs (23.25%). Benign tumours accounted for 45(52.3%) cases and malignant tumours were encounted in 41(47.7%) cases. Among the benign tumours capillary hemangioma was the commonest tumour with 14 cases. Sebaceous cell carcinoma was commonest malignant tumour seen in 17(47.7%) cases followed by basal cell carcinoma 11 cases(26.8%) and squamous cell carcinoma in 9(21.9%) cases. Few rare tumours like mucinous eccrine carcinoma, basal cell carcinoma with angiosarcoma, embryonal rhabdomyosarcoma and malignant melanoma of the eyelid were also seen.

### **Conclusion**

Benign and malignant tumours were seen almost equally with sebaceous cell carcinoma been the most common malignant tumour similar to that seen various studies conducted in India, though basal cell carcinoma is the most common malignant eyelid tumour worldwide. This variation might be due to geographical and environmental factors.

Index Terms- Eyelid, malignant tumours, sebaceous cell carcinoma

## I. INTRODUCTION

Event common neoplasms the most common neoplasms encountered in clinical ophthalmic practice. They are

estimated to represent more than 90% of all ophthalmic tumours.<sup>1</sup> Because of different tissues at eyelid level, a variety of tumoral types and subtypes can arise, but most of them are carcinomas.<sup>2</sup> The classification and differentiation in type of eyelid tumour are beneficial to the histopathological diagnosis.<sup>3</sup>Eyelid malignancies are completely treatable if detected early. The treatment depends on the invasiveness of the cancer which in turn depends on the type of malignancy.<sup>4</sup> basal cell carcinoma has a better prognosis and sebaceous gland carcinoma has a higher mortality and therefore should be treated much more aggressively. Long-term follow-up is needed after treatment of malignant eyelid tumours.<sup>5</sup>

## II. MATERIALS AND METHODS

We accomplished a retrospective analysis of 86 eyelid tumours by histopathological confirmation.

Standard protocol was followed for processing of ocular tissues. Routine Hematoxylin and Eosin staining was done. Special stains like Alcian blue, PAS & Reticulin stain were done wherever necessary.

We analysed the age and sex distribution of lesions, location and histopathological result of the tumours.

#### III. RESULTS

During two and a half period, a total of 86 cases of eyelid tumours with histopathological confirmation were analysed retrospectively, out of which 45(52.3%) cases were benign and 41(47.7%) cases were malignant.

Males had a slight preponderance with a male to female ratio of 1.09:1. Both benign and malignant tumours were seen more on the upper lid.

No cases were seen below 10 yrs and most common age group affected was between 51-60 years(23.25%) (Table 1)



Among the benign tumors, capillary haemangioma was the commonest lesion accounting for 14 cases(31.1%) followed by naevus 9 cases, seborric keratosis 6 cases, lipoma 4 cases,

cutaneous myxoma 3 cases, cavernous haemangioma 2 cases, clear cell hidradennoma 2 cases and others.(Table 2).

DIAGNOSIS	NUMBER	PERCENTAGE
CAPILLARY HEMANGIOMA	14	31.1%
NEVUS	09	20.0%
SEBORRIC KERATOSIS	06	13.4%
LIPOMA	04	8.9%
CUTANEOUS MYXOMA	03	6.8%
SQUAMOUS PAILLOMA	02	4.4%
<b>CAVERNOUS HEMANGIOMA</b>	02	4.4%
CLEAR CELL HIDRADENOMA	02	4.4%
KERATOACANTHOMA	01	2.2%
SCHWANNOMA	01	2.2%
EPITHELIOID	01	2.2%
HEMANGIOENDOTHELIOMA		
TOTAL	45	100%

# **Table 2: BENIGN TUMORS**

Among the malignant ones, sebaceous cell carcinoma was the most common which was seen in 17(41.4%) cases, followed by basal cell carcinoma 11(26.8%), squamous cell carcinoma 9 cases(21.9%) and single cases of mucinous eccrine carcinoma,

basal cell carcinoma with angiosarcoma, embryonal rhabdomyosarcoma and malignant melanoma(Table 3).

DIAGNOSIS	UPPER	LOWER	TOTAL	PERCENTAGE
	LID	LID	NUMBER	
SEBACEOUS CELL	12	05	17	41.4%
CARCINOMA				
BASAL CELL CARCINOMA	04	07	11	26.8%
SQUAMOUS CELL	04	05	09	21.9%
CARCINOMA				
MUCINOUS ECCRINE	1	-	1	2.4%
CARCINOMA				
BASAL CELL CARCINOMA	1	-	1	2.4%

#### **Table 3: MALIGNANT TUMORS**

WITH ANGIOSARCOMA					
EMBRYONAL	1	-	1	2.4%	
RHABDOMYOSARCOMA					
MALIGNANT MELANOMA	1	-	1	2.4%	
TOTAL	24	17	41	100%	

Median age at diagnosis of malignant lesion was 62 years.

Sebaceous cell carcinoma was found most commonly on upper eyelid accounting for 12cases out of 17 cases(70.6%), showed a female preponderance, 88% of cases presenting after 60 years. while basal call carcinoma(63.6%) and squamous cell carcinoma(55.5%) were found commonly on lower lid.



Figure 1: SEBACEOUS CELL CARCINOMA



Figure 2: BASAL CELL CARCINOMA



Figure 3: SQUAMOUS CELL CARCINOMA

# IV. DISCUSSION

Malignancies of the eyelid are predominantly cancers of the skin. As with other skin tumours, malignant lesions of the eyelid increases with age.<sup>1</sup>

Mihaela- cristiana caloi et al <sup>2</sup> studied 471 cases of eyelid tumours and found 114 pseudotumours, 102 benign tumours and 225 cases of malignant tumours.

Fouzia farat et al<sup>6</sup> studied 288 cases of eyelid lesions and found 105 cases(44.11%) of benign, 87(36.99%) cases malignant, 39(16.39%) cases of non neoplastic tumour like lesions and 7(2.94%) cases were pre-malignant lesions.

Deprez et al<sup>7</sup> studied 5504 cases over a period of 19 years and found 84% of benign tumours and rest malignant. The majority of eyelid lesions were benign eyelid tumors while malignant eyelid tumors contributed 10.8% of the total eyelid lesions.<sup>8</sup>

Of the eyelid lesions 24.1% were malignant and 75.9% were benign.  $^{9}$ 

In the present study, for all the eyelid tumours we analysed, benign tumours were 45 cases representing 52.3% and 41 malignant tumours representing 47.7%.

Among the benign tumours, squamous papilloma(84 cases) were the commonest followed by seborric keratosis(11 cases), nevus (5 cases) and capillary haemangioma(2 cases).<sup>2</sup>

Fouzia Farhat et al<sup>5</sup> found epidermal inclusion cyst(26.6%) to be the commonest of benign tumors followed by dermoid cyst(21.90%).

The most common benign lesions were seborrheic keratosis (19.7%), followed by lipogranuloma (13.7%), intradermal nevus (12.2%), and hidrocystoma and fibroepithelial polyps (each with 8.6%).<sup>9</sup>

In our study it was capillary haemangioma(14 cases) to be the most commonest benign tumours followed by nevus(9 cases). Wang JK et al<sup>5</sup> studied 127 malignant eyelid tumours, found 79 basal cell carcinoma(62.2%), 30 sebaceous cell carcinoma(23.6%), 11 squamous cell carcinoma(8.7%), 5 malignant melanoma(3.9%), one kaposi's sarcoma(0.8%) and one metastatic carcinoma(0.8%). All malignant lesions were more common in the lower lid than the upper lid. The mean age at diagnosis for all malignant tumours was 62.6 years.

Basal cell carcinoma was the most frequent malignant neoplasm and represented 82.2% from all malignant eyelid tumors. The maximum incidence of lesions was in  $5^{\text{th}}$  and  $6^{\text{th}}$  decade and the common location was the lower lid.<sup>2</sup>

The most common eyelid malignancy was basal cell carcinoma (71.8%), followed by squamous cell carcinoma (9.7%), melanoma (9.2%), and sebaceous cell carcinoma (7.3%).  $_9$ 

The most common primary malignancy was basal cell carcinoma(84%) followed by sebaceous adenocarcinoma(10.2%) and squamous cell carcinoma(3.4%).<sup>1</sup>

Basal cell carcinoma was the frequent malignant tumor(86%) followed by squamous cell carcinoma(7%) and sebaceous carcinoma(3%).<sup>7</sup>

Basal cell carcinoma is the most common malignant eyelid tumor in whites. The lower eyelid and medial canthus are the most frequent sites of origin.<sup>10</sup>

Fouzia Farhat et al<sup>6</sup> also found basal cell carcinoma with 49 cases(56.32%) to be the commonest followed by squamous cell carcinoma in 18 cases(20.69%), sebaceous cell carcinoma in 13 cases(14.94%) along with few rare tumors.

Squamous cell carcinoma was the most frequently encountered malignant tumor of the eyelid seen in this series.<sup>11</sup>

Sebaceous gland carcinoma was the commonest (40.5 per cent) finding, followed by squamous cell carcinoma (27 per cent), basal cell carcinoma (24.3 per cent), basosquamous carcinoma (5.4 per cent) and malignant melanoma (2.7 per cent).<sup>12</sup>

Although basal cell carcinoma is the most common eyelid cancer in Taiwan, sebaceous gland carcinoma is also common.<sup>5</sup>

Malignant tumors of the eyelid other than basal cell and squamous cell carcinoma are uncommon and usually occur in elderly white persons. Primary eyelid tumors of any type are rare in blacks. The risk of a non-basal cell and non-squamous cell malignant neoplasm of the eyelid in Florida is 6.4 times greater for whites than for blacks . A variety of B-cell lymphomas can be manifested as primary eyelid tumors.<sup>13</sup>

Basal cell carcinoma was the most common malignant eyelid tumour in north-west Pakistan, followed by squamous cell carcinoma. In contrast, the sebaceous gland carcinoma was the least common in the study population.<sup>14</sup>

In the present study it was the sebaceous cell carcinoma which was the commonest malignant tumour with its incidence more on the upper lid.

A racial difference in the incidence of basal cell carcinoma, sebaceous gland carcinoma, and squamous cell carcinoma can be considered in making a diagnosis.<sup>15</sup>

#### V. CONCLUSION

Eyelid is a heterogeneous tissue, hence we tend to see a variety of tumoral types & subtypes, both benign & malignant.

Though basal cell carcinoma is the most common tumour of the eyelid worldwide, sebaceous cell carcinoma was the commonest malignant tumour in the present study co- relating with the other Indian studies. This emphasises the environmental & geographic factors in the occurrence of malignant eyelid tumours.

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#### AUTHORS

**First Author** – Dr Ramya B S, MBBS, MD, Assistant professor, Department of pathology, BMC&RI. Email:

drramyashekar@gmail.com

**Second Author** – Dr. Dayananda S Biligi, MBBS, MD, Professor, Department of pathology, BMC&RI. Email:

drdayabmc41@ymail.com

**Third Author** – Dr Chinmayee J T, MBBS, MS, Assistant professor, Department of ophthalmology, BMC&RI.

**Fourth Author** – Dr A R Raghupathi, MBBS, MD, Professor& HOD, Department of pathology, BMC&RI.

**Correspondence Author** – Dr RAMYA B S, Email: drramyashekar@gmail.com, Contact number: 9480303156

# **Evaluation of Modeling Accuracy of Reconfigurable Patch Antennas**

# Mr. Ullhas.Jayakumar.Maisale<sup>\*</sup>, Prof. Mrs. S.R.Mahadik<sup>\*\*</sup>,

\* Electronics Dr. J.J.Magdum college of Engineering \*\* E&TC, Dr. J.J.Magdum college of Engineering

*Abstract-* Evaluation of frequency reconfigurable patch antennas for multi-standard personal communication systems, using PIN diodes as switches. Two different configurations are studied with dual-band behavior: a patch antenna with two switchable slots; and a rectangular patch with a switchable parasitic element. One of the objectives is to evaluate the reliability of the simulation software to design and predict the performance of reconfigurable antennas with embedded active elements. These antennas were fabricated and the measured results show good agreement with the simulations. Each of the designed antennas enable electronic switching of the operating frequency, while maintaining good input impedance match and stable radiation characteristics.

Index Terms - Reconfigurable antennas, multifrequency antennas, PIN diodes, switches, modeling accuracy.

#### I. INTRODUCTION

Frequency reconfigurable antennas are very attractive in wireless communication systems, because they enable to accommodate more than one service in the same antenna. The resonant frequency adjustment is accomplished by changing the shape of the radiating element. Micro strip antennas are widely used to provide reconfigurability due to their advantages of low profile, lightweight, low fabrication cost, and ease of integration with RF devices. The drawback of the more basic printed antenna designs is its narrow impedance bandwidth characteristic. The frequency band selectivity can be achieved by controlling the state of switches inserted in the antenna, which can be PIN diodes or RF MEMS. The switches can encompass several functions on reconfigurable antennas, for example modify the antenna feed location and, therefore, adjust the resonant frequency control the electrical length of slots placed along the patch connect or disconnect several elements in antenna arrays or, similarly, connect parasitic elements to the radiating patch in order to increase the total length of the antenna.

The first antenna configuration is basically consists on a patch antenna with two slots incorporated, each one closed by a switch near the center. When the switches are in the off-state, the currents flow around the slots and the average length of the current path is the longest and hence the antenna resonates at the minimum operating frequency. Conversely, when the switches are turned on, some of the electric currents flow through the switches, the length of the current path decreases and the resonance frequency increases.

The second antenna configuration is patch with an inscribed rectangular slot fed with a coaxial probe in the inner patch. When the switches are turned off, the resonant frequency is basically defined by the inner patch, although, due to the proximity, the parasitic element produces some influence in the antenna operation. In the closed configuration, the switches connect the parasitic element to the radiating element thus increasing the antenna size, consequently lowering the resonance frequency. Simulations showed that at least four switches are needed on this antenna, in order to obtain a good match for both operating frequencies

#### II. Research Elaborations

When the switches are in the off-state, the currents flow around the slots and the average length of the current path is the longest and hence the antenna resonates at the minimum operating frequency. Conversely, when the switches are turned on, some of the electric currents flow through the switches, the length of the current path decreases and the resonance frequency increases. RF MEMS switches are being used instead of PIN diodes, especially at frequencies of operation above 1.89 GHz to 2.37GHz. For this reasons, the next step is to replace the PIN diodes switches by RF MEMS and reduce the number of active and passive elements in the antennas. A reconfigurable microstrip patch antenna with switchable slot has been designed, fabricated, and measured. The antenna has been designed to work at two operating frequencies with small frequency ratio. The effects of the feeding position, slot lengths, and slot position on the return loss, bandwidth, and frequency ratio are needed to be observed.

The Performance of the micro strip antenna depends on its dimension. Depending on the dimension the operating frequency, radiation efficiency, directivity, return loss and other related parameters are also influenced. The basic antenna structure
consists of a square radiating stub, a feed line, and a ground plane with a rectangular slot. The proposed antenna is connected to connector for signal transmission.



PIN diode circuit

In computer simulation, these PIN diodes, DC blocking capacitor, RF choke inductor are modeled using the resistance, inductance, and capacitance (RLC) model. The PIN diodes are modeled as capacitors in the off state and resistors in the onstate. The datasheet of the PIN diode provides the value of the capacitance and the resistance which are in the range of 0.2pF -0.55pF and  $1.5\Omega-9\Omega$ , respectively. Its value depends on reverse voltage or forward current applied. As a result of extensive parametric study, it has been obtained that the PIN diode is modeled as capacitance with 0.2pF in offstate and resistance with  $1.5\Omega$  in onstate. Thevalue of RF choke inductor is  $1\mu$ H and the capacitor is 10nF. We used entirely 11 DC blocking capacitors, 10 RF choke inductors and 10 PIN diodes on the antenna. Off state between antenna with biasing line circuit as seen on and the conceptual antenna as seen on. It is shown that there is slight change in resonance frequency about 4.97%. The simulated results for several combinations of active switches are presented and summarized -10dB. It is shown that the operating frequency can be reconfigured accordance to combination of onswitches is applied. However, the measured results are different from the simulated results due to soldering imperfection in antenna fabrication.

Use of Simulation software

- 1. IE3D Software
- 2. Antenna Test Unit
- 3. Vector Analyzer

## III. Results or Finding





This works presents the simulated and measured results of reconfigurable slotted micro strip antenna. It is shown in simulation that the operating frequencies can be tuned within 1.28 GHz to 2.92 GHz by using combinations of active switches. Therefore, it has been proven that the reconfiguration of the operating frequencies can be achieved by changing the slot length on the Antenna by turning on or off the switches in certain combinations.

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[10] Tapan K. Sarkar Department of Electrical and Computer Engineering, Syracuse University,

N.Y. 13244-1240, USA.

#### AUTHORS

## First Author - Mr. Ullhas.Jayakumar.Maisale M.E (electronics appeared), Dr. J.J.Magdum college of Engineering and

ullas.maisale@gmail.com

Second Author - Prof. Mrs. S.R.Mahadik, E&TC, Dr. J.J.Magdum college of Engineering and shamalashewale@yahooco.in.

Correspondence Author -, - Mr. Ullhas.Jayakumar.Maisale M.E (electronics appeared), Dr. J.J.Magdum college of Engineering and

ullas.maisale@gmail.com ,09739751254.

## Observation on abundance and group diversity of soil microarthropods with special reference to acarines at four differently used soil habitats.

S. K. Sarkar<sup>\*</sup>, K. Chakraborty<sup>\*\*</sup>, M. N. Moitra<sup>\*\*\*</sup>

\*Pundari High School(H.S), Dakshin Dinajpur, West Bengal, India. \*\* Department of Zoology, Gour Banga University, West Bengal, India. \*\*\* P. D. Women's College, Jalpaiguri, West Bengal, India

*Abstract*- Soil samples were collected from four different types of sites –agricultural field, river basin, brick field and forest floor. Density and group diversity varied considerably among the sites, the statistically significant difference in mean abundance both for total microarthropods and acarines however existed only between forest site and brick field, difference of group diversity was not significant. All the sites showed post-monsoon population maxima. Oribatids were the single largest order at the sites followed by collembolans.

*Index Terms*- microarthropods, acari, oribatid mites, density, group diversity

## I. INTRODUCTION

**S** oil microarthropods including acarines play an important role in the physico-chemical dynamics of soil and has drawn attention of a number of workers in and outside of India (Sanyal, 1982; Bhattacharya and Chakraborti, 1994; Norton, 1994; Crossley and Coleman, 1999; Chitrapati and Singh, 2006). Information however, is scanty on ecology and diversity of soil micrarthropods occurring in the northern plains of Bengal. The current work therefore was taken up to address this scarcity of data. A comparative approach among different habitats was attempted in the present study.

## II. MATERIALS AND METHODS

Soil samples were collected from four differnt sites during June to September, 2014 with an interval of 30 days. Five subplots of 1 m<sup>2</sup> area were selected at each site and three cores (5 cm diameter) of samples were collected from each sub-plot. Soil samples were brought to laboratory in plastic packets and extraction was run using modified tullgren funnel apparatus (Macfadyen, 1953). microarthropod groups were sorted from the extract using needles and fine camel hair brush. They were preserved in 85% alcohol.

Group diversity was calculated using Shannon's Index following Cancela da Fonseca and Sarkar (1998). Logerithmic transformation of data were made for statistical analysis whenever needed. Collection sites:

*i. Site-I*: Agricultural field near Dalimgaon Rail Station  $(25^{\circ} 38'07"N, 88^{\circ} 22'10"E)$  which is used for cultivation of jute , cereals, pulses etc.

*ii. Site-II*: Brick field at Madanpur (25° 38'7"N, 88° 16'10"S where soil is peebly in nature. Large trees , herbs and shrubs were few in number; scattered patches of grasses were present here.

*iii. Site-III*: River basin region at Tungail bill para (25°40'11"N, 88°19'10"E), soil appeared as clayee. A few numbers of plants, herbs and shurbs were present. The area was used as a grazing land.

*iv. Site-IV:* Forest area at Anaun (25°36'3" N, 88 °19'10"E) with plenty of trees, herbs and shurbs are there.

All the places which are being used as observation sites, locate in Uttar Dinajpur of West Bengal, India.

## III. RESULT AND DISCUSSION

Mean abundance of soil microarthropods as well as acarines was highest at site-IV followed by site-I while the same was lowest at site-II (Table 1; Figure 6). Mean density of microarthropods ranged from around 3156 /m<sup>2</sup> (site-II) to 9409 /m<sup>2</sup> (site-IV) in the study region (Table 2). It was well within the range generally recorded in West Bengal and other parts of India by earlier workers (Chitrapati and Singh, 2006; Devi and Singh, 2006; Joy, 2006)

One-way analysis of variance (ANOVA) revealed significant difference in the fluctuation of population of soil microarthropods and acarines as well among the sites (p < 0.05). As per Tukey test, statistically significant difference among mean abundance was observed between sites II and IV and sites III and IV. There was so significant difference of mean between other sites (Table 3, 4).

In all the sites, highest abundance of microarthropods was observed during the month of August, i.e., during post monsoon and the lowest abundance was recorded during the month of June (Table 1, Figs. 6, 7). This observation is in conformity to the observations made by Bhattacharya and Raychoudhuri (1979), Bhattacharya *et al.*, (1980). Lowest abundance during June may due to high temperature and low rainfall. Soil acarines was the largest fraction among the microarthropod groups as recorded in the sites. Oribatid mites constituted the largest single order followed by collembolans at the sites (Figures 1 - 4). They were the most abundant order among soil acarines and microarthropods as well. Similar observations were reported by workers like Sanyal (1981a, 1981b, 1982), Bhattacharya and Chakraborti (1994), Joy and Bhattacharya (1997), Cancela da Fonseca and Sarkar (1998), Ghosh and Roy (2004), Chitrapati and Singh (2006) and Moitra *et al.*, (2007).

Among soil acarines, Mesostigmata was the second highest abundant group. Other two orders – Prostigmata and Astigmata were less numerous (Table 1). Though oribatids were highest in abundance at site-IV but mesostigmatids were most abundant at site-I. It is generally observed that most oribatid species are less tolerant to environmental or mechanical disturbances (Norton and Palmer 1991). Site-IV being a forest site, it was subjected to less disturbance while site-I was located in the vicinity of railway tracks.

Fluctuation (coefficient of variation) of abundance of microarthropod population was highest at site-IV while the same for acarines was highest at site-II (Table 2). Environmental harashness of site-II might be responsible for high fluctuation of acarines. Relative abundance of orders of mites other than Oribatida was highest at site-II. Though oribatids have relatively a long life span but other groups often show a rapid rise and fall of abundance as per the environment and have shorter life span (Philips, 1990; Norton, 1994; Crossley and Coleman, 1999; Behan-Pelletier). High relative abundance of oribatids at forest site and other mites groups at site-II collectively might have contributed in such observation.

Group diversity, which basically varied upon evenness as the number of group made fixed, was relatively high at site-IV. The lowest value also, interestingly, was recorded at site-IV in the month of July (Fig. 5). It might be due to high relative abundance of oribatids at this site. Group diversity did not vary significantly from one site to another (Table 5). Observation however might be different had the calculation included all the orders available at each site.

Further investigation for longer duration is needed to critically assess the scenario, the spatial and the temporal changes in the edaphic environs in the region.

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#### AUTHORS

**First Author-** Swadesh Kumar Sarkar, M. Sc., Teacher, Pundari High School (H.S), Dakshin Dinajpur, West Bengal, India. E-mail: swadeshsarkar4@gmail.com

Second Author- Kaushik Chakraborty, M. Sc., Ph. D., Assistant Professor, Department of Zoology, Gour Banga University, West Bengal, India, E-mail: kaushik\_apdcollege@rediffmail.com Third Author- Manabendra Nath Moitra, M. Sc., Ph. D., Assistant Professor, P. D. Women's College, Jalpaiguri, West Bengal, India, E-mail: manab.moitra@gmail.com

**Correspondence Author**- Manabendra Nath Moitra, E-mail: manab.moitra@gmail.com, (+91) 9831592641

Site-I							
Months	Oribatida	Mesostigmata	Prostigmata	Astigmata	Collembola	Others	Total
June	4.40	1.73	0	0	2.33	1.93	10.40
July	7.93	2.93	0.27	0	5.13	3.53	19.80
August	7.20	3.13	0.07	0.07	3.87	7.27	21.60
September	5.80	4.07	0	0	5.07	2.87	17.80
Mean±SE	6.33±0.78	2.97±0.48	0.09±0.06	0.02±0.02	4.1±0.66	3.9±1.17	17.4±2.46
Site-II							
June	0.87	1.27	0	0	0.47	0.73	3.33
July	1.73	0.67	0.07	0	2.00	1.67	6.13
August	2.73	2.27	0.07	0	1.53	1.40	8.00
September	1.93	1.07	0	0	1.47	2.87	7.33
Mean <u>+</u> SE	1.82 <u>+</u> 0.38	$1.32\pm0.34$	$0.04 \pm 0.02$	-	$1.37{\pm}0.32$	$1.67{\pm}~0.45$	$6.2 \pm 1.03$
Site-III							
June	1.67	1.6	0	0	2	1.13	6.4
July	2.6	1.33	0.07	0	1.6	2.93	8.53
August	3.67	2.87	0	0	4.2	2	12.73
September	2.27	1.27	0.07	0	1.27	2.87	7.73
Mean±_SE	$2.55 \pm 0.42$	1.77±0.37	0.04±_0.02	-	2.27±0.66	2.23±_0.42	8.85±1.37
Site-IV							
June	4.87	2.27	0.27	0	3.67	1.93	13
July	6.87	1.47	0.07	0	4.07	3.53	16
August	9.8	4.33	0.53	0.07	5.8	7.27	27.8
September	6.2	3	0	0	5.07	2.87	17.13
Mean±SE	6.93±1.04	2.77±0.607	0.22±0.12	0.02±0.02	4.65±0.48	3.9±1.17	18.48±3.23

## Table 1: Mean abundance of different groups of microarthropods at collection (individual / core).

(SE = Standard Error)

## $Table \ 2: \ Mean \ density \ (individuals/\ m^2) \ and \ fluctuation \ of \ total \ soil \ microarthropods \ and \ acarines \ at \ different \ sites.$

		Site-I	Site-II	Site-III	Site-IV
rropods	Density (±SE)	8858.17±1252	3156.36±525	4505.45±696	9409.68±1642
Total microarth	CV	26.61	33.23	30.9	37.07
	Density (±SE)	4785.45±570	1612.12±335	2214.54±378	5056.96±836
Aca	CV	23.82	41.56	34.18	33.06

(SE = Standard Error; CV = Coefficient of variation)

	Tuble c			inci our tini oj	pous una u	curine popula	tions at any
<b>One-way A</b> Analysis	NOVA: of Var	Total microa	arthropods	versus Sites			
Source	DF	SS	MS	F	P		
Sites	3	3.441	1.147	10.17	0.001		
		Error	12	1.354	0.11	3	
One-way A	NOVA:	Acari versus	s sites				
Analysis	of Var	iance for a	Acari				
Source	DF	SS	MS	F	P		
Site	3	4.023	1.341	13.34	0.000		
Error	12	1.207	0.101				
Total	15	5.230					
				Individua	1 95% CIs	s For Mean	
				Based on 1	Pooled St	Dev	
Level	Ν	Mean	StDev	+	+		+
Site-I	4	4.9233	0.2722			(*	)
Site-II	4	3.8035	0.3782	(*	)		
Site-III	4	4.1400	0.3079	(	*	- )	
Site-IV	4	4.9678	0.3005			(*	)
				+	+	+	+
Pooled St	Dev =	0.3171		3.60	4.20	4.80	5.40

Table 3: One-way ANOVA for microarthropods and acarine populations at different sites.

 $DF = Degree \text{ of Freedom, } SS = Sum \text{ of square, } MS = Mean \text{ square, } F = F \text{ statistics, } StDev = Standard deviation, CIs = Confidence Intervals}$ 

[Individual confidence intervals given in dotted line indicate (with 95% confidence) the probable range of occurrence of the mean. The asterix in the middle of the line marks the present mean. The ranges of mean within parentheses not overlapping implies that those means are different]

1 able 4: 1 ukey's pairwise comparisons for total microarthropods and soil acarli
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Total microarthropods		Soil acarines					
	Site-I	Site-II	Site-III		Site-I	Site-II	Site-III
Site-II	0.3421 1.7528			Site-II	0.4539 1.7857		
Site-III	-0.0330 1.3777	-1.0805 0.3303		Site-III	0.1173 1.4492	-1.0025 0.3294	
Site-IV	-0.7614 0.6493	-1.8089 -0.3981	-1.4338 -0.0230	Site-IV	-0.7104 0.6214	-1.8302 -0.4984	-1.4937 -0.1618

Table 5: t test for comparing group diversity of different sites.

	Site-I	Site-II	Site-III
Site-II	-1.51 <sub>(ns)</sub>		
Site-III	-1.25 <sub>(ns)</sub>	0.64 <sub>(ns)</sub>	

Site-IV  $-0.38_{(ns)}$   $0.29_{(ns)}$   $0.11_{(ns)}$ 



Figure 1: Relative abundance (%) of four major groups of microarthropods at site- I



Figure 2: Relative abundance (%) of four major groups of microarthropods at site-II.



Figure 3: Relative abundance (%) of four major groups of microarthropods at site-III.



Figure 4: Relative abundance of four major groups of microarthropods at site-IV.



Figure 5: Variation of group diversity of soil microarthropods at different sites.



Figure 6: Monthly fluctuation of density (individual/m<sup>2</sup>) of soil microarthropods at different sites.



Figure 7: Monthly variation of numerical abundance of soil acarines at different sites.

## M<sup>x</sup>/G(a,b)/1 WITH VACATION INTERRUPTED, OPTIONAL RESERVICE AND BALKING

## S.Suganya

#### Pondicherry Engineering College, Pondicherry suganyaphd@hotmail.com

Abstract- In this paper, a single server bulk service queuing system with interrupted vacation, request for Re-service and Balking is considered. At a service completion, if the server finds at least 'a' customers waiting for service say  $\xi$ , he serves a batch of min ( $\xi$ , b) customers, where  $b \ge a$ . At the completion of an essential service, the leaving batch of customers may request for a re-service with probability  $\pi$ . However, the re-service is rendered only when the number of customers waiting in the queue is less than 'a'. If no request for re-service is made after the completion of an essential service and numbers of customers in the queue is less than 'a'. If no request for re-service is made after the completion of an essential service and numbers of customers in the queue is less than then 'a' the server will avail a vacation of a random length. If the queue size reaches 'a' during the vacation, the server terminates the vacation abruptly and resumes for primary service. On completion of the vacation the server remains in the system (dormant period) until the queue length reaches 'a'. Customers arrive in batches to the system and are served on a first come-first served basis. Also assuming that the batch arrival units may decide not to join the system (balks) by estimating the duration of waiting time for a service to get completed or by witnessing the long length of the queue. Analytical treatment of this model is obtained by the supplementary variable technique.

Index Terms-: General Bulk service, interrupted vacation, Re-service, balking

## I. INTRODUCTION

In recent years, Bulk service queueing system with server vacations have been developed for a wide range applications in production, communication systems, bank services and etc. Li and Tian (2007) studied the discrete-time GI/Geo/1 queue with working vacation and vacation interruption. Ji-Hong Li et al (2008) studied GI/M/1 queue with working vacations and vacation interruption. Zhang and Shi (2009) provided a study on the M/M/1 queue with Bernoulli-Schedule-Controlled vacation and vacation interruption. Mian Zhang and Zhengting Hou (2010) studied an M/G/1 queue with working vacations and vacation interruption. Yutaka BABA (2010) studied the M/PH/1 queue with working vacations and vacation interruption. Mian Zhang and Zhengting Hou (2011) studied an MAP/G/1 queue with working vacations and vacation interruption.

Madan and Baklizi (2002) considered an M/G/1 queueing model, in which the server performs first essential service to all arriving customers. As soon as the first service is over, they may leave the system with the probability  $(1 - \pi)$  and second optional service is provided with probability  $\pi$ . Madan et al (2004) analyzed a single server bulk arrival queue, in which the leaving batch of customers might opt for re-service. Arumuganathan and Judeth Malliga (2006) analyzed a bulk queue with repair of service station and set up time. S.Jayakumar and R.Arumuganathan (2011) discussed a bulk service queue with multiple vacation and request for reservice.

In many real life situations, the arriving customers may be discouraged due to long queue, and decide not to join the queue and leave the system at once. This behavior of customers is referred as balking. Sometimes customers get impatient after joining the queue and leave the system without getting service. This behavior of customer recognizes as reneging. In the last few years, we see studies on queues with balking and reneging gaining significant importance. Queuing system with impatient customers is a familiar phenomenon we come across in many real life situations. Customers may be discouraged to join a queue due to long waiting time or service times or for other constraints and may leave the queue without joining and this is known as balking. We see applications of queue with balking in emergency services in hospitals dealing serious patients, communication systems, production and inventory system and many more. A queue with balking was initially studied by Haight (1957). Since then, extensive amount of work has been done on queuing systems related to impatient customers. Queues with balking have been studied by authors like Altman and Yechiali (2006), Ancker et al. (1963), Choudhury and Medhi (2011), in the last few years.

## II. MATHEMATICAL MODEL.

- Let X be the group size random variable of the arrival,  $\lambda$  be the Poisson arrival rate,  $g_k$  be the probability that k customers arrive in a batch and X(z) be its PGF.
- The service follows a general (arbitrary) distribution with cumulative distribution function S(.) and density function s(x). Let S(θ) denote the Laplace -Stieltjes transform of S and S<sup>0</sup>(t) denote the remaining service time of a batch at an arbitrary time t.
- The server's the vacation time follows a general (arbitrary) distribution with cumulative distribution function  $V(\cdot)$  and density function v(x). Let  $\tilde{V}(\theta)$  denote the Laplace -Stieltjes transform of V and  $V^0(t)$  denote the remaining service time of a batch at an arbitrary time t.
- The re-service follows a general (arbitrary) distribution with cumulative distribution function R(.) and density function r(x).
   Let R(θ) denote the Laplace -Stieltjes transform of R and R<sup>0</sup>(t) denote the remaining re- service time at an arbitrary time t.
- We assume that  $(1 a_1)(0 \le a_1 \le 1)$  is the probability that an arriving customer balks during the period when the server is busy and  $(1 a_2)(0 \le a_2 \le 1)$  is the probability that an arriving customer balks during the period when the server is on vacation
- $N_s(t)$  and  $N_q(t)$  are the number of customers in the service and number of customers in the queue respectively.

The different states of the server at time t are defined as follows

( 0, if the server is busy with service

$$C(t) = \begin{cases} 1, \text{ if the server is on vacatio} \\ 2, \text{ if the server is busy with } Re - service \end{cases}$$

3, if the server is on idle period

To obtain the system of Equations, the following state probabilities are defined:

$$\begin{split} &P_{i,n}(x,t)dt = P\{N_{g}(t) = i, N_{q}(t) = n, x \leq S^{0}(t) \leq x + dt, C(t) = 0\}, a \leq i \leq b, n \geq 0, \\ &Q_{n}(x,t)dt = P\{N_{q}(t) = n, x \leq V^{0}(t) \leq x + dt, C(t) = 1\}, n \geq 0 \\ &R_{n}(x,t)dt = P\{N_{q}(t) = n, x \leq R^{0}(t) \leq x + dt, C(t) = 2\}, n \geq 0 \\ &T_{n}(t)dt = P\{N_{q}(t) = n, C(t) = 3\}, 0 \leq n \leq a - 1. \\ &\text{Now, the following system equations are obtained for the queueing system, using supplementary variable technique:} \\ &T_{0}(t + \Delta t) = T_{0}(t)(1 - \lambda \Delta t) + Q_{0}(0, t)\Delta t \\ &T_{n}(t + \Delta t) = T_{n}(t)(1 - \lambda \Delta t) + Q_{n}(0, t)\Delta t + \sum_{k=1}^{n} T_{n-k}(t)\lambda g_{k} \Delta t, \qquad 1 \leq n \leq a - 1, \\ &P_{i,0}(x - \Delta t, t + \Delta t) = P_{i,0}(x, t)(1 - \lambda \Delta t) + \lambda(1 - a_{1})P_{i,0}(x, t) + \sum_{m=a}^{b} P_{m,i}(0, t)s(x)\Delta t \\ &+ R_{i}(0)s(x) + \sum_{a=0}^{a=0} Q_{k}(x, t)\lambda g_{i-k} s(x)\Delta t + \sum_{m=1}^{m=0} T_{m}(t)\lambda g_{i-m} s(x)\Delta t; x \leq i \leq b \\ &P_{i,j}(x - \Delta t, t + \Delta t) = P_{i,j}(x, t)(1 - \lambda \Delta t) + \lambda(1 - a_{1})P_{i,j}(x, t) + a_{1}\sum_{k=1}^{j} P_{i,j-k}(x, t)\lambda g_{k} \Delta t, \\ &a \leq i \leq b - 1; j \geq 1 \\ &P_{b,j}(x - \Delta t, t + \Delta t) = P_{b,j}(x, t)(1 - \lambda \Delta t) + \lambda(1 - a_{1})P_{b,j}(x, t) + \sum_{m=a}^{b} P_{m,b+j}(0, t)s(x)\Delta t \\ &+ \sum_{k=0}^{a=0} Q_{k}(x, t)\lambda g_{k} \Delta t + \sum_{m=0}^{m=0} T_{m}(t)\lambda g_{b+j-m} s(x)\Delta t \\ &+ \sum_{k=0}^{a=0} Q_{k}(x, t)\lambda g_{k} \Delta t + \sum_{m=0}^{m=0} T_{m}(t)\lambda g_{b+j-m} s(x)\Delta t \\ &+ \sum_{k=0}^{a=0} Q_{k}(x, t)\lambda g_{b+j-k} s(x)\Delta t; \quad j \geq 1 \\ &Q_{0}(x - \Delta t, t + \Delta t) = Q_{0}(x, t)(1 - \lambda \Delta t) + \lambda(1 - a_{2})Q_{0}(x, t) \\ &+ (1 - \pi) \sum_{m=a}^{b} P_{m,0}(0)v(x)\Delta t + R_{0}(0)v(x); \\ &Q_{n}(x - \Delta t, t + \Delta t) = Q_{n}(x, t)(1 - \lambda \Delta t) + \lambda(1 - a_{2})Q_{n}(x, t) + (1 - \pi) \sum_{m=a}^{b} P_{m,0}(0)v(x)\Delta t \\ &+ \sum_{k=1}^{n} Q_{n-k}(x, t)\lambda g_{k} \Delta t + R_{n}(0)v(x); \\ &Q_{n}(x - \Delta t, t + \Delta t) = R_{0}(x, t)(1 - \lambda \Delta t) + \lambda(1 - a_{2})Q_{n}(x, t) + \pi \sum_{m=a}^{b} P_{m,0}(0)v(x)\Delta t \\ &+ \sum_{k=1}^{n} Q_{n-k}(x, t)\lambda g_{k} \Delta t + R_{n}(0)v(x); \\ &1 \leq n \leq a - 1 \\ &R_{0}(x - \Delta t, t + \Delta t) = R_{0}(x, t)(1 - \lambda \Delta t) + \lambda(1 - a_{1})R_{0}(x, t) + \pi \sum_{m=a}^{b} P_{m,0}(0, t)r(x) \end{aligned}$$

$$\begin{aligned} R_n(x - \Delta t, t + \Delta t) &= R_n(x, t) \left(1 - \lambda \Delta t\right) + \lambda (1 - a_1) R_n(x, t) + \pi \sum_{m=a}^b P_{m,n}(0, t) r(x) \\ &+ \lambda a_1 \sum_{k=1}^n R_{n-k}(x, t) g_k; \ 1 \le n \le a - 1, \end{aligned}$$

$$R_n(x-\Delta t,t+\Delta t)=R_n(x,t)\left(1-\lambda\Delta t\right)+\lambda(1-a_1)R_n(x,t)+\lambda\sum_{k=1}^nR_{n-k}(x,t)\,g_k;\ n\geq a.$$

## **III. STEADY STATE QUEUE SIZE DISTRIBUTION**

From the above equations, the steady state queue size equations are obtained as follows:

$$0 = -\lambda T_0 + Q_0(0)$$
(1)  

$$0 = -\lambda T_n + Q_n(0) + \sum_{k=1}^n T_{n-k} \lambda g_k , 1 \le n \le a - 1$$
(2)  

$$-P'_{i,0}(x) = -\lambda P_{i,0}(x) + \lambda (1 - a_1) P_{i,0}(x) + \sum_{m=a}^b P_{m,i}(0) s(x) \Delta t$$

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$$+\sum_{k=0}^{a-1}Q_k(x)\lambda g_{i-k}s(x) + \sum_{m=0}^{n-1}T_m\lambda g_{i-m}s(x) + R_i(0)s(x); \ a \le i \le b$$
(3)

$$-P_{i,j}(x) = -\lambda P_{i,j}(x) + \lambda(1 - a_1)P_{i,j}(x) + a_1 \sum_{k=1}^{j} P_{i,j-k}(x) \lambda g_k; \qquad a \le i \le b, j \ge 1$$

$$-P_{b,j}(x) = -\lambda P_{b,j}(x) + \lambda(1 - a_1)P_{b,j}(x) + a_1 \sum_{k=1}^{j} P_{b,j-k}(x) \lambda g_k + \sum_{m=n}^{b} P_{m,b+j}(0)s(x)$$
(4)

$$+\sum_{m=0}^{n-1} T_m \lambda g_{b+j-m} s(x) + \sum_{k=0}^{a-1} Q_k(x) \lambda g_{b+j-k} s(x) + R_{b+j}(0) s(x); \quad j \ge 1$$
(5)

$$-Q_0(x) = -\lambda Q_0(x) + \lambda (1 - a_2) Q_0(x) + (1 - \pi) \sum_{m=a}^{b} P_{m,0}(0) v(x) + R_0(0) v(x);$$

$$-Q_0'(x) = -\lambda Q_0(x) + \lambda (1 - a_2) Q_0(x) + (1 - \pi) \sum_{m=a}^{b} P_{m,0}(0) v(x)$$
(6)

$$+a_2 \sum_{k=1}^n Q_{n-k}(x) \lambda g_k + R_n(0) \nu(x); \quad 1 \le n \le a-1$$
(7)

$$-R'_{0}(x) = -\lambda R_{0}(x) + \lambda (1 - a_{1})R_{0}(x) + \pi \sum_{m=a}^{b} P_{m,0}(0)r(x)$$

$$-R_{n}'(x) = -\lambda R_{n}(x) + \lambda (1 - a_{1})R_{n}(x) + \pi \sum_{m=a}^{b} P_{m,n}(0)r(x) + \lambda a_{1} \sum_{k=1}^{n} R_{n-k}(x) g_{k}; \ 1 \le n \le a - 1,$$
(9)  
$$-R_{n}'(x) = -\lambda R_{n}(x) + \lambda (1 - a_{1})R_{n}(x) + \lambda \sum_{k=1}^{n} R_{n-k}(x) g_{k}; \ n \ge a.$$
(10)

The Laplace-Stieltjes transforms of 
$$P_{i,n}(x)$$
 and  $Q_j(x)$  are defined as:

$$\tilde{P}_{i,n}(\theta) = \int_0^\infty e^{-\theta x} P_{i,n}(x) dx \; ; \; \tilde{Q}_j(\theta) = \int_0^\infty e^{-\theta x} Q_j(x) dx \text{ and } \tilde{R}_n(\theta) = \int_0^\infty e^{-\theta x} R_n(x) dx$$

Taking Laplace-Stieltjes transform on both sides of the equations (1) to (10), we get  

$$\theta \tilde{P}_{i,0}(\theta) - P_{i,0}(0) = \lambda \tilde{P}_{i,0}(\theta) - \lambda(1 - a_1) \tilde{P}_{i,0}(\theta) \\ - [\Sigma_{m=a}^{b} P_{m,i}(0) + R_i(0) + \Sigma_{k=0}^{a-1} Q_k(x) \lambda g_{i-k} + \Sigma_{m=0}^{n-1} T_m \lambda g_{i-m}] \tilde{S}(\theta); \quad a \le i \le b,$$
(11)

$$\theta \tilde{P}_{i,j}(\theta) - P_{i,j}(0) = \lambda \tilde{P}_{i,j}(\theta) - \lambda (1 - a_1) \tilde{P}_{i,j}(\theta) \tilde{S}(\theta) - \lambda a_1 \sum_{k=1}^{j} \tilde{P}_{i,j-k}(\theta) g_k; \quad a \le i < b, j \ge 1$$

$$(12)$$

$$\theta P_{b,j}(\theta) - P_{b,j}(0) = \lambda P_{b,j}(\theta) - \lambda (1 - a_1) P_{b,j}(\theta) - a_1 \sum_{k=1}^{j} P_{b,j-k}(\theta) \lambda g_k - \sum_{m=a}^{b} P_{m,b+j}(0) \tilde{S}(\theta) + R_{b+j}(0) \tilde{S}(\theta) - \sum_{m=0}^{n-1} T_m \lambda g_{b+j-m} \tilde{S}(\theta) - \sum_{k=0}^{a-1} \tilde{Q}_k(\theta) \lambda g_{b+j-k} \tilde{S}(\theta); j \ge 1$$
(13)

$$\theta \tilde{Q}_{0}(\theta) - Q_{0}(0) = \lambda \tilde{Q}_{0}(\theta) - \lambda (1 - a_{2}) \tilde{Q}_{0}(\theta) - (1 - \pi) \sum_{m=a}^{b} P_{m,0}(0) \tilde{V}(\theta) - R_{0}(0) \tilde{V}(\theta);$$
(14)

$$\theta \tilde{Q}_{n}(\theta) - Q_{n}(0) = \lambda \tilde{Q}_{n}(\theta) - \lambda (1 - a_{2}) \tilde{Q}_{n}(\theta) - (1 - \pi) \sum_{m=a}^{b} P_{m,n}(0) \tilde{V}(\theta) - \lambda a_{2} \sum_{k=1}^{J} \tilde{Q}_{n-k}(\theta) g_{k} - R_{n}(0) \tilde{V}(\theta);$$

$$1 \le n \le a - 1$$
(15)

$$\theta \tilde{R}_{0}(\theta) - R_{0}(0) = \lambda \tilde{R}_{0}(\theta) - \lambda (1 - a_{1}) \tilde{R}_{0}(\theta) - \pi \sum_{m=a}^{b} P_{m,0}(0) \tilde{R}(\theta);$$
(16)

$$\theta \tilde{R}_n(\theta) - R_n(0) = \lambda \tilde{R}_n(\theta) - \lambda (1 - a_1) \tilde{R}_n(\theta) - \pi \sum_{m=a}^b P_{m,0}(0) \tilde{R}(\theta) - \lambda a_1 \sum_{k=1}^J \tilde{R}_{n-k}(\theta) g_k; \ 1 \le n \le a - 1$$
(17)

$$\theta \tilde{R}_n(\theta) - R_n(0) = \lambda \tilde{R}_n(\theta) - \lambda (1 - a_1) \tilde{R}_n(\theta) - \lambda a_1 \sum_{k=1}^J \tilde{R}_{n-k}(\theta) g_k; \quad n \ge a.$$

$$\tag{18}$$

## **IV. SYSTEM SIZE DISTRIBUTION**

To obtain the system size distribution let us define PGF's as follows:

$$\tilde{P}_{i}(z,\theta) = \sum_{j=0}^{\infty} \tilde{P}_{i,j}(\theta) z^{j} ; P_{i}(z,0) = \sum_{j=0}^{\infty} P_{i,j}(0) z^{j}; a \le i \le b, 
\tilde{Q}(z,\theta) = \sum_{j=0}^{a-1} \tilde{Q}_{j}(\theta) z^{j} ; Q(z,0) = \sum_{j=0}^{a-1} Q_{j}(0) z^{j} 
\tilde{R}(z,\theta) = \sum_{n=0}^{\infty} \tilde{R}_{n}(\theta) z^{n} ; R(z,0) = \sum_{n=0}^{\infty} R_{n}(0) z^{n}; 
T(z) = \sum_{j=0}^{a-1} T_{n} z^{n}$$
(19)

The probability generating function P(z) of the number of customers in the queue at an arbitrary time epoch of the proposed model can be obtained using the following equation

$$P(z) = \sum_{i=a}^{b-1} \tilde{P}_i(z,0) + \tilde{P}_b(z,0) + \tilde{Q}(z,0) + \tilde{R}(z,0) + T(z)$$
(20)

In order to find the following  $\tilde{P}_i(z,\theta), \tilde{P}_i(z,\theta), \tilde{Q}(z,\theta)$  and  $\tilde{R}(z,\theta)$  sequence of operations are done.

Multiply the equations (14) by  $z^0$  (15) by  $z^n$  (1 < n < a - 1) and summing up from n = 0 to a - 1 and by using (20), we get  $\left[\theta - a_2\left(\lambda - \lambda\xi(z)\right)\right]\tilde{Q}(z,\theta) = Q(z,0) - \tilde{V}(\theta)\sum_{n=0}^{a-1}\left[\sum_{m=a}^{b}(1-\pi)P_{m,n}(0) + R_n(0)\right]z^n$  (2) (21)Where  $\xi(z) = \sum_{k=1}^{a-1} g_k z^k$ Multiply the equations (16) by  $z^0$ ,(17) by  $z^n$  (1 < n < a - 1), (18) by  $z^n$  (n > a) and summing up from n = 0 to a - 1 and by using (20), we get  $\tilde{R}(z,\theta) = \frac{\left(\tilde{R}\left(a_1(\lambda - \lambda X(z))\right) - \tilde{R}(\theta)\right) \pi \sum_{n=0}^{a-1} p_n z^n}{\left(\theta - \alpha \left(\lambda - \lambda X(z)\right)\right)}$ (22)

Multiply the equations (11) by  $z^0$ , (12) by  $z^j$  (j > a) and summing up from n = 0 to  $\infty$  and by using (20), we get  $\left[\theta - a_1(\lambda - \lambda X(z))\right] \tilde{P}_i(z, \theta) = P_i(z, 0) - \tilde{S}(\theta) \left[\sum_{m=a}^b P_{m,i}(0) + R_i(0) + \sum_{k=0}^{a-1} Q_k(x, t) \lambda g_{i-k} + \sum_{m=0}^{n-1} T_m(t) \lambda g_{i-m}\right]$ 

Multiply the equations (11) by  $z^0$  (13)  $z^j$  (j > a) and summing up from j = 0 to  $\infty$  and by using (20), we get

(23)

 $a \leq i \leq b - 1$ 

(8)

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$$z^{b}[\theta - a_{1}(\lambda - \lambda X(z))]\tilde{P}_{b}(z,\theta) = P_{b}(z,0)\left(z^{b} - \tilde{S}(\theta)\right) \\ -\tilde{S}(\theta) \begin{bmatrix} \sum_{m=a}^{b-1} P_{m}(z,0) - \sum_{m=a}^{b} \sum_{j=0}^{b-1} P_{m,j}(0) z^{j} \\ +R(z,0) - \sum_{n=0}^{b-1} R_{n}(0) z^{n} \\ +\lambda(T(z)X(z) - \sum_{m=0}^{a-1}(T_{m}z^{m}\sum_{j=1}^{b-m-1}g_{j}z^{j})) \\ +\lambda(X(z)\sum_{i=0}^{a-1}\tilde{Q}_{i}(\theta) z^{i} - \sum_{i=0}^{a-1}(\tilde{Q}_{i}(\theta)z^{i}\sum_{j=1}^{b-i-1}g_{j}z^{j})) \end{bmatrix}$$
(24)

By substituting 
$$\theta = a_2 \left(\lambda - \lambda \xi(z)\right)$$
 in the equations (21), we get  

$$O(z, 0) = V \left(a_2 \left(\lambda - \lambda \xi(z)\right)\right) \sum_{n=0}^{n-1} \left[(1 - \pi) \sum_{m=0}^{b} P_{m,n}(0) + R_n(0)\right] z^n;$$
(25)

By substituting 
$$\theta = a_1(\lambda - \lambda X(z))$$
 in the equations (22) & (24), we get

$$R(z,0) = \tilde{R}\left(a_{1}(\lambda - \lambda X(z))\right) \pi \sum_{n=0}^{a-1} \sum_{m=a}^{b} P_{m,n}(0) z^{n},$$
(26)

$$P_{i}(z,0) = S\left(a_{1}(\lambda - \lambda X(z))\right) \left[\sum_{m=a}^{b} P_{m,i}(0) + R_{i}(0) + \sum_{k=0}^{a-1} Q_{k}(\lambda - \lambda X(z))\lambda g_{i-k} + \sum_{m=0}^{n-1} T_{m}\lambda g_{i-m}\right]$$
  
$$a \le i \le b-1$$
(27)

$$P_b(z,0) = \frac{\delta(a_1(\lambda - \lambda X(z))) f(z)}{z^b - \delta(a_1(\lambda - \lambda X(z)))}$$
(28)

where

$$\begin{split} \sum_{m=a}^{b-1} P_m(z,0) &- \sum_{m=a}^{b} \sum_{j=0}^{b-1} P_{m,j}(0) z^j + R(z,0) - \sum_{n=0}^{b-1} R_n(0) z^n + \lambda \big( T(z) X(z) - \sum_{m=0}^{a-1} \big( T_m z^m \sum_{j=1}^{b-m-1} g_j z^j \big) \big) \\ f(z) &= \\ &+ \lambda \left( X(z) \sum_{i=0}^{a-1} \tilde{Q}_i \big( a_2 \big( \lambda - \lambda X(z) \big) \big) z^i - \sum_{i=0}^{a-1} \big( \tilde{Q}_i \big( a_2 \big( \lambda - \lambda X(z) \big) \big) z^i \sum_{j=1}^{b-i-1} g_j z^j \big) \right) \end{split}$$
(29)

From the equation (21) & (24), we have

$$\tilde{Q}(z,\theta) = \frac{\left(\vartheta(a_2(\lambda-\lambda\xi(z))) - \vartheta(\theta)\right)\sum_{n=0}^{\alpha-1}[(1-\pi)\sum_{m=\alpha}^{b} P_{m,n}(0) + R_n(0)]z^n}{\left(\theta - a_2(\lambda-\lambda\xi(z))\right)}$$
(30)

From the equation (22) & (25), we have

$$\tilde{P}_{i}(z,\theta) = \frac{1}{\left(\theta - a_{1}(\lambda - \lambda X(z))\right)} \begin{bmatrix} \left(\tilde{S}\left(a_{1}(\lambda - \lambda X(z))\right) - \tilde{S}(\theta)\right) \left(\sum_{m=a}^{b} P_{m,i}(0) + R_{i}(0) + \sum_{m=0}^{n-1} T_{m}\lambda g_{i-m}\right) \\ \tilde{S}\left(a_{1}(\lambda - \lambda X(z))\right) \sum_{k=0}^{a-1} \tilde{Q}_{k}(\lambda - \lambda X(z))\lambda g_{i-k} \\ -\tilde{S}(\theta) \sum_{k=0}^{a-1} \tilde{Q}_{k}(\theta)\lambda g_{i-k} \\ a \le i \le b-1 \end{bmatrix}$$
(31)

From the equation (23) & (26), we have

$$\tilde{P}_{b}(z,\theta) = \frac{\begin{pmatrix} \left( \hat{s} \left( a_{1}(\lambda - \lambda x(z)) \right) - \hat{s}^{\prime}(\theta) \right) g(z) + R(z,0) - \sum_{n=0}^{b-1} R_{n}(0) z^{n} \\ + \lambda \sum_{k=0}^{a-1} z^{i} \left( \hat{Q}_{k} \left( a_{2}(\lambda - \lambda x(z)) \right) \hat{s} \left( a_{1}(\lambda - \lambda x(z)) \right) - \hat{Q}_{k}(\theta) \hat{s}^{\prime}(\theta) \right) (x(z) - \sum_{j=1}^{b-i-1} g_{j} z^{j}) \\ - \lambda \sum_{i=0}^{a-1} z^{i-b} \left( \hat{Q}_{i} \left( a_{2}(\lambda - \lambda x(z)) \right) - \hat{Q}_{i}(\theta) \right) \hat{s} \left( a_{1}(\lambda - \lambda x(z)) \right) \hat{s}^{\prime}(\theta) (x(z) - \sum_{j=1}^{b-i-1} g_{j} z^{j}) \\ \left( \theta - a_{1}(\lambda - \lambda x(z)) \right) \left( z^{b} - \hat{s} \left( a_{1}(\lambda - \lambda x(z)) \right) \right) \end{pmatrix}$$
(32)

where

 $g(z) = \sum_{m=a}^{b-1} P_m(z,0) - \sum_{m=a}^{b} \sum_{j=0}^{b-1} P_{m,j}(0) z^j + \lambda \left(T(z) X(z) - \sum_{m=0}^{a-1} \left(T_m z^m \sum_{j=1}^{b-m-1} g_j z^j\right)\right)$ Let  $p_i = \sum_{m=a}^{b} P_{m,i}(0)$ ,  $r_i = R_i$ ,  $i \ge 0$ Using the Equations (21), (22) and (23) in the Equation (14), the probability generating function of the queue size P(z) at an arbitrary

time epoch is obtained as

$$P(z) = \frac{\begin{pmatrix} \sum_{i=a}^{b-1} ((z^{b}-1)\hat{s}(a_{1}(\lambda-\lambda x(z)))\lambda E_{1} + (\hat{s}(a_{1}(\lambda-\lambda x(z)))-1)z^{b}E_{3} - (z^{b}-\hat{s}(a_{1}(\lambda-\lambda x(z))))\lambda E_{2}) \\ -(\hat{s}(a_{1}(\lambda-\lambda x(z)))-1)\sum_{j=1}^{b-1} (1-\pi)p_{j}z^{j} + (\hat{s}(a_{1}(\lambda-\lambda x(z)))-1)\lambda E_{4} + \pi(\hat{\pi}(a_{1}(\lambda-\lambda x(z)))-1)\sum_{j=1}^{a-1} p_{j}z^{j}) \\ +(z^{b}-\hat{s}(a_{1}(\lambda-\lambda x(z))))a_{1}(-\lambda+\lambda x(z))\tau(z) + \lambda \sum_{i=0}^{a-1} z^{i}f(\hat{s},\hat{Q},z) - \lambda \sum_{i=0}^{a-1} z^{i-b}\phi(\hat{s},\hat{Q},z) \\ -a_{1}(\lambda-\lambda x(z))(z^{b}-\hat{s}(a_{1}(\lambda-\lambda x(z))))) \end{pmatrix}$$

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+ 
$$\frac{\left( \mathcal{V}\left(a_2(\lambda-\lambda\xi(z))\right)-1\right)\sum_{n=0}^{a-1}(1-\pi)p_n z^n}{-a_2(\lambda-\lambda\xi(z))}$$

On further simplification, we get

$$P(z) = \frac{\sum_{i=a}^{b-1} (z^{b}-1) \hat{s}(a_{1}(\lambda-\lambda x(z)))\lambda E_{1} + (\hat{s}(a_{1}(\lambda-\lambda x(z)))-1) z^{b} E_{3} - (z^{b}-\hat{s}(a_{1}(\lambda-\lambda x(z))))\lambda E_{2})}{-(\hat{s}(a_{1}(\lambda-\lambda x(z)))-1) \sum_{j=1}^{b-1} p_{j} z^{j} + (\hat{s}(a_{1}(\lambda-\lambda x(z)))-1)\lambda E_{4} + \pi(\hat{\pi}(a_{1}(\lambda-\lambda x(z)))-1) \sum_{j=1}^{a-1} p_{j} z^{j})}{-\pi \sum_{j=1}^{a-1} p_{j} z^{j} (\hat{s}(a_{1}(\lambda-\lambda x(z)))-1) + (z^{b}-\hat{s}(a_{1}(\lambda-\lambda x(z))))a_{1}(-\lambda+\lambda x(z))\tau(z)}{+\lambda \sum_{i=0}^{a-1} z^{i} f(\hat{s}, \hat{Q}, z) - \lambda \sum_{i=0}^{a-1} z^{i-b} \phi(\hat{s}, \hat{Q}, z)} + (a_{1}(-\lambda+\lambda x(z))(z^{b}-\hat{s}(a_{1}(\lambda-\lambda x(z))))(\hat{r}(a_{2}(\lambda-\lambda \xi(z)))-1) \sum_{n=0}^{a-1} (1-\pi)p_{n}z^{n})} a_{1}a_{2}(-\lambda+\lambda \xi(z))(-\lambda+\lambda x(z))(z^{b}-\hat{s}(a_{1}(\lambda-\lambda x(z)))))$$

where

$$\begin{split} f\left(\tilde{S},\tilde{Q},z\right) &= \left(\tilde{Q}_{i}a_{2}\left(\lambda-\lambda X(z)\right)\tilde{S}\left(a_{1}\left(\lambda-\lambda X(z)\right)\right) - \tilde{Q}_{i}(\theta)\tilde{S}(\theta)\right)\left(X(z)-\sum_{j=1}^{b-i-1}g_{j}z^{j}\right)\\ \phi\left(\tilde{S},\tilde{Q},z\right) &= \left(\tilde{Q}_{i}\left(a_{2}\left(\lambda-\lambda X(z)\right)\right) - \tilde{Q}_{i}(0)\right)\tilde{S}\left(a_{1}\left(\lambda-\lambda X(z)\right)\right)\left(X(z)-\sum_{j=1}^{b-i-1}g_{j}z^{j}\right)\\ E_{1} &= \sum_{k=0}^{a-1}\tilde{Q}_{k}\left(a_{2}\left(\lambda-\lambda X(z)\right)\right)g_{i-k} \quad ; \quad E_{2} &= \sum_{k=0}^{a-1}\tilde{Q}_{k}(\theta)\lambda g_{i-k}\\ E_{3} &= p_{i}+r_{i}+\sum_{m=0}^{n-1}T_{m}\lambda g_{i-m} \quad ; \quad E_{4} &= \left(T(z)X(z)-\sum_{m=0}^{a-1}\left(T_{m}z^{m}\sum_{j=1}^{b-m-1}g_{j}z^{j}\right)\right) \end{split}$$

The probability generating function P(z) has to satisfy P(1) = 1. In order to satisfy the condition, applying L'Hospital's rule and evaluating  $\lim_{z\to\infty} P(z)$  and equating the expression to 1,  $b - \lambda a_1 E(X)[E(S) + \pi E(R)] > 0$  is obtained.

Define ' $\rho$ ' as  $\frac{\lambda a_1 \mathcal{E}(x) [\mathcal{E}(s) + \pi \mathcal{E}(R)]}{b}$ . Thus  $\rho < 1$  is the condition to be satisfied for the existence of steady state for the model.

## **V. PERFORMANCE MEASURES**

In this section, some useful performance measures of the proposed model like, expected number of customers in the queue E(Q), expected length of idle period E(I), expected length of busy period E(B) are derived which are useful to find the total average cost of the system. Also, probability that the server is on setup work P(U), probability that the server is on vacation P(V) and probability that the server is busy P(B) are derived.

## **EXPECTED QUEUE LENGTH**

The expected queue length E(Q) (i.e. mean number of customers waiting in the queue ) at an arbitrary time epoch, is obtained by differentiating P(z) at z=1 and given by

$$\begin{split} \lim_{x \to 1} P(z) &= E(Q) \\ E(Q) &= \frac{\left[\sum_{n=0}^{b-1} [2(T11)(f1) - (f7)(f8)] - \sum_{j=0}^{b-1} d_j [2(T11)(f2) - (f7)(f9)]}{[\sum_{n=0}^{a-1} [2(T11)\lambda(f5 - f6) - \lambda(f7(f11)] + 2(T11)(f4) - (f7)(f11)]}{n [2f14T11 - f7f12] \sum_{j=0}^{a-1} p_j}\right] \\ + \frac{\sum_{n=0}^{a-1} (1 - \pi) p_n [f^2 - f10]}{(T27)^2} \end{split}$$
(35)  
where  
$$S1 &= \lambda a_1 E(X) E(S); \quad S2 &= \lambda a_1 X''(1) E(S) + \lambda^2 a_1^2 E^2(X) E(S^2); \\S3 &= \lambda a_1 X'''(1) E(S) + 3\lambda^2 a_1^2 E(X) E(X^2) E(S^2) + \lambda^3 a_1^3 E^2(X) E(S^2); \\Y1 &= \lambda a_2 E(X) E(V); \quad G1 &= 1 - \sum_{j=1}^{b-1-1} g_j; G2 &= E(X) - \sum_{j=1}^{b-1-1} jg_j; \\G3 &= E(X^2) - \sum_{j=1}^{b-1-1} j(j - 1) g_j; G4 &= T(1) - \sum_{m=0}^{m-1} \sum_{j=1}^{b-m-1} T_m g_j; \\G5 &= \sum_{m=0}^{m-1} \sum_{j=1}^{b-m-1} (m + j) (m + j - 1) T_m g_j; \quad G6 &= \sum_{m=0}^{m-1} \sum_{j=1}^{b-m-1} (m + j) T_m g_j; \\G7 &= E(X) T'(1); \quad G8 &= E(X) T(1); \quad G9 &= E(X^2) T(1) \\G10 &= p_i + r_i + \sum_{m=0}^{m-1} T_m \lambda g_{i-m}; \quad T1 &= \left(\sum_{k=0}^{n-1} \tilde{Q}_k \left(a_2(\lambda - \lambda X(z))\right) g_{i-k}\right)_{z=1}; \end{split}$$

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(33)

(34)

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## PARTICULAR CASES

In this section, an existing model is deduced as particular case of the proposed model. **Case(i)** 

If no request for re-service (i.e.  $\pi=0$ ) and if no balking (i.e.,  $a_1 = 1, a_2 = 1$ ) then the Equation (32) reduces to

$$P(z) = \frac{\sum_{i=a}^{b-1} \left( (z^{b}-1) \hat{s}(\lambda-\lambda X(z)) \lambda E_{1} + (\hat{s}(\lambda-\lambda X(z))-1) z^{b} E_{3} - (z^{b}-\hat{s}(\lambda-\lambda X(z))) \lambda E_{2} \right)}{-(\hat{s}(\lambda-\lambda X(z))-1) \sum_{j=1}^{b-1} p_{j} z^{j} + (\hat{s}(\lambda-\lambda X(z))-1) \lambda E_{4}} + (z^{b}-\hat{s}(\lambda-\lambda X(z)))(-\lambda+\lambda X(z)) T(z) + \lambda \sum_{i=0}^{a-1} z^{i} f(\hat{s}, \tilde{Q}, z) - \lambda \sum_{i=0}^{a-1} z^{i-b} \phi(\hat{s}, \tilde{Q}, z) \right)}$$

which is the PGF of queue size distribution of Analysis of a batch arrival general bulk service queueing system with interrupted vacation of M.Haridoss (2012)

## Case(ii)

If no request for re-service (i.e.  $\pi=0$ ) and if the server doesn't avail any vacation(i.e.,  $\mathcal{V}(a_2(\lambda - \lambda\xi(1))) = 1$ ), and if no balking (i.e.,  $a_1 = 1, a_2 = 1$ ) then the Equation (32) reduces to

$$P(z) = \frac{\begin{pmatrix} \sum_{i=a}^{b-1} ((z^{b}-z^{i}) & p_{i}(\mathcal{S}(\lambda-\lambda X(z))-1) \end{pmatrix} + \lambda \sum_{i=a}^{b-1} ((\mathcal{S}(\lambda-\lambda X(z))-1) z^{b} & \sum_{m=0}^{a-1} T_{m} g_{i-m}) \\ & -(\mathcal{S}(\lambda-\lambda X(z))-1) \sum_{j=1}^{a-1} p_{j} z^{j} + (z^{b} - \mathcal{S}(\lambda-\lambda X(z)))(-\lambda+\lambda X(z)) T(z) \\ & +\lambda ((\mathcal{S}(\lambda-\lambda X(z))-1)(T(z) X(z) - \sum_{m=0}^{a-1} (T_{m} z^{m} \sum_{j=1}^{b-m-1} g_{j} z^{j}))) \\ & -(\lambda-\lambda X(z))(z^{b} - \mathcal{S}(\lambda-\lambda X(z))) \end{pmatrix}$$

which is the PGF of queue size distribution of  $M^{x}$  /G /1 queueing system without vacation and it coincides with the result of  $M^{x}$  /G /1 queueing system without modified vacation and constant arrival rate of Balasubramanian et al (2011).

## VI. Conclusion

An  $M^{X}$  /G(a,b)/1 queue with vacation interrupted, request for Re-service and balking service has been studied. The PGF of queue size at an arbitrary time epoch is obtained. Some performance measures are also derived.

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#### AUTHOR

## First Author - S.Suganya, Research Scholar, Pondicherry Engineering College, Pondicherry (suganyaphd@hotmail.com)

## Communal Land Acquisition and Valuation for Compensation in Nigeria

## Sule, Abass Iyanda

Department of Estate Management, Federal University of Technology Minna, Nigeria

Abstract- It is debatable that the Nigerian Land Use Act of 1978 has not absolutely transferred ownership of land to the Governor of states in Nigeria. It is argued that the citizens have no rights or interest over the land beyond their occupation because such rights or interest has been taken over by the virtue of section 1 of the Land Use Act, which provides that subject to the provisions of the Act, lands in each State of the Federation is vested in the Governor of that State and such land shall be held in trust and administered for the use and common benefits of all Nigerians. No doubt, the procedure for compulsory acquisition requires adequate notice to be given to the owner, compensation to be paid and the acquisition must be for "public purpose". This article seeks to dwell on the valuation for compensation aspect of the three requirements for compulsory acquisition. The data for this write up is basically secondary data source. Findings show the truism that current provisions of the Act cannot guarantee adequate compensation. It therefore, recommends an amendment to the present Land Use Act of Nigeria to reflect realities as regard ownership and transparent methods of assessment for compensation.

*Index Terms*- Land Use Act, Compulsory land acquisition, Compensation, Valuation

#### I. INTRODUCTION

There is no land without owner; the ownership may be L individual, corporate, communal or nation at large. Everything depends on land, houses are built on land, food comes from land, and the ultimate relationship between Man and land is that man's remains are committed to land after death. Hence, life's basic needs are expressed to be food, clothing and shelter therefore it is true to assert that there is only one fundamental need of life and that is land because food, clothing and shelter are entirely derived from land. Statutory definitions of land in Nigeria include the following:- "Land includes land and everything attached to the earth and all chattels real." Further, "Land includes land of any tenure, buildings or parts of buildings (whether the division is horizontal, vertical, or made in any other way), and other corporeal hereditaments; also a rent and other incorporeal hereditaments, and an easement, right, privilege or benefit in, over or derived from land." Furthermore, the word "land", according to Justice Andrew Obaseki (retired Justice of the Supreme Court of Nigeria), "is a species of property. Property has been defined to mean ownership or title and sometimes the res over which ownership may be exercised. The land comprised in the territory of each state of the Federation is the res over which the governor exercised ownership in trust in

accordance with section 1 of the Land Use Act of 1978. It is an immovable property". The Land Use Decree was promulgated on 29 March 1978 following the recommendations of a minority report of a panel appointed by the Federal Military Government of the time to advise on future land policy. With immediate effect, it vested all land in each state of the Federation in the governor of that state (Federal Republic of Nigeria, 1978).

The Decree distinguishes throughout between urban and non-urban (hereafter 'rural') land. In urban areas (to be so designated by the Governor of a state), land was to come under the control and management of the Governor, while in rural areas it was to fall under the appropriate local government. 'Land Use and Allocation Committees', appointed for each state by the Governor, were to advise on the administration of land in urban areas while 'Land Allocation Advisory Committees' were to exercise equivalent functions with regard to rural land. This paper is focus on the provisions of the ACT, section 28 and section 29 relating to compulsory acquisition and compensation. However, the following objectives are critical to achieve the aim of this paper:

- (i) what are the provisions of the ACT relating to acquisition and compensation
- (ii) what are stands of the ACT as regard valuation for compensation
- (iii) Why compensation have been a subject of litigation

## II. CONCEPTUAL AND LITERATURE REVIEW

Compulsory acquisition or purchase is the process by which local and national governments obtain land and premises for development purposes when they consider this to be in the best interest of the community. The process of valuation for compensation in compulsory acquisition of land takes place within distinct legal; cultural; socio-economic; political and historical environments which influence the delivery of the process by key actors in it. The basic principles are perceived to be quite similar even though the practice may vary in different nations or regions, the assessment of compensation is usually influenced by local and national statutes, enactments or laws that provide the basis upon which existing professional standards and methods may be applied (Kakulu, Byrne and Viitanen, 2009). The main statute governing land acquisition and the assessment of compensation in Nigeria is the Land Use Decree No.6 of 1978 (hereinafter called the Act). These have been found well documented by Otubu (2012), section 28 and 29, provided that:

(1) It shall be lawful for the Governor to revoke a right of occupancy for overriding public interest.

(2) Overriding public interest in the case of a statutory right of occupancy means

(a) the alienation by the occupier by assignment, mortgage, transfer of possession, sublease, or otherwise of any right of occupancy or part thereof contrary to the provisions of this Act or of any regulations made there under; (b) the requirement of the land by the Government of the State or by a Local Government in the State, in either case for public purposes within the State, or the requirement of the land by the Government of the Federation for public purposes of the Federation; (c) the requirement of the land for mining purposes or oil pipelines or for any purpose connected therewith.

(3) Overriding public interest in the case of a customary right of occupancy means

(a) the requirement of the land by the Government of the State or by a Local Government in the State in either case for public purpose within the State, or the requirement of the land by the government of the Federation for public purposes of the Federation; (b) the requirement of the land for mining purposes or oil pipelines or for any purpose connected therewith; (c) the requirement of the land for the extraction of building materials; (d) the alienation by the occupier by sale, assignment, mortgage, transfer of possession, sublease, bequest or otherwise of the right of occupancy without the requisite consent or approval.

(4) The Governor shall revoke a right of occupancy in the event of the issue of a notice by or on behalf of the (Head of the Federal Military Government) if such notice declares such land to be required by the Government for public purposes.

(5) The Military Government may revoke a statutory right of occupancy on the ground of (a) a breach of any of the provisions which a certificate of occupancy is by section 10 deemed to contain; (b) a breach of any term contained in the certificate of occupancy or in any special contract made under section 8; (c) a refusal or neglect to accept and pay for a certificate which was issued in evidence of a right of occupancy but has been cancelled by the Military Governor under subsection (3) of section 10.

(6) The revocation of a right of occupancy shall be signified under the hand of a public officer duly authorised in that behalf by the Governor and notice thereof shall be given to the holder.

(7) The title of the holder of a right of occupancy shall be extinguished on receipt by him or a notice given under subsection (5) or on such later date as may be stated in the notice. Section 29. (1) If a right of occupancy is revoked for the cause set out in paragraph (b) of subsection (2) of section 28 or (c) of subsection (3) of the same section, the holder and the occupier shall be entitled to compensation for the value at the date of revocation of their un-exhausted improvements.

(2) If a right of occupancy is revoked for the cause set out in paragraph (c) of subsection (2) of section 28 or in paragraph (b) of subsection (3) of the same section the holder and the occupier shall be entitled to compensation under the appropriate provisions of the Mineral Act or the Mineral Oils Act or any legislation replacing the same.

(3) If the holder or the occupier entitled to compensation under this section is a community the Governor may direct that any compensation payable to it shall be paid (a) to the community; (b) to the chief or leader of the community to be disposed of by him for the benefit of the community in accordance with the applicable customary law; (c) into some fund specified by the Governor for the purpose of being utilised or applied for the benefit of the community.

(4) Compensation under subsection (1) of this section shall be, as respects (a) the land, for an amount equal to the rent, if any, paid by the occupier during the year in which the right of occupancy was revoked; (b) building, installation or improvements thereon, for the amount of the replacement cost of the building, installation or improvement, that is to say, such cost as may be assessed on the basis of the prescribed method of assessment as determined by the appropriate officer less any depreciation, together with interest at the bank rate for delayed payment of compensation and in respect of any improvement in the nature of reclamation works, being such cost thereof as may be substantiated by documentary evidence and proof to the satisfaction of the appropriate officer; (c) crops on land apart from any building, installation or improvement thereon, for an amount equal to the value a prescribed and determined by the appropriate officer.

(5) Where the land in respect of which a right of occupancy has been revoked forms part of a larger area the compensation payable shall be computed as in subsection (4) (a) above less a proportionate amount calculated in relation to that part of the area not affected by the revocation but of which the portion revoked forms a part and any interest payable shall be assessed and computed in like manner.

(6) Where there is any building, installation or improvement or crops on the land to which subsection (5) applies, then compensation shall be computed as specified hereunder, that is a respects (a) such land, on the basis specified in that subsection; (b) any building, installation or improvement or crops thereon (or any combination or two or all of those things) on the basis specified in that subsection and subsection (4) above, or so much of those provisions as are applicable, and any interest payable under those provisions shall be computed in like manner. For the purposes of this section, "installation" means any mechanical apparatus set up or put in position for use or materials set up in or on land or other equipment, but excludes any fixture in or on any building.

In the existing body of literature it is noted there are a number of observable problems associated with compulsory acquisition and valuation for compensation in different parts of the world. Nuhu (2008) noted that the land use act is silent on the question of "disturbance and injurious affection" which implies that dispossessed land owners are not compensated for certain losses such as goodwill. However, Kortey (2003) and Larbi (2008) as cited in Famuyiwa et al (2011) opined that the manner by which the governments in many developing countries exercise the rights of compulsory acquisition undermines tenure security because often, little or no compensation is paid, which then have negative impacts on equity and transparency. Observations on the invocation of Public Land Acquisition and Payment of Compensation in Nigeria have resulted in controversies, lapses and disputes in the past. Such as listed; inadequate revocation notices, inadequate compensations, illiteracy of the claimants, inadequate funding of compensation exercise, non-payment of interest on delayed payments, problem of conflicting claims, use of low rate for economic trees and crops, non-enumeration for some crops/economic trees, resistance to allow surveyors to

represent claimant, non-payment for undeveloped land, corruption of Government officers were among the problems reported of a study by Nuhu (ibid).

The laws dealing with land acquisition are not clear and there is ambiguity with regards to who is entitled to compensation, what items to be included in the compensation, and what is meant by adequate compensation. The absence of clear explanations is a hindrance to uniform and consistent interpretation and so valuers tend to flout the provisions contained therein. This is partly responsible for the existence of multiple interpretations of its contents by key actors in the process (Kakulu et al., 2009). Moreover, Alias et al., (2010), noted that the main issue of land expropriation is the quantum of compensation that is perceived by the respondents as inadequate to fulfil adequate compensation notion under the spirit of the constitution. They noted that adequate compensation is not defined in the statute of Malaysia and the determination of compensation is based solely on the discretion of the various authorities. Therefore, Omar and Ismail (2009) recommend reviews to include payment of all genuine losses, common agreement on any amount of compensation between landowners and land administrators, quick payment, value plantation separately and the payment of solatium to the affected land owners, as more detailed elements of adequate compensation. Solatium is a provision for a sum of money to be paid to an injured party by the party responsible for the injury, over and above compensation paid for damages for injury to feelings.

Nuhu and Aliyu (2009) studied court cases on revocation of communal land title by the governor of Niger State in Nigeria within the beam of statutory procedures for just and fair acquisition of communal land and payment of compensation. Among the disposed of cases, it was reveal that "Private convenience" does not translate to "public purposes" hence, acquisition of communal lands for "private purpose" becomes void. The research also raised the question whether the formula of valuation for compensation, if ever used, was just? But this was left in an illusory state. Therefore, this write up consider looking into the valuation scenarios for compensation.

## III. VALUATION FOR COMPENSATION

The valuation of payable compensation is usually a function of the provisions of the Acts, Decrees and other relevant statutory enactments guiding the process. This framework usually specifies the basis and methods of assessment, as well as procedures, heads of claim and roles of respective parties. It is influenced by the level of socio-economic development of particular nations; their development needs, cultural norms and land-use patterns. Also influential is the level of development of the appropriate national professional body (Viitanen & Kakulu, 2009). It should be noted however that valuation for compensation is not only expected to satisfy professional standards of valuation but in addition, constitutional provisions and international requirements for just, fair, adequate and equitable value must be met. In what Nuhu and Aliyu (2009) refers to as faulty assumption of replacement cost method of valuation is not based on the requirement of the valuation method thus; the Depreciated Replacement Cost (DRC) method is accepted as a legitimate approach for the valuation of properties for which there is no ready market due to their specialised nature. On this, all valuation standards agreed. Three elements are required for the performance of DRC calculation

- (a) The value of the land in its existing uses;
- (b) The gross replacement of the building; and
- (c) The appropriate deductions from gross replacement cost for all types of obsolescence.

The calculation of DRC lies within the realm of the valuer (Aluko, 2012). Therefore, it is not the DRC that exclude value of the land from the calculation as noted in Nuhu and Aliyu(2009) rather, section 29(4a) of LUA no 6 of 1978 required.

Apart from the requirement of the LUA no 6 of 1978, that recommend DRC approach for valuing buildings, installations and other improvement on land these kind of scenarios could be obvious;

## 3.1 Scenario 1:

3.1.1 Acquiring Communal Land with this type of House and Grains Storage Structures (see below);



Plate 1: mud house in the village Source: adapted from (Saheed, 2012)



Plate 2; mud house



Plate 3: Mud Rhombus with stone grillage foundation floor assembly and thatched roof Source: adapted from (Adejumo & Raji, 2007)



Plate 4: Thatched Rhombus with tree stem columns, showing tree stem external support Source: adapted from (Adejumo & Raji, ibid)

The question is how do you justify using investment method of valuation for this house and other improvements on the farm land? Where is the comparables? Where is the rent? Even, undeveloped land here, how do you use market value here? Where is the data? Where is the market survey?

**Plate 3 category:** The cost of construction ranges between N6000 –N10, 000, and it basically depends on the capacity, location and availability of materials. However, **Plate 4 categories:** Construction cost is between N2, 000 and N 8,000. They usually have external support ranging from 6 - 16 units depending on the size of the rhombus. (Adejumo & Raji, ibid)

## 3.2 Scenario 2

Nuhu and Aliyu (2009) observed that the valuation methodology for the valuation of crops and economic Trees for compensation under the Act is not spelt out at all. However current practice is based on the arbitrary fixing of prices for Crops and Economic Trees compulsorily acquired by the socalled Land Officer. Though evidences were not given but it suffices that, it is professionally suicidal to be fixing arbitrary prices for such. Kwache, (2007) listed such tree crops as mango; citrus, (orange) cashew; cocoa; kola nuts, gum Arabic, guava, ogbono, coconuts, rubber, coffee, sheanuts.



**Plate 5: Cocoanut tree** 



Plate 6: Mango Tree

The price of these economic trees should not be fixed arbitrarily because this is an investment compulsorily acquired by government and it should be treated as such. Farmers that have these economic trees are secure for life because these trees produce forever. Therefore, the valuer should categorise them as investment and prepare the valuation on that basis.

#### 3.2.1 Experiment:

**THE INCOME CAPITALISATION (INVESTMENT) APPROACH:** This is based on the principle of anticipation. The principle states that the value of any property (interest) may be defined as the present worth of future benefits. Formula is; Capital Value= Net Income × Year Purchase

**Category A**; Economic Trees (Mango, Orange, Cocoanut, Palm Tree etc)

Net Income of the farmer on economic trees will be; how many number of these economic trees available on land multiply by price of each per annual (local market retailers buys each economic trees and harvest it themselves or hire somebody) then appropriate yield applied.

**Category B**; Economic Crops (Maize, Cassava, Yam, Pepper etc)

Net Income of the farmer on economic Crops will be; Local retailers buy these in hectares, acres or per number of heaps at a harvest time, then appropriate yield applied.

#### IV. FINDINGS AND DISCUSSION

Findings reveal among others the followings;

- That all land in Nigeria belongs to the government ≻ Section 1 of the Land Use Act No 6 of 1978 of Nigeria (LUA), therefore bareland compulsorily acquired by the government is not compensated Section 29(4a) of the LUA. This is widely reported in the literature, but observations from the unreported disposed cases from Niger State High Court (NSHC) cited by Nuhu and Aliyu (Ibid) shows that bareland is being compensated. See: Sule Ahmadu Dogo and 7 Others v. Hon. Commissioner Ministry for Lands, Survey and Town Planning and 2 Others The plaintiff claimed that no compensation was paid at all and this was defeated because the defendants provided evidence which convinced the court that compensation was actually paid. Contrary to this was the case of Hassan Doma Bosso v. Commissioner of Lands and Anor., failure by the defendants to challenge the claims advanced by the plaintiff left the court with no option than to hold that no compensation was paid at all to the plaintiff and the subsequent grant was void ab initio.
- The method of valuation provided by the LUA may be useful in some cases (special properties such that does not change hand in the property market e.g shrine,

religious houses) but it is inappropriate to be mandated for all kinds of valuation for all building improvements or installations as contained by section 29(4b).

Arbitrary fixing of value for economic crops or trees is being practised because the LUA did not provide for methods of assessment rather left it in the hands of appropriate officer, while appropriate officer is not defined in the Act. Section29 (4c), apparently appropriate officer should be an Estate Surveyors and Valuers and anything contrary is a misplacement of professionalism.

#### V. CONCLUSION AND RECOMMENDATIONS

The provisions of the Land Use Act no 6 of 1978 of Nigeria on compensation is completely faulty and it requires total reform as many have called for the same. Of important note, the de facto of communal land cannot be denied so section 29(4a) of the Act cannot stand by virtue of recommending compensation of an amount equal to the rent paid if any during the year the right of occupancy is revoked. Government need to have aerial survey or rural land use Map for the government to know where there is virgin land rather than create injury or disturbance to their subjects except in the case of urban area (built environment).

However, what is advocated for world over is an adequate, just and fair compensation whenever land is appropriated by government of any Nation. A review of compensation aspect of Nigeria land use act seems not adequate by the provision of section 29(4b) which left no option to the assessor than Depreciated Replacement Cost. To be fair, this should be expunged and the method of valuation should be determined by the assessor (Estate Surveyors and Valuers) who had been licensed to carryout valuation for all purposes in Nigeria by the Estate Surveyors and Valuers Decree No 24 of 1975. Furthermore, this suggest that for compensation litigation the court is not to determined the value and in lieu of this court can have Land Arbitration Panel where a neutral Estate Surveyors and Valuers will be a member to inspect and evaluate the process of value claim if there is no ambiguity regarding ownership which is determined by the lawyers.

Also, professionalism and value ethics is necessary. All professionals involve in land administration must contribute their expertise professionally and this can only be improved and achieved through training, retraining, workshops and conferences where new techniques are discussed.

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#### AUTHORS

**First Author** – Sule, Abass Iyanda, Department of Estate Management, Federal University of Technology Minna, Nigeria Suleabass76@yahoo.com; tel.: +2348039734156

## Cost-Effective Design of Self Activating Fire Extinguisher (S.A.F.E)

## Deep Shrivastava\*, Raina Shrivastava\*\*

\*Mechanical Department of Oriental Institute of Science and Technology Bhopal \*\* Electrical and Electronics Department of Vellore Institute of Technology, Vellore

## ABSTRACT

The main idea behind this research paper is to propose a model focusing on cost effective design of a S.A.F.E i.e SELF ACTIVATING FIRE EXTINGUISHER. S.A.F.E is self-activating fire extinguisher which on sensing flame/smoke from the fire automatically activates and extinguishes the fire.

#### INDEX TERMS

 $\operatorname{Cost-Effective}$  , Self Activating , Fire extinguisher , Simplified design

#### INTRODUCTION

The research relates to versatile fire extinguishers that selfactivate via a heat or fire sensor and that distribute fire suppressant over a fire source with a nozzle. Several models of Self activating fire extinguisher are proposed so far, Such prior art models typically are either very expensive or ineffective. So this present invention of new Cost - effective design of Self activating Fire extinguisher fulfills all the needs of Self activating fire extinguishing system and minimizes the drawbacks of previously proposed design.

## CONSTRUCTION OF S.A.F.E

The S.A.F.E consists of Battery which supplies current to the microcontroller unit i.e the brain of S.A.F.E which is connected to Flame sensor (UV Tron) which detects the temperate of the surrounding air . The microcontroller unit is connected to a motor through a relay which sends the current to motor when the temperature reaches above the desired cut off limit. The motor is attached to lever of fire extinguisher by nut bolt arrangement .

The microcontroller electronic circuit consists of :

## HIGH VOLTAGE D.C TO D.C CONVERTER

This converts low D.C voltage coming from battery into suitable high D.C voltage. They are used because they offer a method to increase voltage from a partially lowered battery voltage thereby saving space instead of using multiple batteries to accomplish the same thing.



UV tron	Disch
( Sensor )	Reco
Characteristics :	Reco
	Bank

Parameters	Rating	Units
Discharge Starting Voltage (with UV radiation)	280	Vdc Max
Recommended Operating Voltage	325±25	Vdc
Recommended Average Discharge Current	100	μA
Background *	10	cpm Max
Sensitivity 4	5000	cpm Typ

CHARACTERISTICS (at 25°C)

## FLAME SENSOR

UVTRON is an ultraviolet ON / OFF sensor tube that uses the photoelectric effect of metal and gas multiplication effect of electric current by means of discharge. It has a very narrow range of sensitivity from 185 nm to 300 nm and is completely insensitive to visible light. Because it used the discharge phenomenon, its sensitive is high and an adequate output voltage is obtained, making it possible to design a high-sensitivity, quick response ultraviolet detection with simple circuitry. International Journal of Scientific and Research Publications, Volume 4, Issue 11, November 2014 ISSN 2250-3153

RELAY

A relay is an electrically operated switch. Relays are used where it is necessary to control a circuit by a lowpower signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. Putting all of this together, here is a simple motor control circuit. The parameters of this circuit design call for a single continuous contact switch (such as a basic wall switch or toggle switch) to activate a motor to drive a load to a certain limit.





## WORKING OF S.A.F.E

The mechanical arrangement consists of a motor mounted on the upper arm of the fire extinguisher which is attached to a bolt such that the bolt rotates on the axis of the shaft of the motor i.e the bolt and the shaft of the motor are in the same line and a nut is fixed at the lower arm of the fire extinguisher. The bolt is partially fastened in the nut the threading prevents the screw and motor arrangement to move back i.e it provides a temporary lock , so as soon a fire is detected by the flame sensor the electronic circuit activates the relay which provides current to motor and as soon as shaft of the motor rotates along with the bolt it gets fasten in the nut and thus converting rotary motion to linear motion which in turn moves the upper arm of fire extinguisher in downward direction and thus extinguishing fluid comes out of the nozzle and fire extinguishing action takes place automatically



## ADVANTAGES OF S.A.F.E OVER THE OTHER MODELS OF S.A.F.E PROVIDED IN THE PAST

- Reduced heat and smoke damage Significantly less heat and smoke will be generated when the fire is extinguished at an early stage
- Immediate alert S.A.F.E will notify the people and emergency response personnel of the developing fire as automatic fire alarm system is installed in it.
- Ease of installation As the this arrangement simple in nature and occupy very less space .
- Cost effective Due to simplicity in arrangement and use of cheap materials like bolt, nut, motor etc make it very cost effective in nature thus can be widely implemented in any type of vehicle as well as fire prone areas.
- Can be used in high-risk area where most fires are likely to start, it will self activate upon reaching the appropriate temperature and extinguish the fire.
- Easily available As this arrangement requires no complex mechanisms and materils so it can made widely available.

## RELIABILITY OF S.A.F.E

The reliability of individual fire protection strategies such as detection, automatic suppression, and construction compartmentation is important input to detailed engineering analyses associated with performance based design. here are several elements of reliability, including both operational and performance reliability. Operational reliability provides a measure of the probability that a fire protection system will operate as intended when needed. Performance reliability is a measure of the adequacy of the feature to successfully perform its intended function under specific fire exposure conditions. The former is a measure of component or system operability while the latter is a measure of the adequacy of the system design. The overall reliability of a system depends on the reliability of individual components and their corresponding failure rates, the interdependencies of the individual components that compose the system, and the maintenance and testing of components and systems once installed to verify operability. All of these factors are of concern in estimating operational reliability. Performance reliability estimates require data on how well systems accomplish their design task under actual fire events or full scale tests. Information on performance reliability could not be discerned directly from many of the data sources reviewed as part of this effort due to the form of the presented data, and therefore, it is not addressed as a separate effect.









Fault tree of detector failure.

## RELIABILITY OF FIRE ALARM AND FIRE DETECTORS (SENSORS)

A literature review of reliability data of fire detection and alarm systems was made resulting to rough estimates of some failure frequencies. No theoretical or technical articles on the structure of reliability models of these installations were found. Inspection records of fire detection and alarm system installations by SPEK (Spesifikasi) were studied, and transferred in electronic data base classifying observed failures in failure modes. This tree is for demonstration of the dependencies, and not strictly a fault tree in the mathematical sense, since the number of components in various branches or even within a branch are not the same. These fault trees are used to evaluate the performance and thus reliability of the fire extinguishing systems can me estimated .

## CONCLUSION

So this invention of S.A.F.E if effective a well within the reach of every person. If considerable amount of time is spend on its further research and development it could really prove to be a effective product in the fire safety department and for the common household.

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## AUTHORS

Deep Shrivastava, Bachelors in Engineering (Mechanical engineering), Oriental institute of science and technology Bhopal and <u>deepshrivastava2493@gmail.com</u>

Raina Shrivastava Bachelors in Engineering(Electrical and Electronics Engineering) Vellore Institute of Technology, Vellore and rokingraina@gmail.com

# Innovative Policies in Technology Business Incubation: Key elements for sustainable entrepreneurship development in Nigeria

Nkem Okpa Obaji<sup>\*</sup>, Mercy Uche Olugu<sup>\*\*</sup>, Kayode O. Balogun<sup>\*\*</sup>

\* Fakulti of Management, Universiti Teknologi Malaysia \*\* Department of Statistics, Federal School of Statistics, Ibadan Nigeria

Abstract- Entrepreneurial policies are generally enacted by governments to promote entrepreneurship and help sustain Small and Medium Enterprises (SMEs). However, in Nigeria, despite laudable policies, the implementation of those policies relating to entrepreneurship as well as technology incubation programme leaves a lot to be desired. Thus, the Nigerian version of business incubation is yet to attain success stories in comparison with some other developing nations. Consequently. the entrepreneurship development is also in the path of decline. Three key themes were identified, which formed the basis for developing the proposed theoretical framework. Also, several other factors that influence the success of entrepreneurship development through technology incubation were identified: infrastructure and local adaptation of the incubator model. The purpose of this study is to identify the specific elements that are crucial to the performance of Technology Business Incubation (TBI) in Nigeria.

*Index Terms*- Business incubation, Entrepreneurship development, Government policy, Nigeria, Sustainable development

## I. INTRODUCTION

The role of innovation in creating economic advancement by concentrating on science and technology-based knowledge cannot be overemphasized [1, 2]. Wonglimpiyarat [3, 4] also discussed the relevance of technology innovation which has been globally acknowledged as causing the emergence of sustained economic development. Ajagbe and Ismail [5] viewed technology innovation as a key stimulant for growth in both developing and developed countries.

A number of programmes have been put in place to support entrepreneurship in several countries especially in the developing world. A case in point is Malaysia where innovation has been recognized as a strategy by the government to rapidly develop the country's economy technologically [5]. In addition, a recent study conducted by [6] describe how government contribution towards developing entrepreneurship through the offering of environment conducive to business in stimulating SMEs activity. Furthermore, [7] stressed that the government of emergent countries such as Japan, China, South Korea, Indonesia, Malaysia and India typically put in place affirmative government entrepreneurship policies that are advantageous to SMEs. However, no matter how the entrepreneurial policies may nicely sound, there must be a mechanism in place that will be used to actualize the government strategy of transforming their various countries. Technology business incubation (TBI) is one of the mechanisms used to promote entrepreneurship through SMEs.

NBIA [8] describes business incubation as a business support procedure that fast-tracks the successful development of start-up and inexperienced businesses through the provision of a series of targeted resources and services to entrepreneurs. It stressed the importance of incubator management by acknowledging that the services are typically orchestrated by incubator management and offered both in the business incubator and through its network of contacts. In line with this Business Incubation is an integrated support programme offered by governments, academia and the private sector with the aim of breeding and fostering of promising value-added and technology-related ventures [9]. Phan et al [10] described incubators as a mechanism that is typically regarded as offering key contacts in the entrepreneurial value chain.

The Nigerian governments of different administrations since independence have shown interest and increasing appreciation of the role of Science and Technology (S&T) in national socioeconomic development. The recognition of this fact motivated the Federal Government to restore the Federal Ministry of Science and Technology (FMST) as a separate organization in 1985. Since then, Nigeria has exhausted an immense arrangement of tasks on S&T strategy advancement through a blend of determined efforts of its scientists, engineers and technologists, international cooperation and government support.

In the past government has used different assistance schemes to assist in reducing the level of business failure [11, 12]. One notable feature of Nigeria's latest (2011) strategy on science and technology is the prominence of "Innovation", which refers to an enhancement or a completely new product, process or organizational system in the design, production and distribution of goods and services [9]. However, the number of policies that have been employed by several administrations failed to stand the test of time as a result of policy related issues including the implementation, inconsistent funding as well as government bureaucracy.

Particularly, the aim of this study is to highlight the importance of government policy related to science, technology

and innovation (STI) in the development of entrepreneurship using the business incubation scheme as the support structure.

The paper is structured as follows; Section 2 deals with the review of related literature. Section 3 dwells on the methodology, while section 4 is on findings and discussion and finally section 5 concluded the study with recommendation.

## II. LITERATURE REVIEW

This section reviews the literature-related concepts which are imperative to the study under appraisal since they are the phenomenon of interest in the study as suggested by [13]. Some of the key concepts are business incubator, Nigerian STI policy, Nigerian TBI policy, business incubation success factors, SME among others.

Globally, any realistic innovation or advancement must be vigorously sustainable. Sustainable development implies a meeting point of three major concepts; Society, Environment and Economy. Sustainable Development Commission [14]defines "Sustainable development as development that meets the needs of the present, without compromising the ability of future generations to meet their own needs".

Figure 1 below describes the enhancement of the economic well-being as well as sustaining natural resources and environment. Its main import is to create a balance among the economic, environment and social needs, thereby allowing prosperity for now and hereafter generations. Pinter et al [15] maintains that sustainable development is balancing the protection of the natural environment with the fulfilment of human needs so that these needs can be met both now and in the future. Furthermore, the handy relationship between environmental health and human development, as well as the necessity to change social and economic policies in order to reduce the human impact on the planet has been universally acknowledged [16].



Figure 1: Innovative and Sustainable Development-shaping the future

## 2.1 Various Science & Technology Policies in Nigeria

The first National Science and Technology Policy in Nigeria came to being in 1986. Since then a total of four different science policies have evolved at different point in time which spanned within a period of twenty five years [17]. The policy was reviewed in 1997, 2003, 2005 and 2011.

## 2.2 Entrepreneurship and Assistance Policy Framework

Oni and Daniya [11]discussed the enthusiasm with which several countries adopted entrepreneurship especially the developing countries in the past using policies that are userfriendly in assisting the entrepreneurs. Country case-wise shows that in China, the government was resolute in helping to develop high technology businesses using policies that are friendly to the cause of entrepreneurship development [18] in the country. Etzkowitz [19]discussed the swiftness in the development of entrepreneurship in Brazil through government policies that were pitched towards the development of both low-tech and hightechnological focused companies. In the case of Malaysia, [20] discussed the attentive manner in which the government approached the setting up of different technology financing groups with the intention of giving complete assistance to technology entrepreneurs.

Furthermore, in the Kingdom of Saudi Arabia, the government in its bid to put the country in equal status with high economic competitive countries worldwide put up a decade of entrepreneurship development policies in related innovation Nigeria, several programme [21]. In governments' administrations have at different period of time put a number of strategies to support the development of the SME sub-sector [12]. The past regimes set up at different periods, infrastructure to tackle the collective fiscal challenges in the nation. This was evidenced by the activities of the Directorate of Foods, Roads and Rural Infrastructure (DFRRI), National Directorate of Employment (NDE), Petroleum (Special) Trust Fund (PTF) and of recent, the Vision 20-20-20 as well as various poverty alleviation programmes.

## 2.3 Critical Success Factors for Business Incubation

Rockart [22]described the critical success factors as those elements related to attainment that duty bound to get the up-todate consideration of management if the establishment is to continue to be competitive. The role of TBIs in assisting the early-stage businesses in overcoming the difficulties related to newly formed companies cannot be overemphasized. The goal of TBI is largely dependent on the different interest groups that set up the TBI. Thus the success of the TBI rest on meeting the aims of sponsors [23].

In business incubator study, several scholarly works have been conducted especially as it relates to success factors [23-28]. The findings of these scholarly works have been rotating round the traditional success factors which include inter alia Shared services; Business support services; Facilities and locations; Incubator governance; Tenant entry and exit; Mentoring and Networking; Tie to University; Funding and Support; Community Support. The contemporary writers have also agreed with several critical success factors, which are not at divergence from those acknowledged by prior scholars [29].

Akcomak [30] observed that in developing countries, most incubators are still sustained financially by government; therefore the profit-making concept is still missing. Nevertheless, he contended that the commercial concept of incubators is the underlying principle for market failure argument. Von Zedtwitz, [31] previously recommends that whether an incubator is profitrelated or not-for profit ought to be run as a business entity.

Kumar and Ravindran, [23] indicated that many scholarly works related to incubators have shown that the incubatees' continuous survival and growth should be an important goal of an incubator. This is also how a study underscores the perception of scholars that TBI as an instrument have the tendency to support newly formed technology-based enterprises, by helping them to improve their continuous survival [32].

In a study related to German context, [33] found that graduation causes an immediate negative effect on survival that lasts three years after graduation from incubators. Furthermore, [34] emphasized the relevance of counselling and networking collaborations with incubator management in causing the emergence of innovative enterprises.

## 2.4 Research context and the Nigerian Experience of business incubation initiative

The Batavia Industrial Center, generally recognized as the foremost U.S. business incubator, opened in Batavia, N.Y., in 1959. In 1980, approximately 12 business incubators were operating in the United States – all of them in the industrial Northeast, which had been hard-hit by plant closures in the previous decade [8].

Business Incubator is a facility-based technology infrastructure that assists the small new business start-ups to develop. TBIs are planned to present newly formed enterprises the technical assistance and facilities. Business incubation initiatives have been implemented in developing countries including Nigeria since the 1990s with uneven levels of success

The involvement of Nigeria with the TBI programme can be tracked through the interactions made by a UNDP representative to four African nations, viz.; Gabon, Cote D"Ivoire, Nigeria and Zimbabwe in June, 1988 in Gabon. The UNDP along with the four countries put together a passionate concern which they had previously shown in an industrial development procedure centred on the concepts of commercialization of R&D results and innovation for the development as well as submission of an importation swap policy; Job creation and capital creation through the useful employment of the association that exist between science and technology and the private enterprise development [35].

Nigeria started implementing it in 1993 when the first pilot centre was established in Lagos in 1993, then later established in Kano in 1994 and Aba in 1995. Presently, there are about 29 functional TIC in Nigeria [36]. Business incubation programme has been adopted in many developed and emerging nations since 1980s with different level of success. Nigeria has also implemented the initiative over two decades but the performance has not been comparatively mostly effective [37]. They claim that the drawback or difficulty encountered reveal how programmes or strategies imported from the developed countries need to be adapted to suit the local condition of the home-grown model. Since business incubator concept is a Western-driven model, it necessitates for local context adaptation.

There are so many factors that prevent a better operation of the Technology Business Incubation (TBI) in Nigeria which range from lack of adequate funding of the scheme to inconsistent government policies toward the Small and Medium Enterprises (SMEs) on one hand and the development of Science, Technology and Innovative Policy on the other hand.

There are a lot of claims from the stakeholders/participants that the programme has been successful but this study's assessment based on observation and interviews conducted revealed that most of the centres or the Nigerian incubation programme are not really where it ought to be in comparison with some other countries of equal development. This was supported by [7] scholarly work which concluded that the Nigerian context of technology incubation centres has not emphatically generated employments for the swarming populace, particularly the young people. Furthermore, their argument was strengthened by the report of the National Bureau of Statistics [38] that puts the total number of Nigerian population who are unemployed at 14 million.

## 2.5 National Policy on Technology Incubation in Nigeria

The drive for the policy is the employment of technology incubation programme as an instrument for technological, industrial, social and economic accomplishment and also to enhance the quality of life of its people. This is to be achieved by means of technology commercialization since quick development can only be reached if it is involved with dependable S&T policy. The basis of this is to establish best practices that will move the programme at the same level with associated programmes in other nations especially USA and other OECD nations. The intent is to in the best way exploit the benefit of technology incubation which include economic development at all levels, job formation, wealth creation, technology acquisition and techno-entrepreneurship culture support by Nigerians [39].

As sustainability is a paramount factor in developmental activities in today's world (c.f figure 1), technology incubation is not an exception. In all the activities that an incubator will embark on, the business practices that would be supported, sustainability must be the hallmark. Most technology incubations are characterized by public-private partnership in the industrialized world as well as public sponsorship in the developing countries, in which the initial financial support is acquired from government mostly. Thus, the sustainability concept in relation to technology incubation implies the ability to continue to achieve results in a positive dimension, both in cash flows as the case may be and perpetuity.

The Nigeria's vision 20:2020 hold out to link TICs in its policy objectives [7]. The policy has two all-encompassing objectives, such as enhancing human and natural resources in order to attain quick economic growth. The second objective is translating the economic growth achieved in the first objective into reasonable social development for all citizens. These objectives have been conceptualized into social, economic, institutional and environmental dimensions.

## 2.4.1 Policy Objectives and Implementation Strategies

The significance of this policy is to present the platform for the high-scale industrial development, as well as innovativeness of the country. The policy will be realized if the much needed aims and their associated strategies are employed carefully. A number of the objectives of TBI and its related strategies are discussed below:

The setting up of established infrastructure and approaches for the improvement and technologies commercialization is one of the aims. The setting up of National Board for Technology Incubation for policy implementation was one of the strategies to achieving this objective. Setting up of TBI Centres all over the country was another strategy employed in achieving the objective. For the time being about twenty nine centres are operational [36]. Others are the setting up of Network of professional services providers [31, 40, 41] and instituting processes for technologies commercialization [5, 40]. Furthermore funding of the programme implementation is another objective of the policy. Outsourcing of resources from government endowments as well as donations, public as well as private sourcing of funds, venture capital; and International Donor Agencies sourcing of funds are some of the strategies to attain the objective [39].

The operative policy is centred on the Board's (NBTI) role. The NBTI coordinate the Technology Incubation programme in Nigeria while the actual incubation process takes place at Technology Incubation centres (TICs). NBTI functions inter alia are policy implementation and Coordination which involves development of working guidelines. Other roles include supervision, monitoring and evaluation; Financial Management and Control; Sourcing of fund; National and International Liaison; Program Planning and Development as well as provision of legal services [39].

## III. METHODOLOGY

This study interviewed 10 respondents in Nigeria. Even though qualitative data collection does not prescribe a particular desired number of participants required to achieve understanding, [42] suggested that usually 9 to 20 in-depth interviews are sufficient to gain the most insight from the participants. In line with this, 10 interviewees were selected for interview in this scholarly work,

After the data collection through interview was over, the data was transcribed, coded and emerging themes presented. This work was approached through a multiple case (cross case analysis) study methodology to tackle these questions. Interview transcript was transcribed and analysed following [43] qualitative data analysis.

In sum this study's design is centred on the principles of [44] and [45]. In line with this, the study employed a purposeful sampling, uses the case study as a reporting mechanism and employs a corresponding means to establish the positivist concepts of validity, reliability and objectivity as the researcher moves through the phenomenon under study. For the reason that naturalistic inquiry will employ other equivalent means to establish the positivist concepts of internal and external validity, reliability and objectivity (viz. credibility, transferability, dependability and confirmability).

## IV. RESULTS AND DISCUSSION

The outcome of the structured interviews based on the research questions revealed that Government of various administrations have experimented with a lot of assistance policies geared towards helping the SMEs but the implementations of those policies at different times have been the shortcomings of the very nice policy documents which are very vivid on paper but to put in practice have been the bane of entrepreneurship development in Nigeria. Three major themes emerged from the interviews outcome; namely, inadequate funding, lack of policy implementation and inconsistent policy. This section contains key outcomes from the study which has assisted in approaching the research question. On the basis of the research findings a number of elements are responsible for successful incubation initiative, however, only the key elements are stated.

Research Question 1: Which factors are needed for the Nigerian government to operate a more successful TBI Model?

Policies offer strategic direction for virtually any government effort. It maps out a programme for the tactical and functional delivery of the initiative. However, poor policy direction has been a key obstacle militating against successful delivery of the TBI. This is long-established that there is a lack of a National blueprint on the Technology Incubation Programme. There is absence of a robust reference to the Technology Incubation Programme on the National Development Plan including the extant Vision 20-2020. The TBI allusion in the Nigerian Vision 20-2020 is just very weak. An original idea of the TBI effort in Nigeria was to lead to the transformation relating to R&D results directly into product or service within Nigerian economic system. This has since also been derailed due to the shortage relating to research facilities in Nigeria as well as inconsistency in terms of the way government executes its policies. Lack of government implementation policy was acknowledged by all of the interviewees as very critical to the success or failure of the scheme, as the government is seen as the lead stakeholder as well as a policy provider. Consequently, the functionality of this initiative is contingent on how well policies are executed. There are various laudable federal government policies coming from diverse administrations even so the execution and also consistency towards performance in the programme has become the bane involving the nation's industrialization.

Government continually brings one policy document or the other from time to time with different nomenclature but with the same intentions and different modus operandi. This has made so many initiatives that have laudable plans to be thrown away just for its successor to be doing the same thing with a different name and with different workforce. This has not really helped the country in achieving the desired success in all these initiatives including SMEs on one hand and Technology Incubation on the other, due to changes and inconsistencies in the workforce as well as different objectives and perspectives of the plan.

The basis of starting technology incubation (TI) centers is to assist in the emergence of start-ups and fledgling companies that have acceptable technology input and output. Consequently, there is a need to offer financial resources to the incubator in such a way as to make funding accessible to the businesspersons; unfortunately, incubators cannot on their own make available funds for the tenants. The reason is that the incubators are not making money on their own; they still depend on government subvention for their sustainability and as such cannot offer any financial assistance directly to the tenant firms. This has made activities at the TI centers very challenging to the extent that the incubator management cannot render the basic role reposed on the incubator. Nevertheless, as the incubator cannot directly support the tenants financially, the incubator generally draws other financial suppliers (banks, venture capitalist, and angel organization) to support the tenants. In the case of commercial banks, the entrepreneurs are discouraged by the rigid security enforced by banks which makes it difficult for them to be given a credit facility. On the aspect of the venture capitalists, the Technology Incubation programme lacks the venture capitalists that would ordinarily come in to help out; unfortunately, they seldom exist and if they do exist, the venture capitalists would seldom invest in the fledgling business enterprises. Also, angel organizations who are private high net-worth individuals would be skeptical about taking up some equity investment in the newly formed businesses. Alagbaoso et al [46] recognize inadequate funding as one of the key challenges in entrepreneurship development. Business incubation literature has linked funding to be one of the success factors [23].

## V. CONCLUSION LIMITATION AND IMPLICATION FOR FUTURE RESEARCH

This Research presents a concise appraisal of the literature related to success factors for technology business incubation. It highlights the various traditional factors that are vital to successful incubation practice as well as the government policies as they relate to science, technology and innovation generally and technology incubation in Nigeria in particular. The full implementation of government policies are the much needed requirements needed to move the technology Incubation program in Nigeria forward as well as its sustainability. Also for a successful TBI Policy implementation, the program should engender technological SME development or focusing it to cause the transformation of the entire SME sector.

We are of the opinion that the result will fill a substantial amount of gap in the body of knowledge as well as contribute immensely to the policymakers and incubator managers.

This study is aimed at exploring the relevant research question guiding this scholarly. The themes that emerged from this research can help the policy makers in mapping out a new path to the development of entrepreneurship generally and business incubation programme in particular. Results suggest that in order to achieve a successful incubation attainment, certain elements, for example (efficient and user-friendly government policy and its implementation) ought to be in place

Furthermore, from the literature review above, it is pertinent to say that aside from the traditional success factors, government policies as they relate to science, technology and innovation (STI), technology business incubation (TBI) as well as SMEs are very crucial to the successful operation of TBI on one hand and entrepreneurship development on the other.

In addition, for the reason that this kind of research is usually context-specific, there are theoretical justifications to be based upon in which different emerging countries may perhaps experience similar dynamics. Accordingly, it necessitates for this deduction to be verified by future research undertakings to be conducted in other developing countries through analytic generalization [47]. Moreover, future research should be carried out quantitatively using the themes that emerged from the interviews to construct questionnaire instrument

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#### AUTHORS

**First Author** – Nkem Okpa Obaji, Ph.D, Universiti Teknologi Malaysia, amazonsng@yahoo.com

**Second Author** – Mercy Uche Olugu, M.Sc, Federal School of Statistics, Ibadan, Nigeria olugumercy@yahoo.com

**Third Author** – Kayode O. Balogun, M.Sc, Federal School of Statistics, Ibadan, Nigeria, kayibalogun@yahoo.com.

**Correspondence Author** – Nkem Okpa Obaji, amazonsng@yahoo.com, amazonsng@gmail.com, +60162738205
# **Relevance of Red Cell Distribution Width (RDW) Determination in Stroke: A Case Control Study**

Dr R Vijayashree<sup>1</sup>, Ms V. R.Abirami<sup>2</sup>, Dr. S. Govindaraju<sup>3</sup>, Dr K. Ramesh Rao<sup>1</sup>

<sup>1</sup>Department of Pathology <sup>2</sup>Third Year Medical Student <sup>3</sup>Department of Statistics

Abstract- BACKGROUND: Stroke is an important cause of disability and death. Recently several studies have claimed that RDW is a good predictor of outcome in stroke. As RDW is a complete blood count (CBC) parameter that is routinely determined in clinical laboratories, these studies important implications in patient management in developing countries. The present study was taken up to find out if RDW can be used as an inexpensive biomarker for stroke. MATERIALS AND METHODS: A case-control study involving 52 test subjects and 54 matched controls was conducted. RDW values were determined in test and control groups, compared and statistically analysed. RESULTS & CONCLUSIONS: Significantly higher mean values for RDW (p <0.001) are observed in stroke patients compared to reference population. RDW values higher than 13.0 are associated with several fold increase in the risk of stroke (odds ratio 4.1; p value <0.006); but, the level of RDW does not show a linear relationship with the severity of stroke. So, RDW values can predict the occurrence of stroke but not its severity.

*Index Terms*- RDW, Stroke, Biomarker, case control study, predictor of outcome.

#### I. INTRODUCTION

**S** troke or the cerebrovascular accident affects well over 20 million people every year globally and kills close to 6 million of them (Dalal, Malik et al. 2008). It is the second most important cause of mortality(Strong, Mathers et al. 2007). Besides, it also causes significant disability with nearly 20% of the survivors requiring institutionalised care(Steinwachs, Collins-Nakai et al. 2000). Due to the limited availability of reliable data on stroke related mortality and morbidity, the situation in India is not entirely clear. But the gravity of the problem can be understood from the ICMR report (2004) which claims that stroke accounts for 41% of deaths and 72% of disability adjusted life years (DALY) among non-communicable diseases(ICMR 2004). The age adjusted annual incidence rate for stroke is 124/100000 in Rural India(Bhattacharya, Saha et al. 2005) and 145 in Urban India(Das, Banerjee et al. 2007).

The neurological impairment associated with stroke is usually assessed by NIH stroke scale (NIHSS) (Brott, Adams et al. 1989, Matt B. Jensen and Patrick Lyden 2006) and the outcome is predicted by using Barthel index, Rankin Scale or Glasgow Outcome Scale (Adams, Davis et al. 1999). Recently, several studies have claimed that red cell distribution width (RDW) is a good independent predictor of outcome in stroke (Ani and Ovbiagele 2009, Kim, Kim et al. 2012, Ramírez-Moreno, Gonzalez-Gomez et al. 2013), having a statistically significant correlation with the NIHSS scores and grading. If these claims are true, then RDW will be a simple inexpensive biomarker for the assessment of the severity of stroke, since RDW is a routine haematological parameter detected easily by most modern automated counters. This will be particularly beneficial for patients of the third world countries, who cannot afford expensive investigations. However, this claim has been disputed by some investigators, who failed to find similar association(Ntaios, Gurer et al. 2012). The present study was taken up to find out if RDW can be used as an independent prognostic biomarker in stroke.

#### II. MATERIALS AND METHODS

A case control study was conducted involving 52 study subjects and 54 age and sex matched controls. All the participants were 16 years of age or above, of either sex and were admitted in the medical and the neurology wards of Chettinad Hospitals and Research Institute, Kelambakkam, Tamilnadu, India. All the study subjects had confirmed stroke, with or without co-morbid conditions like hypertension, diabetes, cardiac or renal disease. The control subjects had no history or evidence of cerebrovascular disease.

In the study subjects, the severity of stroke was scored according to NIH stroke scale and was graded into mild, moderate and severe categories (Adams, Davis et al. 1999). From all the subjects, venous blood was collected in  $K_2EDTA$  vacutainers for haemoglobin and RDW (CV) estimations using Coulter LH 780 automated haematology analyser.

The statistical analysis was done using SPSS version 21. RDW was used as continuous variable and in quartiles. The participants were also categorised into two groups based on RDW values of  $\leq 12.9$  and  $\geq 13.0$  respectively and the odds ratio were determined. For comparing the results in study subjects and the controls, and for assessing the relationship between RDW and the co-morbidities, independent samples t-test was performed. One way ANOVA was performed to find out the relationship between RDW and the severity of the stroke. A 'p' value of 0.05 or less was taken as significant. III. RESULTS

Summary statistics is given in table 1.

Table 1. Summary statistics									
		Group		-		Monn White	av. II Teat		
		Test (n =	52)	Control (r	n =54)				
		Count	%	Count	%	Z	p value		
Sov	Male	35	67.31	36	66.67	070	0.044		
SCA	Female	17	32.69	18	33.33	070	0.944		
Smalring	Yes	7	13.46	2	3.70	1 702	0.072		
Smoking	No	45	86.54	52	96.30	-1.795	0.075		
Alcoholism	Yes	8	15.38	4	7.41	1 200	0.107		
	No	44	84.62	50	92.59	-1.290	0.197		
Dichatan Mallitur	Yes	22	42.31	26	48.15	601	0 5 4 9		
Diabetes Menitus	No	30	57.69	28	51.85	001	0.348		
Urmontonsion	Yes	21	40.38	18	33.33	740	0.454		
Hypertension	No	31	59.62	36	66.67	749	0.434		
Dravious CVA*	Yes	6	11.54	0	.00				
Previous C V A	No	46	88.46	0	.00				
C + D **	Yes	5	9.62	5	9.26	062	050		
CAD	No	47	90.38	49	90.74	062	.930		
Anomio	Yes	24	46.15	34	62.96	1 720	094		
Anemia	No	28	53.85	20	37.04	-1.730	.064		

\*CVA=cerebrovascular accident; \*\*CAD\_Coronary artery disease

The present case control study was carried out on 52 test subjects and 54 age and sex matched controls. The test group consisted of 35 men and 17 women; and the control group had 36 men and 18 women. The average age of the test group was 60.29 years while the control group averaged 59.74 years. Apart from the absence of past history of cerebrovascular accident in the control group, there were no other significant differences between the groups with regard to co-morbidities. The categories based on severity of stroke are given in table 2.

Majority of the study subjects were having strokes of mild (38.46%) or moderate severity (57.69%). Only two subjects had severe degree of stroke.

Table 2. Grades of Stroke						
	Count	%				
Mild	20	38.46				
Moderate	30	57.69				
Severe	2	3.85				

The mean values for RDW along with standard deviation, and the results of independent t-tests in the test and the control groups are given in table 3. RDW values ranged from 11.3 to 24.5 in the test group, and from 11.9 to 16.1 in the control group.

Mean for RDW in the test group was  $15.12 \pm 2.87$  and in the control group,  $13.27\pm0.79$ . The difference between the groups was statistically highly significant (p =<0.001) (table 3).

Table 3.								
			Group				Independent	
	]	Test $(n = 52)$		Coi	ntrol $(n = 54)$		Sampl	es t-test
	Range	Range Mean SD Range Mean SD					t-value	p value
Age	16 - 85	60.29	15.27	17 - 89	59.74	14.91	0.187	0.852
Hb (g/dl)	6.2 - 18.7	12.71	2.84	9.1 - 18.7	12.58	1.64	0.291	0.771
RDW (%)	11.3 - 24.5	15.12	2.87	11.9 – 16.1	13.27	0.79	4.485	<0.001

	Table 4. RDW and severity of stroke										
	Mild (n =20) Moderate (n = 30)			n = 30)	Severe $(n = 2)$			C A	ne way NOVA		
	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range	F	p value
RDW	14.20	2.57	11.3-24.5	15.76	2.95	12.3-22.0	14.75	3.32	12.4-17.1	1.87	0.165
			t value $= 1.926$	; p value = (	).06						

Mean values for RDW varied with the severity of stroke (table 4). In mild form of stroke, the mean value for RDW was  $14.2\pm2.57$  and in stroke of moderate severity, it was  $15.76\pm2.95$ . However, the difference was not statistically significant (p value = 0.06). In severe form of stroke, the value was lower than the

mean value in stroke of moderate severity. But the number of cases were very few. When all the participants were categorised into two groups based on RDW values of  $\leq 12.9$  and  $\geq 13.0$  respectively, it was found that the participants in the group with RDW values  $\geq 13.0$  were several times more likely to have a stroke than the other group(odds ratio= 4.16; p value 0.006) (table 5).

		Table 5. RDW cate	gories and Stroke		
Group		RDW Categories		Total	
		>= 13.0	<= 12.9		
Test	Count	$46_{a}$	6 <sub>b</sub>	52	
Test	Row %	88.46	11.54	100.00	
Company 1	Count	35 <sub>a</sub>	19 <sub>b</sub>	54	
Control	Row %	64.81	35.19	100.00	
Total	Count	81	25	106	
Total	Row %	76.42	23.58	100.00	
Chi Square Value: 8.21	9; p value: 0.004	1454			
Odds Ratio: 4.1619048	8; p Value: 0.006	50276			
95% CI for Odds ratio:	(1.5042339, 11.51	151315)			

The co-morbidities did not affect RDW significantly (table 6).

	Table 6. RDW and co-morbidities								
		RDW		t voluo	n Valua				
		Mean	SD	t value	p value				
Gender	male	14.02	2.19	1.027	0.307				
	female	14.50	2.42	-1.027	0.307				
Smolting	yes	14.68	1.21	695	0.405				
Smoking	no	14.13	2.34	.085	0.495				
Alashalism	yes	14.52	2.30	542	0.5%				
Alconolism	no	14.14	2.28	.345	0.388				
Diabetes	yes	13.75	1.56	1 0 1 1	0.072				
Mellitus	no	14.54	2.69	-1.011	0.073				
humantancian	yes	14.02	2.05		0.577				
hypertension	no	14.27	2.40		0.377				
Dravious CVA*	yes	15.23	3.32	000	0.021				
Flevious C VA	no	15.11	2.84	.099	0.921				
CAD**	yes	14.87	2.67	1.000	0.215				
CAD	no	14.11	2.23	1.009	0.315				
Anomio	yes	14.36	2.66	006	0.267				
Anaenna	no	13.96	1.68	.900	0.307				

\*CVA=cerebrovascular accident; \*\*CAD\_Coronary artery disease

### IV. DISCUSSION

Worldwide, stroke is an important cause of permanent disability and death. In India alone, more than 1.5 million new cases are recorded each year with 28-day mortality of 29.8% (Pandian and Sudhan 2013, Taylor and Suresh Kumar 2012). Besides, it is responsible for 6,398,000 disability adjusted life years. The extent of disability and the occurrence of mortality following a stroke are dependent on the severity of stroke. At present, the severity of the stroke is assessed by NIH stroke scale (NIHSS), which has been shown to be a reliable predictor of outcome (Adams, Davis et al. 1999, Matt B. Jensen and Patrick

Lyden 2006). Recently, several studies have tried to find a simpler alternative to NIHSS. Some of these studies have focussed on RDW, as it has already been shown to be a prognostic biomarker in a variety of serious human ailments including cardiovascular disease (Chen, Sung et al. 2010, Aung, Dworakowski et al. 2013, Olivares Jara, Santas Olmeda et al. 2013, Yao, Sun et al. 2014), pulmonary ailments (Grant, Kudalkar et al. 2003, Nathan, Reffett et al. 2013) and diabetes(Malandrino, Wu et al. 2012). Another attractive feature about RDW is that it is a routine parameter that is inexpensively determined along with complete blood count by automated haematology counters. Ani and Ovbiagele (2009) in an analysis of data collected from 480 individuals over a period of six years

from 1988 to 1994 concluded that elevated RDW was associated with the occurrence of stroke and it strongly predicted all-cause mortality in persons afflicted with stroke. They also found out that those subjects who had RDW values higher than 13.9% had two fold increased risk of death compared to the reference group(Ani and Ovbiagele 2009). Ramírez-Moreno and others (2013) in a case control study involving 224 stroke patients and an equal number of matched controls found that RDW was a powerful predictor of stroke. In addition, they observed that higher values of RDW was associated with increased risk of stroke suggesting a level response gradient(Ramírez-Moreno, Gonzalez-Gomez et al. 2013).

The present study is a case-control study involving 52 stroke patients and 54 age and sex matched controls. We found that the mean RDW values in the test subjects were significantly higher than the mean values in the control group (p < 0.001). We also noted that RDW values higher than 13.0 increased the risk of stroke several folds (odds ratio 4.1; p value 0.006). Although there was difference in the mean values of RDW between mild and moderately severe forms of stroke, it was not statistically significant. From our observations, it appears that severity of stroke does not show a linear relationship with RDW values. So, higher RDW values, while increasing the risk of stroke, may not be associated with more severe forms of stroke. This is in agreement with the observations of Ntaios and others (2012), who after analysing the data from 1504 patients, concluded that RDW did not predict severity or functional outcome(Ntaios, Gurer et al. 2012).

In conclusion, the following observations can be made: significantly higher mean values for RDW (p < 0.001) are observed in stroke patients compared to reference population; RDW values higher than 13.0 are associated with several fold increase in the risk of stroke (odds ratio 4.1; p value <0.006); but, the level of RDW does not show a linear relationship with severity of stroke. So, RDW values can predict the occurrence of stroke but not its severity.

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#### AUTHORS

First Author: Dr. R. Vijayashree, MBBS, MD,

(Pathology)Associate Professor, Department of Pathology,

Chettinad Hospitals & Research Institute (CHRI), Kelambakkam, Chennai 603103, Tamilnadu Email: <u>drvjshree@gmail.com</u> **Second Author:** Ms. Ms V. R. Abirami, Third Year Medical Student, Chettinad Hospitals & Research Institute (CHRI), Kelambakkam, Chennai 603103, Tamilnadu Email: <u>umamaheswariramesh86@gmail.com</u>

**Third Author:** Dr. S. Govindaraju, PhD, Professor of Statistics, Chettinad Hospitals & Research Institute (CHRI), Kelambakkam, Chennai 603103, Tamilnadu, Email: <u>sg\_raju49@yahoo.co.in</u>

**Corresponding Author:** Dr. K. Ramesh Rao, MBBS, MD (path), DCP, Professor and Head, Department of Pathology, Chettinad Hospitals & Research Institute (CHRI), Kelambakkam, Chennai 603103, Tamilnadu Email: <u>rameshkrao@gmail.com</u> Email: <u>rame5hra0@yahoo.co.uk</u>Cell: 9884616318

# Extraction based approach for text summarization using k-means clustering

# Ayush Agrawal, Utsav Gupta

*Abstract*- This paper describes an algorithm that incorporates kmeans clustering, term-frequency inverse-document-frequency and tokenization to perform extraction based text summarization.

*Index Terms*- Information retrieval, k-means clustering, Natural Language Processing, text summarization.

### I. INTRODUCTION

In recent years, natural language processing (NLP) has moved to a very firm mathematical foundation. Many problems in NLP, e.g., parsing [2] word sense disambiguation[3], and automatic paraphrasing [4]have benefited significantly by the introduction of robust statistical techniques.[1] In this paper we will discuss an unsupervised learning technique for a NLP problem. With the recent increase in the amount of content available online, fast and effective automatic summarization has become more important. The need for getting maximum information by spending minimum time has led to more efforts being directed to the field of summarization. So in this paper we will discuss an unsupervised learning technique for the Automated Summarization problem.

Text summarization is the process of automatically creating a compressed version of a given text that provides useful information for the user. The information content of a summary depends on user's needs. Topic-oriented summaries focus on a user's topic of interest, and extract the information in the text that is related to the specified topic. On the other hand, generic summaries try to cover as much of the information content as possible, preserving the general topical organization of the original text. There are basically two methods of summarization: extraction and abstraction. Extractive summarization produces summaries by choosing a subset of the sentences in the original document(s). This contrasts with abstractive summarization, where the information in the text is rephrased. Although summaries produced by humans are typically not extractive, most of the summarization research today is on extractive summarization. Purely extractive summaries often give better results compared to automatic abstractive summaries. This is due to the fact that the problems in abstractive summarization, such as semantic representation, inference and natural language generation, are relatively harder compared to a data-driven approach such as sentence extraction. In fact, truly abstractive summarization has not reached to a mature stage today.

In this paper, we employ extraction based techniques to generate automatic summaries from a document. Early research on extractive summarization is based on simple heuristic features of the sentences such as their position in the text, the overall frequency of the words they contain, or some key phrases indicating the importance of the sentences [5,6,7]

The approach used in this paper is an unsupervised learning technique which is accomplished as a part of three step process.

- Tokenization of Document
- Computing Score for each Sentence
- Applying Centroid Based Clustering on the Sentences and extracting important Sentences as part of summary.

#### II. TOKENIZATION OF DOCUMENT

Given a character sequence and a defined document unit, tokenization is the task of chopping it up into pieces, called tokens, perhaps at the same time throwing away certain characters, such as punctuation. The Major idea is to break the entire document into a list of sentences.[8]

2.1. Methods for tokenization:

Typically, tokenization occurs at the word level. However, it is sometimes difficult to define what is meant by a "word". Often a tokenizer relies on simple heuristics, for example:

- All contiguous strings of alphabetic characters are part of one token; likewise with numbers
- Tokens are separated by <u>whitespace</u> characters, such as a space or line break, or by punctuation characters.
- Punctuation and whitespace may or may not be included in the resulting list of tokens.

In languages that use inter-word spaces (such as most that use the Latin alphabet, and most programming languages), this approach is fairly straightforward.

However, even here there are many edge cases such as contractions, <u>hyphenated words</u>, <u>emoticons</u>, and larger constructs such as <u>URIs</u> (which for some purposes may count as single tokens). For instance consider the text "New York-based", which a naive tokenizer may break at the space even though the better break is (arguably) at the hyphen.

#### III. COMPUTING SCORE FOR EACH SENTENCE

Each sentence is given an importance score and this acts as a goodness measure for the sentence. The scores can be used to order sentences and pick most important sentences. The probability of a sentence to be present in the summary is proportional to its score. Each sentence is represented by a set of features and the score is a function of the weighted sum of the individual feature values.[9]

#### The features we have used are:

3.1. TF-IDF sum: The goodness of a sentence is usually represented by the importance of the words present in it. TF-IDF is a simple but powerful heuristic for ranking the words

according to their importance. This feature is the sum of the TF-IDF scores of the individual words of the sentence.

• TF:Term Frequency, which measures how frequently a term occurs in a document. Since every document is different in length, it is possible that a term would appear much more times in long documents than shorter ones. Thus, the term frequency is often divided by the document length (aka. the total number of terms in the document) as a way of normalization:

TF(t) = (Number of times term t appears in a document) / (Total number of terms in the document)

• IDF:Inverse Document Frequency, which measures how important a term is. While computing TF, all terms are considered equally important. However it is known that certain terms, such as "is", "of", and "that", may appear a lot of times but have little importance. Thus we need to weigh down the frequent terms while scale up the rare ones, by computing the following:

$$\label{eq:IDF} \begin{split} IDF(t) = log_{e}^{\ (Total number of documents / Number of documents with term t in it)} & [10, 11, 12, 13] \end{split}$$

• Tf-idf weighting:We now combine the definitions of term frequency and inverse document frequency, to produce a composite weight for each term in each document. The *tf-idf* weighting scheme assigns to term a weight in document given by

Tf-idf = tf \* idf

In other words, tf-idf assigns to term a weight in document that is

- 1. highest when term occurs many times within a small number of documents (thus lending high discriminating power to those documents);
- 2. lower when the term occurs fewer times in a document, or occurs in many documents (thus offering a less pronounced relevance signal);
- 3. lowest when the term occurs in virtually all documents. [8,9,13]

3.2. Sentence length: This feature is the number of words present in the sentence. Longer sentences usually contain more information about the documents.

### IV. CENTROID BASED CLUSTERING

K-means is an unsupervised learning algorithm that solves the well known clustering problem. The procedure classifies a given data set through a certain number of clusters (assume k clusters) fixed a priori. The main idea is to define k centroids, one for each cluster. These centroid are chosen to place them as much as possible far away from each other. The next step is to take each point belonging to a given data set and associate it to the nearest centroid. When all points have been classified, we recalculate k new centroid as new centers of the clusters resulting from the previous step. After we have these k new centroid, a new association is generated between the same data set points and the nearest new centroid. The k centroid change their location in each step until no more changes occur. Although the K-means algorithm will always terminate, it does not necessarily find the most optimal configuration, corresponding to the global objective function minimum. The algorithm is also significantly sensitive to the initial randomly selected cluster centers. The K-means algorithm can be run multiple times to reduce this effect.[14]

The problem is computationally difficult (NP-hard); however, there are efficient heuristic algorithms that are commonly employed and converge quickly to a local optimum.[15]

This algorithm aims at minimizing an *objective function*, in this case a squared error function. The objective function is :

$$J = \sum_{j=1}^{k} \sum_{i=1}^{n} \left\| x_{i}^{(j)} - c_{j} \right\|^{2}$$

Where  $\left\|x_{i}^{(j)} - c_{j}\right\|^{2}$  is a chosen distance measure between

a data point  $x_i^{(j)}$  and the cluster centre  $c_j$ , is an indicator of the distance of the *n* data points from their respective cluster centres.[16,17]

The algorithm is composed of the following steps:

- 1. Place K points into the space represented by the objects that are being clustered. These points represent initial group centroids.
- 2. Assign each object to the group that has the closest centroid.
- 3. When all objects have been assigned, recalculate the positions of the K centroids.
- 4. Repeat Steps 2 and 3 until the centroids no longer move. This produces a separation of the objects into groups from which the metric to be minimized can be calculated. [18]

# Our approach

The major idea is to divide the entire document into sentences. Each sentence can be considered as a point in the Cartesian plane.

Each sentence is then broken into tokens and the tf-idf score is computed for each token in the sentence.

 $Tf_t = \hat{f}(t,d) / f(d)$  where , t is a token

d represents the document

f(t,d) represents frequency of t in d

f(d) represents frequency of every term in d

 $idf_t = log_{10}^{(N / f(t,d))}$ where , N is the number of sentences in the document

tf-idf 
$$_{t} = Tf_{t} * idf_{t}$$

Score for each sentence is computed by summing up the tfdidf score for every token in the sentence and normalizing it by using the sentence length. Score(X) =  $\sum_{t}$  tf-idf<sub>t</sub> / |X| where , X represents a sentence in the document t is a term in X |X| represents length of X

These sentence scores are used to represent the sentences as unique coordinates in the single dimensional Cartesian plane.

These coordinates are used as input data for unsupervised kmeans clustering algorithm. Simulating the algorithm on the input data generates k cluster centers.

Now we classify each sentence into different clusters based on the scores computed for each sentence.

Finally, we pick the cluster with maximum number of sentences and generating the summary by producing the sentences in the same order in which they appear in the original document.

This approach gives a precise summary because the densest cluster which is returned by the k-means clustering algorithm consists of the sentences with highest scores in the entire document. These sentence scores are computed by summing up the tf-idf scores of individual terms in the sentence and normalizing it by using the length of the sentence.tf-idf takes into account the case of stop words and unique words. Thus the sentences in the most dense cluster are the ones which are contextually closer to the abstract idea of the document. The length of the summary should change depending on the length of the document. If we choose a very large value for k, then the clusters are sparse and the summaries are not coherent. On the contrary, if the value of k is very small then the clusters are very dense and the summary is not so concise. Hence, the value of k should dynamically vary according to the length of the document.

After running the simulations on various documents and different values of  ${\bf k}$  , we formulated a function to determine the value of  ${\bf k}.$ 

if N <= 20:

k = N - 4

else : k = N - 20

where, N is the number of sentences in the document

### **Evaluation**

As the approach described in the paper is an extraction based, it is necessary for the resulting summary size to be around 35% - 50% of the original text size because the resulting summary if is smaller then 35- 50% size of original size of text will be small in size but not concise in meaning and the summary will also be not that coherent when compared to human written abstractive summary. To evaluate our approach we ran simulation on some text samples and compared it with other existing summarizer which uses an extraction based technique

Text	Number of	Number of	Number of	% of size	% of size of text in
	Sentences	Sentences	Sentences in	of text in	summary by our
	in Original	in summary	summary made	summary	autosummarizer.com
	Passage	made by	by	by our	
		our	autosummarizer.com	approach	
		approach			
1	24	10	4	41.66	16.66
2	20	6	5	30	25
3	30	14	8	46.66	26.66
4	33	16	6	48.48	18.18
5	18	9	5	50	27.77
6	14	6	3	42.85	21.43

Choice of k for the clustering algorithm

Figure 1 : Results of Evaluation of our approach on various sample text

Our approach when compared with a human written abstractive summary produces a good result. Whereas, other extraction based technique does not produce a similar result when compared to human written summary.

Summary written by human for a certain document -

New Caledonia is an island archipelago slightly north the Tropic of Capricorn, approximately 1,500 km from Australia and New Zealand. 80% of New Caledonia's 200,000 residents live on the main island, Grand Terre. The economy is sustained mostly by mining and tourism. Through the mining sector has been down lately, tourism is doing well and many wind surfers, scuba divers, snorkelers, and golfers flock to Pacific islands. The capital city of Noumea has a charming French atmosphere and lots of boutiques, museums, and restaurants. The zoo, botanical gardens, and aquarium are a must see. New Caledonia offers a wide variety of hotel facilities and though French is the lingua franca, English is also widely understood - particularly in touristy places.

Summary generated by our approach -

New Caledonia a cluster of islands in the southwestern Pacific Ocean.New Caledonia's economy is based mainly on tourism and mining.About 25% of the world's known nickel resources are found in New Caledonia.The botanical and zoological gardens in Noumea are first rate.A range of accommodations are available throughout the territory.You five-star hotels/resorts or simple tribal lodgings in Melanesian villages.

#### Summary generated by autosummarizer.com -

The main island, known as Grand Terre, is home to over 160,000 people - over 80% of the population of this French colony. The capital city, Noumea, has a distinctly French ambience and offers many shops, museums, and restaurants with various French, Indonesian, Chinese, Italian, Mexican, and Japanese food. Though French is the official language island there are about 30 local languages, English is also widely spoken in areas which are heavily touristed.

#### V. CONCLUSION

In this paper, we proposed an automatic text summarization approach by sentence extraction using an unsupervised learning algorithm. In particular, the K- means algorithm for creating groups of similar sentences was used. Then, from the groups of sentences, the most representative sentence was selected for composing the summary. The proposed approach, in contrast to supervised methods, does not need large amount of golden samples for training. Therefore, our proposed approach is more independent from language and domain. According to experimental results we demonstrate that the proposed approach obtains more favourable results than others state-of-the-art approaches using graph based techniques and supervised learning algorithms [19, 20, 21]; ranking our proposed approach in second place, very close to the first place.

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#### AUTHORS

First Author – Ayush Agrawal, ayush.agrawal464@gmail.com Second Author – Utsav Gupta, utsavgupta7@gmail.com

# Local Residents' Perception of the Psycho-Social and **Economic Impact of Tourism in Goa**

Dr. (Fr) Simão R. Diniz<sup>\*</sup>, Dr. Savio P. Falleiro<sup>\*\*</sup> and Ms. Maria M. de Barros<sup>\*\*\*</sup>

<sup>\*</sup>Department of Psychology, Rosary College of Commerce and Arts, Navelim, Goa (India) <sup>\*\*</sup>Department of Economics, Rosary College of Commerce and Arts, Navelim, Goa (India)

\*\*\*\*Department of Psychology, Rosary College of Commerce and Arts, Navelim, Goa (India)

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*Abstract*- This paper explores the benefits and adverse effects of tourism on the psycho-social and economic life of the locals in the coastal village of Cavelossim, Goa (India). In the study a sample comprising 232 household heads were interviewed. Using *Chisquare* and *Kruskal-Wallis H* test, it was found that all household heads perceived that tourism had negatively impacted the psychosocial life of the locals. While the major economic benefits of tourism perceived were employment and increased income, the major adverse effect was increase in food prices. It was also found that due to tourism traditional occupations were abandoned for more lucrative employment.

Index Terms- crime, culture, economic impact, HIV, psycho-social impact, tourism

### I. INTRODUCTION

Tourism is one of the largest and dynamically developing sectors that contribute actively to the social and economic development of a state and the country as a whole. Tourism is <u>travel</u> for <u>recreational</u>, <u>leisure</u> or <u>business</u> purposes, and is for a limited duration only. It has become a popular global activity. Though commonly associated with trans-national travel, tourism also includes travel to another location within the same country. Although the visit of tourists to a destination area is transient, tourism can bring short and long term economic, environmental and socio-cultural effects on a destination (Meadows, n.d.).

The Psycho-Social Impact of Tourism: Tourism provides an excellent opportunity for locals to meet an array of interesting people, learn about the world, and expose themselves to new perspectives. Makan (2006) found that when locals experience different cultural practices, these increase insight and appreciation for different approaches to living and helps broaden horizons. These encounters also promote a greater acceptance to social differences.

Tourists visit a community to witness the glories of the past and to enjoy the beauties of the present, creating an increased demand for the restoration and development of historical and cultural exhibits. Many traditional ceremonies may be renewed, revived and readapted to the interests of tourist (Singh, 1996). According to Kreag (n.d.), tourism helps preserve the cultural identity of host population and promotes a greater tolerance of social differences.

Tourism can come to a community with a dark social and psychological side, too. Waitt (2003) argued that many societies live within a potentially alienating void of self- understanding because of loss of family, gender, class, ethnic, religious, or other social relations that once acted as a source of self-identification and understanding of the past. Due to tourism locals change their values, beliefs and acceptable standards of behaviour leading to the development of an artificial culture in order to identify with the tourists. The locals may also feel estranged from their own localities when tourism development initiatives fail to consider their interests. According to Kreag (n.d.) some negative effects of tourism include unwanted lifestyle changes, alterations in the values and customs and the disruption of family life of the locals. Often tourism development initiatives like construction of hotels, shopping complexes and pubs may develop in residential areas where tourists live, forcing locals to adapt to the changes in the physical composition of the community. Additionally, tourists who live in a place for a long period of time could even work against local issues. Their presence in the community often causes locals to make adjustments in their routine day to day activities (for example forces them to alter travel routes to avoid excessive motor and human traffic at marketplaces and social or religious gatherings). The long term presence of tourists in a community has also often been found to change the structure of families in the community on account of locals marrying tourists. Additionally, many illegal activities may thrive in the relaxed atmosphere in tourist areas, which include underage drinking, crime, drugs, prostitution, gambling and smuggling.

The Economic Impact of Tourism: The economic benefits of tourism have been studied by many researchers like Andriotis (2004), Fredline & Faulkner (2000), Marzuki (2012), Mensah (2005), Perez & Var (1994), Ritchie & Inkari (2006), Waitt (2003) and Wang et al (2006). Some of the benefits of tourism often cited include: increased employment opportunities and tax revenue through new business opportunities and increased commercial activity within the host community. According to Bhatia (2002), as a result of catering to tourists, locals also enjoy better public facilities and improved infrastructure like airports, hotels, water supply, roads, sewerage, sidewalks, transportation, lighting, landscaping, parking, restrooms etc.

In the light of these benefits, lie some hidden costs often borne by the locals. Tourism undermines the livelihood of residents, with a typical example being the conversion of paddy fields in Kumarakom (Kerala) for tourism purposes. These conversions denied villagers of their livelihoods as well as increased the price of essential food products especially fish (Sebastian & Rajagopalan, 2009, in Chand, 2013). The highly seasonal nature of the sector creates high-risk under-employment or unemployment issues. Besides, the increased job opportunities available for the locals are mostly low-paying; in Goa for example it is mostly the non-Goan personnel who are hired for the managerial/higher paying jobs. The influx of tourists brings with it a greater demand for goods, services, land and housing which increases prices and in turn increases the cost of living. According to Marzuki (2012), the most negative impact of tourism in Phuket (Thailand) was the increased cost of land and housing, and increased cost of living. When tourism services are outsourced, non-local owners and corporations often export their profits outside the community. Therefore, instead of being the beneficiaries of the venture the locals become the cost-bearers paying higher prices and taxes.

Goa is one state in India that has a seen the impact of tourism on the culture and lives of its people. It is a small state on the south-west coast of India replete with natural beauty and a unique culture. The state renowned for its relatively western culture and pristine beaches has captured the attention of people worldwide. Ever since tourism took roots in Goa with the arrival of the hippies in the sixties, more and more tourists flock into Goa every year making it a favourite holiday destination for Indian and as well as

international tourists. Over the years, increasing numbers of tourists visiting the villages in Goa have greatly impacted the lives of the local residents.

# II. ABOUT THE STUDY

The present study/paper explores the local residents' perception of the impact of tourism on the psychological, social and economic life of the people in the small coastal village of Cavelossim in Goa (India). Cavelossim was inhabited by fishermen since ancient times and it stayed aloof from the turbulent historical events and religious cults in Goa (The Goa Villa, 2014). The village presents a kaleidoscopic view of the river Sal, the paddy fields and the soft, sandy beach of the Arabian Sea. It is one of the most beautiful beaches in Goa. Today, though a considerable proportion of the population still continue to engage in fishing, the livelihood of the locals is primarily concerned with tourism. The tourist attractions in Cavelossim include relaxation and sun bathing on the beach, dolphin trips and sunset cruises. The place also offers attractive shopping opportunities for Goan and Indian handicrafts. The beach, which is well connected to the airport and railway station, is a centre for a number of luxury hotels, beach resorts and budget hotels.

## Objectives

- 1. To study the perceived impact of tourism on the psycho-social life of the local people on the basis of age.
- 2. To study the association between age and perceived impact of tourism on HIV infections.
- 3. To study the association between age and the economic benefits of tourism.
- 4. To study the association between age and the perceived adverse economic effects of tourism.
- 5. To study the impact of tourism on occupations (traditional versus recent).
- 6. To study the relationship between the duration of residence in Cavelossim and the attitude of the locals towards tourism.

# **Operational Definition of Variables**

Independent Variable: 1) Age of the household

2) Duration of residence in the village of Cavelossim

Dependent Variables: Perceived impact of tourism on the psycho-social and economic life of the household heads.

- 1) Psycho-social life (family life, moral values, culture, crime levels and inappropriate behaviour)
  - 2) Economic life (economic benefits, stimulation of the local economy, occupations, beneficiaries of tourism and adverse impact)

# Sample

For the purpose of the study an individual survey procedure was used. A total of 232 household heads participated in this study,<sup>1,2</sup> comprising of 151 male and 81 female household heads. The profile of the study sample is shown in Table 1:

	Age Gr	oup			
Demographic	30–54 yrs	55– 64 vrs	65– 90 vrs	Tota l	
Gender of	Males	66	43	42	151
the	Females				
household		14	29	38	81
head	1 1				
Religion of	Catholic	77	66	74	217
the	Hindu	3	6	5	14
household head	Others	0	0	1	1
Income	Rs. <2 lakhs	73	63	68	204
group of the	Rs. 2–5 lakhs	6	6	9	21
household^	Rs. 5–10 lakhs	0	1	1	2
Educational	Illiterate	6	10	29	45
qualificatio n of the	Up to Std. 4	1	3	15	19
household	Std. 5–10	53	45	30	128
heads^	Std. 11–12	11	6	4	21

# Table 1 Sample Profile

heads

	Graduate	3	4	1	8
	Postgraduat e	1	0	0	1
	Diploma	1	0	0	1
	Professiona 1	1	1	0	2
	Others	1	0	0	1
	Since birth	61	52	67	180
Period of residence in	More than 15yrs	12	17	11	40
area	Less than 15 yrs	7	3	2	12

Source: Fieldwork of the authors

^Excludes households which did not provide information.

# Data collection and data analysis

The sample was administered a questionnaire of 47 items. The questions were designed in a forced choice format (dichotomous) and in a 5-point *Likert* scale (including reverse scoring). The questions aimed at understanding the impact of tourism on the psychosocial (moral standards, sexual permissiveness, inappropriate behaviour, conflicts, insecurity, alcohol and drug use, HIV infections, traditional family values, culture, character of the community, leisure and recreational activities) and the economic life (economic benefits, stimulation of the local economy, beneficiaries of tourism and adverse impacts) of the locals residing in Cavelossim, Goa. The data collected was analyzed using *Chi-square* and *Kruskal-Wallis H* test. It may be noted that percentage figures cited in this study are with reference to the overall sample, unless stated otherwise.

### III. RESULTS AND DISCUSSION

Problem 1: To study the perceived impact of tourism on the psycho-social life of the local people on the basis of age.

#### Table 2: Indicating age differences in the perceived adverse impact of tourism on the psycho-social life of the locals^

	Psycho-Social Life						
Age Gro up	Mor al Valu es	Cult ure	Cri me	Inappro priate Behavio ur	Fam ily Life		
30– 54 year s	27.6 %	24.8 %	27.6 %	36.0%	30.2 %		
55– 64 year s	20.7 %	18.0 %	22.1 %	30.6%	25.8 %		
65– 90 year s	21.2 %	20.7 %	21.2 %	31%	28.0 %		
Tota l Perc enta ge	69.5 %	63.5 %	70.9 %	97.6%	84%		
χ <sup>2</sup>	3.53 8	1.48 9	5.95 8	5.140	5.53 0		
Sig.	.170	.475	.05*	.077**	.063 **		

Source: Fieldwork of the authors \*Significant at 0.05

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# \*\*Significant at 0.1

*^Figures pertain only to those who indicated that there was an impact.* 

Table 2 illustrates the percentage of household heads who consider that tourism has negatively impacted their psycho-social lives. It has been found that across age groups tourism has played a considerable role in the degradation of the psycho-social lives of the locals. Analyzing the impact of tourism on the moral values of the locals, it is observed that 69.5 percent household heads considered that tourism has lowered the moral standards of the locals and 63.5 percent of the household heads felt that tourism had diluted the local culture. However, there was no significant difference between the age groups in the perceived impact of tourism on the moral values and culture of the locals.

On analysing the negative impact of tourism on the crime levels in the locality, inappropriate behaviour among locals and the disruption family life, it was found that 70.9 percent, 97.6 percent and 84 percent household heads respectively, felt that tourism had negatively impacted these aspects of their psycho-social life. There was significant age difference in the perceived impact of tourism on the disruption of family life, inappropriate behaviour among locals and crime levels in the locality.

The lowered moral standards included, increased sexual permissiveness (including prostitution) and increase in teenage pregnancies and abortions in the locality. It is often observed that as tourists frequently visit certain localities, the host communities alter their customs, beliefs, language and dress to cater to the demands and comforts of tourists – by even lowering their moral standards. In some localities the traditional culture is superficially lifted from the villages and presented to tourists in their luxury hotels in a compressed environmental bubble (Menon, 1993). These practices only destroy the uniqueness of the traditional Goan culture.

Another cause for the degradation of moral standards and culture is the festival of *Carnival* in Goa. The *Carnival* was once a spontaneous affair supposedly introduced by the Portuguese. However, due to its tourism potential, the festival has lost its spontaneity and has become an artificial show with sponsored floats, live bands, scantily clad women and cardboard cut-outs of sponsored products. During such events tourists are often accused of misbehaviour with locals, causing a law and order situation in the state. Also, when locals come in contact with tourists, it gives them a glimpse of foreign cultures and beliefs. The locals are often found to imitate these lifestyles and to engage in culturally inappropriate behaviour like alcohol consumption, drug use, rowdy behaviour and promiscuous sexual living, thus leading to increased stress and conflict among the locals and with the tourists. These activities are only detrimental to the Goan culture.

Tourism has also led to an attitudinal change not only towards one's self and others, but towards traditional art and dance forms and ceremonial festivals also (Chopra, 1991). The locals, due to the western influences, have become individualistic and more oriented to personal profits, rather than benefits for the entire community. Therefore, each individual may open small business enterprises (e.g. pubs, clubs. general stores, restaurants, cyber cafes in residential areas) without considering its impact on the community as a whole.

Lastly, the nature of the tourism industry being based on seasonality and odd timings, the locals spend long hours away from home, returning late from parties and recreational events, thus reducing the quality time spent with family members; often the meal times that they shared together have now become solitary activities thus disrupting family ties and bonds. Also, the increased financial independence may cause youth to break away from their families as in western cultures. According to Tsartas (2003), tourism brings about a change in the family structure, where male elders are replaced by young entrepreneurs with independent sources of income from tourism as chief decision makers in the traditional villages.

The highest percentage of household heads who perceived that the strongest negative impact of tourism in terms of increase in the level of crime, inappropriate behaviour and destruction of family ties in the community, were in the age group of 30–54yrs. The reason for this difference could be the increased exposure these individuals may have had to the changes tourism brought in their community. Being relatively young, members of this age-group are more involved in the tourism sector and thus experience the changes in their personal lives and their community more harshly.

Problem 2: To study the association between age and the perceived impact of tourism on HIV infections.

	Tourism causes an increase in HIV infections					
Age Group	Yes	Undecid ed	No			
30-54 years	13.7%	13.1%	8.9%			
55-64 years	12.2%	6.5%	12.5%			
65-90 years	18.2%	5.4%	9.5%			
Total	44.1%	25%	30.9%			
$\chi^2$	13.455					
Level of Significance	0.097*					

Table 3: Indicating age differences in the perceived impact of tourism on HIV infections

Source: Fieldwork of the authors

#### \*Significant at 0.1

Table 3 indicates the perceptions of household heads who consider that tourism causes an increase in HIV infections. It is observed that 44.1 percent household heads consider tourism to be the cause of an increase in HIV infections. It is also observed that age is significantly associated with the perceived impact of tourism on HIV infections ( $\chi^2 = 13.455$ , p<0.1) with household heads from the age group of 65–90 years having more of the said perception.

According to <u>Bisika</u> (2009) tourism is associated with increasing prostitution, drug abuse and a whole range of other sexual and reproductive health (SRH) problems such as early initiation of sexual activity, teenage pregnancies, multiple sex partners, unprotected sexual intercourse, HIV/AIDS and sexually transmitted infections (STIs). Recent statistics on tourist arrivals in Goa indicate 3 million tourists visiting the State in the year 2013. The number of international tourist arrivals went up by 9.27 percent and domestic tourists went up by 12.47 percent from the year 2012.<sup>3</sup> To cater to the growing number of tourists, hotels provide entertainment facilities like parties, bars and discos which often allow liberal consumption and abuse of alcohol and other mind-altering substances. These facilities may also be a business rendezvous for commercial sex workers. Alcohol and drug abuse disrupts the parts of the brain used in making rational decisions. Thus in altered states of consciousness locals and tourists may engage in risky and irresponsible behaviours, including soliciting prostitutes and using injectable drugs. GSACS (2011) found that 83–95 percent of new HIV infections in Goa are through the sexual mode of transmission.

## Problem 3: To study the association between age and the economic benefits of tourism.

Age	Econo	mic Bene	fits of T	ourism	
grou p (yea rs)	Inco me	Emplo yment	Tax Rev enue	Infrastr ucture	Ot her s
30- 54	17.1 %	8.5%	1.6 %	3.1%	1.6 %
55– 64	13.3 %	14.1%	1.6 %	3.1%	.8%
65- 90	16.4 %	17.2%	1.6 %	.0%	.0%
Tota 1	46.8 %	39.8%	4.8 %	6.2%	2.4 %
$\chi^2$	10.059	)			
Leve 1 of Sig	0.261				

Table 4: Indicating age differences in the perceived economic benefits of tourism

# Source: Fieldwork of the authors

Referring to Table 4 indicating the benefits of tourism, the two outstanding benefits of tourism are income to the community (46.8 percent) and opportunities for employment (39.8 percent). There is no significant association though between age and the economic benefits of tourism ( $\chi^2$ =10.059; p>0.1). While in case of income, it was the 30–54 years age group respondents who relatively perceived the greater positive impact, in case of employment it was the older age groups who relatively perceived more of the same. In a study by Perez & Var (1994), it was found that age was an important determinant of attitudes toward tourism with middle-aged residents more inclined to accept the positive economic impacts of tourism development. Husbands (1989) however found that older residents are less positive about the impacts of tourism (in Wang et al, 2006). The lack of significant difference in the perceived economic benefits from tourism activities. The benefits can reach every person if any household member is associated with tourism related business on account of the income contributed to the household. Also, since there is no upper-age barrier for people to get involved in the tourism, there are young, middle-aged and even elderly people gaining a livelihood through tourism.

# Problem 4: To study the association between age and the perceived adverse economic effects of tourism.

# Table 5: Indicating age differences in the perceived adverse economic impact of tourism

Adverse	Economic	Impact	of	~ <sup>2</sup>	Le
Tourism				λ	ve

Age grou p (yea rs)	Rise in pric e of food	Rise in pric e of land	Sca rcit y of goo ds	Extinc tion of traditi onal occup ations	Ot her s		l of Si g
30- 54	18.7 %	9.8 %	1.6 %	3.3%	2.4 %		
55– 64	22.8 %	4.9 %	0.0 %	1.6%	2.4 %	8.	0.
65- 90	21.1 %	8.1 %	1.6 %	1.7%	0.0 %	7	2
Tota 1	62.6 %	22.8 %	3.2 %	6.6%	4.8 %		

Source: Fieldwork of the authors

Referring to Table 5 indicating the perceived adverse economic impact of tourism, a rise in the price of food was the most serious adverse impact of tourism in Cavelossim (62.6 percent household heads). The other adverse economic effects of tourism were rise in price of land (22.8 percent), extinction of traditional occupations (6.6 percent) and scarcity of goods (3.2 percent). In a study by Marzuki (2012) it was found that the most adverse consequences of tourism were an increase in the cost of land and housing, and the increased prices of goods and services. Pertaining to the present study, there was no significant association between age and the adverse economic effects of tourism ( $\chi^2$ =8.227; p>0.1). Household heads, irrespective of age, felt that rise in the price of food was the most serious adverse impact of tourism.

# Problem 5: To study impact of tourism on the traditional and recent occupations in Cavelossim.

	Occ	upati	on	15	Rec	ent	/	Last
Occupa	year	rs ago	)		occu	ipatio	n	
tion	30	55	65		30	55	65	
	_	_	_		_	_	_	
	54	64	90	Tot	54	64	90	Tot
	ye	ye	ye	al	ye	ye	ye	al
	ar	ar	ar		ar	ar	ar	
	s	s	s		s	s	s	
Coconu								
t	2	2	2		0	0	0	
pluckin	3.	3. -	3.	10.	0.	0. 2	0. ~	1.07
g/	l	5	9	5%	0	5	5	1%
toddy	%	%	%		%	%	%	
tapping								
	3.	3.	3.	10	1.	3.	2.	7.0
Fishing	1	5	5	10.	4	1	8	7.3
	%	%	%	1%	%	%	%	%
т •	3.	1.	6.	11		0.	1.	1.0
Farmin	5	8	6	11.	0	5	3	1.8
g	%	%	%	9%		%	%	%
D 4	1.	1.	1.	4.2	2.	4.	1.	0.4
Restaur	8	3	2	4.5	3	2	9	0.4 0/
ant	%	%	%	%0	%	%	%	%
Transp	0.		0.	1.2	5.	0.	0.	6.5
ortatio	9	0	3	1.2	1	9	5	0.3
n	%		%	%0	%	%	%	%0
	10	7.	7.	25	13	9.	8.	22
Service	10	5	5	23	.8	7	8	52. 20/
	%	%	%	%0	%	%	%	3%
Professi	0.	0.	0.	2.7	1.	0.	0.	3.3
onal	9	9	9	%	9	9	5	%

Table 6: Traditional and recent occupations in Cavelossim

	%	%	%		%	%	%	
	11	12	11	24	11	12	15	20
Others	.0	.3	.0	54. 20/	.6	.5	.3	39. 40/
	%	%	%	5%	%	%	%	4%
$\chi^2$	10.2	10.233			26.298			
Level of Sig	0.745				0.024*			

Source: Fieldwork of the authors \*Significant at 0.05

Referring to Table 6, considering the occupation of households heads 15 years ago, 32.5 percent household heads engaged in the traditional occupations including coconut plucking/ toddy tapping (10.5 percent), fishing (10.1 percent) and farming (11.9 percent); 4.3 percent household heads engaged in tourism related businesses of running restaurants and 1.2 percent in transportation. Of the remaining, 25 percent household heads were employed in the service sector and 2.7 percent were professionals. There was no significant association between age and the occupation of household heads 15 years ago ( $\chi^2 = 10.233$ ; p>0.1).

Referring to the recent occupations of household heads (Table 6) it is observed that the percentage of household heads engaged in the traditional occupations has reduced such that only 10.1 percent of household heads now engage in traditional occupations. These include coconut plucking/toddy tapping (1 percent), fishing (7.3 percent) and farming (1.8 percent). It is observed that the percentage of household heads engaged in tourism related businesses increased such that today, 8.4 percent run restaurants and 6.5 percent are engaged in the transportation business. The number of household heads employed in the service sector has also increased (32.3 percent). There is a significant association ( $\chi^2$ =26.298; p<0.05) between age and the recent occupation of household heads; it is apparent that by and large it is the first age group of respondents (30–54 years age-group) which is relatively less in traditional occupations and more in tourism related employment/activities.

Toddy-tapping, fishing, and farming have been the primary occupations of villagers of Cavelossim since time immemorial. Urban office employment and overseas shipping jobs have significantly reduced the numbers of youth choosing to enter into the occupation of their fathers (Larsen n.d.). Today more youth choose easy employment in the now lucrative tourism business. For traditional farmers, agricultural practice has now become a part-time activity with the locals shifting to the service sector. Due to this extinction of traditional occupations, the Government of Goa introduced the *Goenchem Daiz Yojana* to encourage the dying traditional occupations in the state.<sup>4</sup>

### Problem 6: To study the impact of duration of residence in Cavelossim and the attitude towards tourism.

Duratio	Economic Benefits of Tourism						
n of residenc e in Caveloss im	Inco me	Employ ment	Tax Reve nue	Inf ra.	Oth ers		
Since birth	33.6 %	33.6%	3.9%	6.2 %	2.3 %		
Over 15 years	10.9 %	4.7%	0.0%	0.0 %	0.0 %		
Less than 15 years	2.3 %	1.6%	0.8%	0.0 %	0.0 %		
Total	46.8 %	39.9	4.7%	6.2 %	2.3 %		
$\chi^2$	9.054						
Level of Sig	0.338						

# Table 7: Indicating the association between duration of residence in Cavelossim and the perceived economic benefits of tourism

Source: Fieldwork of the authors

Referring to Table 7, the two major benefits of tourism were income to the community (46.8 percent household heads) and opportunities for employment (39.9 percent). These benefits were followed by increased tax revenue and improved infrastructure and public facilities in the community. There is no significant association between duration of residence and the economic benefits of

tourism ( $\chi^2$ =9.054; p>0.1). Thus suggesting that the there is no difference in the perceived benefits of tourism between the original residents of Cavelossim and those residents that may have relocated to the village less than 15 years ago.

<b>Fable 8: Indicating the association betwee</b>	duration of residence in Cavelossin	1 and the attitude towards tourism
---	-------------------------------------	------------------------------------

Duration of residence in Cavelossim	Should touris encou	d m be raged	Negative impact on character of the village		
	Yes	No	Yes	No	
Simon hinth	52.0	25.8	32.3	45.1	
Since birth	%	%	%	%	
0 15	12.4	4.50/	2.7	14.6	
Over 15 years	%	4.3%	%	%	
Less than 15	4.9	0.40/	1.8	3.5	
years	%	% 0.4%		%	
Total	69.3	30.7	36.8	63.2	
Total	%	%	%	%	
$\chi^2$	3.658		9.577		
Level of Significance	0.161		0.008*		

# Source: Fieldwork of the authors \*Significant at 0.01

Referring to Table 8, there was no significant association between duration of residence and view that tourism should be encouraged ( $\chi^2$ =3.658; p>0.1). However, there was a significant association between duration of residence and the view that tourism has a negative impact on the character of the village ( $\chi^2$ =9.577; p<0.01). The household heads who were residents since birth were of the view that tourism brought a negative character to their village.

### IV. CONCLUSION

Tourism being a multi-dimensional activity, affects all aspects of the life of a host community. The present study has revealed that the local populace of Cavelossim were of the view that tourism had disrupted their psycho-social lives. There were significant age differences in the perceived impact of tourism on the levels of crime in the community, the portrayal of inappropriate behaviour by locals and the disruption of family life due to tourism, such that the relatively lower age group of 30–54 years perceived a strong negative impact of tourism. Additionally, the locals also perceived that tourism had led to the lowering of moral values and the dilution and destruction of the unique Goan culture.

However, in spite of the above, the local residents considered tourism to be a booming sector as it had a vast potential for generating employment and income to the locals. Increase in tax revenue and improved infrastructure were also considered as other benefits of tourism. The more severe adverse effects of tourism perceived by the locals were an increase in the price of food, followed by increase in the price of land, extinction of traditional occupations and scarcity of goods. We can thus say that though the tourism industry has a huge potential of boosting the economy of a community, it can disturb the psychological and social wellbeing of the locals.

To maintain sustainability and long-term success of the industry the major stakeholders, namely the State and Central governments should take a stronger initiative to direct the private sector, voluntary organisations and the locals to develop tourism activities in a responsible manner such that the tourists are welcomed and entertained in the community and at the same time their activities are minimally intrusive to the host community. It is the task of all the stakeholders (not only the government) to continually evaluate the effects of tourism on the locals who are directly affected by tourism activities. The stakeholders should also give importance to the locals residing in and around the tourist centre, such that any event/activity designed for tourists does not disrupt the cultural or social structure of the community. Lastly, as found by Allen (1988), for a tourism-based economy to sustain itself in local communities, the residents must be willing partners in the process (in Kreag, n.d.). Stakeholders should not take it for granted that locals welcome any and all types of tourism development activities in their area. They should asses the interest of the locals in the venture and only once the locals are willing partners through a democratically initiated consultative process, can the tourism industry flourish.

#### NOTES

<sup>&</sup>lt;sup>1</sup> The sample comprises the total population of presently occupied households in the village of Cavelossim, Goa.

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- <sup>2</sup> Data was collected in the month of November 2013.
- <sup>3</sup> See *The Times of India*, ' Tourist arrivals crossed 3 million mark in 2011', January 23, 2014; retrieved from: http://timesofindia.indiatimes.com/city/goa/Tourist-arrivals-crossed-3-million-mark-in-2013/articleshow/29225958.cms
- <sup>4</sup> See *The Hindu*, 'Goa all set to implement financial assistance scheme', November 24, 2011; Retrieved from: <u>http://www.thehindu.com/todays-paper/tp-national/tp-karnataka/goa-all-set-to-implement-financial-assistance-scheme/article2655278.ece</u>

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#### AUTHORS

**First Author**: Rev. Dr. Simão R. Diniz, Principal, Head – Department of Psychology, Rosary College of Commerce and Arts, Navelim, Salcete, Goa (India) – 403707, Email: <u>rosarycollege.1990@gmail.com</u> **Second Author**: Dr. Savio P. Falleiro, Vice Principal, Associate Professor, Head – Department of Economics, Rosary College of Commerce and Arts, Navelim, Salcete, Goa (India) – 403707, Email: <u>saviofalleiro@gmail.com</u> International Journal of Scientific and Research Publications, Volume 4, Issue 11, November 2014 ISSN 2250-3153

**Third Author**: Ms. Maria M. de Barros, Assistant Professor, Department of Psychology, Rosary College of Commerce and Arts, Navelim, Salcete, Goa – 403707, Email: <u>muriel\_debarros@yahoo.com</u>

**Correspondence Author**: Dr. Savio P. Falleiro, Vice Principal, Associate Professor, Head – Department of Economics, Rosary College of Commerce and Arts, Navelim, Salcete, Goa – 403707 Mobile No. 09422060384, Email: <u>saviofalleiro@gmail.com</u>

# Impact of Educational Intervention on Knowledge of Asha Workers about Their Job Responsibilities in Rural and Tribal Areas of Kurnool Division in Kurnool District, Andhra Pradesh

# Dr.B.Renuka<sup>\*</sup>, Dr.A.Sreedevi<sup>\*\*</sup>, Dr.C.Niranjan Paul<sup>\*\*\*</sup>

\* Assistant Professor

<sup>\*\*</sup> Professor & HOD, Department of Community Medicine, Kurnool Medical College, Kurnool <sup>\*\*\*</sup>Professor & HOD, Department of Community Medicine, Viswabharathi Medical College, Kurnool

Abstract- ASHA will be a health activist in the community who will create awareness on health and its social determinants and mobilize the community towards local health planning and increased utilization and accountability of the existing health services. This is an educational interventional and longitudinal study. Six PHCs of Atmakur CHNC namely Kottalcheruvu, Bairluty, Kothapally, Yerramattam, Gokavaram, Pamulapadu were selected for the study by using multistage random sampling technique. All 130 ASHAs from these six PHCs had participated in educational intervention given to them in three sessions with an interval of one month between the sessions by using flip charts, video shows, role plays, demonstrations on ASHA Day, first Tuesday of every month. For evaluation of knowledge level of the ASHAs, a questionnaire prepared in the local language was administered to the ASHAs before and after educational intervention .The mean scores of pre-test and post test were compared and analyzed. Majority of the ASHAs belonged to age group of 30-34 years (28.5%) followed by 25-29 years (24.6%), had secondary educational level(58.4%), predominantly scheduled caste(49.2%) and hailing from lower socio-economic status(60%). The mean test scores of the ASHAs improved significantly after educational intervention from 24.96 to 42.18. The mean pre-test score was found to be higher in the 35-39 years age group (26.93), 'higher secondary & above' educational level (30.00). The mean test score results improved significantly with educational intervention in all age groups and educational status groups. The post test score did not differ significantly with any of these pertinent variables like age and educational status. It is recommended that there should be regular on the job training as well as review training every 6 months.

*Index Terms*- ASHA, CHNC, Educational Intervention, NRHM, PHC

#### I. INTRODUCTION

One of the core strategies of NRHM is appointment of Accredited Social Health Activist (ASHA) to facilitate access to health services. ASHA will be a health activist in the community who will create awareness on health and its social determinants and mobilize the community towards local health planning and increased utilization and accountability of the existing health services.<sup>1</sup>

For any society to be healthy, they need to be aware regarding creation of a healthy environment through hygiene maintenance, safe drinking water, sanitation and being motivated to seek preventive and curative health. ASHA is playing that crucial role of generating the much desired awareness and acting as a link between the rural communities and the health infrastructure thus empowering people to have the biggest asset "health" in their stride, which ultimately would be helpful in community empowerment at large and bring revolutionary change at the local level and also helping socio-economic development in the rural areas of the country.<sup>2</sup>

The present study was conducted to serve the vulnerable segment of population in tribal and remote rural areas of kurnool division in kurnool district through improving the knowledge of ASHA workers about their roles to be performed in the community.

#### AIM

To create awareness among ASHA workers in rural and tribal areas of kurnool division about their roles to be performed in the community.

#### **OBJECTIVES**

1. To study the socio-demographic profile of ASHAs.

2. To assess the knowledge of ASHAs about their roles to be performed in the community.

3. To compare the knowledge of ASHAs before and after educational intervention.

#### II. MATERIALS & METHODS

This is an educational intervention and longitudinal study. Multistage random sampling technique had been used to select study area. In Kurnool district, Kurnool division was selected by simple random sampling. From CHNCs of Kurnool division, Atmakur CHNC was selected by simple random sampling. All the six PHCs of Atmakur CHNC namely Kottalcheruvu, Bairluty, Kothapally, Yerramattam, Gokavaram, Pamulapadu were selected for the study. All 130 ASHAs from these six PHCs had participated in educational intervention given to them on ASHA Day, first tuesday of every month. For reinforcement of their knowledge, educational intervention was conducted in three sessions with an interval of one month between the sessions by using flip charts, video shows, role plays, demonstrations. Each session lasted for three hours. The selection of Kurnool division, Atmakur CHNC and finally ASHAs working in villages formed different stages of the sampling technique. Study period is one year i.e. from July 2011 to July 2012.

For evaluation of knowledge level of the ASHAs, a questionnaire prepared in the local language was administered to the ASHAs before and after educational intervention (Pre test and Post test evaluation). The questionnaire consisted of **50** questions with a total of **50** marks. The mean scores of pre-test and post test were compared and analyzed. The data was analyzed using SPSS 16 version and appropriate statistical tests have been applied in the needed situations in the presentation of data

#### **III. RESULTS & DISCUSSION**

Characteristics	Number of ASHAs (n=130)	Percentage
Age Group (years)		
20-24	17	13.1%
25 - 29	32	24.6%
30 - 34	37	28.5%
35 – 39	29	22.3%
40 and above	15	11.5%
Educational Status		
Illiterate	4	3.1%
Primary	13	10%
Upper Primary	33	25.4%
Secondary	76	58.4%
Higher Secondary and above	4	3.1%
Social Status		
Other Castes	15	11.5%
Backward Caste	38	29.3%
Scheduled Caste	64	49.2%
Scheduled Tribe	13	10%
Socio- Economic Status		
Lower Middle	19	14.6%
Upper Lower	33	25.4%
Lower	78	60%

Table 1: Socio - demographic characteristics of ASHAs in study area

Table 1 shows that majority of the ASHAs belong to age group of 30-34 years (28.5%) followed by 25-29 years (24.6%). Similarly in a study by Darshan K. Mahyavanshi et al<sup>3</sup> it was found that majority of ASHAs were between 25-34 (53.1%) years of age. While Vartika Saxena et al<sup>4</sup> noticed that maximum (42%) ASHAs were in 26-30 years of age group.

The majority of the ASHAs had secondary level of educational status (58.4%). Similarly in a study by Darshan K. Mahyavanshi et al<sup>3</sup> it was reported that about 70% of ASHAs had received secondary level of education. While Neera Jain et al<sup>5</sup> found that 53.3% of the ASHAs had schooling up to Junior High School, 31.7% High School and 5% intermediate, and 10% were graduates.

The majority of the ASHAs belonged to scheduled caste (49.2%) followed by backward caste (29.3%). Whereas in a study by Sangeeta kansal et  $al^6$  it was reported that majority belonged to the OBC category (43.75%) while 37% were from the General category followed by 19.3% belonged to SC category. While D.K. Srivastava et  $al^7$  noticed that the caste composition of ASHA showed roughly equal distribution between SC (38.33%), OBC (35%) and General (26.67%).

60% of ASHAs belonged to lower socio-economic status. Similarly in a study by D.K. Srivastava et al<sup>7</sup> it was reported that more than half (61.67%) of ASHAs belonged to below poverty line. Whereas Vartika Saxena et al<sup>4</sup> noticed that most of them belong to upper middle class (41.3%) followed by lower middle class (27.3%) and upper class (18%).

Table 2: Test score Results of the ASHAs(n = 130)

Test Score	Mean ± SD
Pre test score	24.96 ± 6.37
Post test score	42.18 ± 8.18
Statistical Significance	<i>t</i> = 40.66; <i>P</i> < 0.001; <i>S</i>

Table 2 shows that the mean pre- test score of the ASHAs was found to be understandably low at 24.96. The mean post test

score of the ASHAs improved to 42.18. The mean test scores improved significantly after educational intervention.

Table 3 shows that the mean pre test score was found to be higher in 35-39 years age group (26.93). The post test score was found to be higher in 20-24 years age group (44.94). The scores significantly improved after training in each age group. The differences in the mean scores before educational intervention and after educational intervention among the age groups were statistically significant.

Table 4 shows that the mean pre educational intervention test score was significantly higher among 'higher secondary & above group' (30.00) than other groups. The post educational intervention test score was also significantly higher among 'higher secondary & above group' (45.25). There was significant increase in the test score after educational intervention in all the educational groups.

### IV. CONCLUSIONS & RECOMMENDATIONS

Educational intervention was done on commendable lines and all the study participants not only improved their knowledge level but also on par with other participants despite differences in the criteria influencing learning. Thus it can be concluded that the educational intervention process was simple yet highly informative. Keeping in view the feedback from the ASHAs themselves, it is recommended that there should be regular on job training as well as review training every 6 months. Brief refresher training at regular interval should be planned for all ASHAs. 'ASHA Radio' an innovation seen in Assam should be implemented through which ASHAs could receive on going on the job training. A 'newsletter' could be published in local language half yearly or yearly basis for updating knowledge of ASHAs.

### Table 3: Distribution of ASHAs by Age and Test scores

Age Group (Years)	No. of ASHAs	Pre Educational Intervention Score Mean ± SD	Post Educational Intervention Score Mean ± SD	't' test and significance
20 -24	17	25.88±3.60	44.94±3.47	t =16.02; P <0.001; S
25 -29	32	24.16±5.97	41.88±8.45	t =23.36; P <0.001; S
30 -34	37	25.41±6.12	42.38±7.66	t =23.13; P <0.001; S
35-39	29	26.93±4.50	43.72±2.68	t =24.33; P <0.001; S
40 and above	15	20.73±10.67	36.20±15.03	t =7.79; P <0.001; S
ANOVA F- value P- value Significance		2.74 0.03 S	2.92 0.02 S	

Education	No. of Subjects	Pre Educational Intervention score Mean ± SD	Post Educational Intervention score Mean ± SD	't' value and significance
Primary	13	21.77±6.08	41.46±3.50	t =22.56; P <0.001; S
Upper Primary	33	25.36±4.05	42.30±3.30	t =34.01; P <0.001; S
Secondary	76	26.38±4.25	44.30±2.87	t =38.09; P <0.001; S
Hr. Secondary and Above	4	30.00±3.55	45.25±2.21	t =8.08; P <0.01; S
ANOVA F- value P – value& significance		38.13 P< 0.001; S	207.33 P< 0.001; S	

### Table 4: Educational qualification and Test Scores of ASHAs

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### AUTHORS

**First Author**: Dr.B.Renuka ,Assistant Professor, Department of Community Medicine, Viswabharathi Medical College , Kurnool , Andhra Pradesh , <u>biyyala.renuka@gmail.com</u>

**Second Author** : Dr.A.Sreedevi ,Professor & HOD , Department of Community Medicine , Kurnool Medical College ,Kurnool ,

# Andhra Pradesh.

**Third Author** : Dr.C.Niranjan Paul , Professor & HOD , Department of Community Medicine , Viswabharathi Medical College , Kurnool , Andhra Pradesh.

# Correspondence Author : Dr.B.Renuka,

biyyala.renuka@gmail.com, 9494736832.

# Teaching Profession in Nigeria; Issues, Problems and Prospects

# Mr Tosin. E. Akinduyo

Department of Guidance and Counselling, Adekunle Ajasin University, Akungba-Akoko, Ondo-State, Nigeria.

#### I. INTRODUCTION

Developed countries will always trace their roots of success in all sectors to the quality of their teaching profession. The long chain of all other professions like medicine, law and engineering originates from the teaching profession. Reverse is the case in Nigeria. Teaching has been seen as a mere activity, occupation and vocation for the academic losers. Some people even refer to teachers as substitutes on the bench of life, who are left with no option than to proceed and get employed into the teaching profession.

It is worrisome in Nigeria that teaching profession has moved from the foreground to the background which the aftermaths are continuous insecurity, under-development, retrogression, corruption, indoctrination, low-technological advancement, economic insufficiency, cultism, mediocrity, students unrest just to mention but few. The focus of this chapter is to X-ray the concept of teaching, the concept of a profession, characteristics of a profession and prospects of teaching profession in Nigeria.

### II. WHAT IS TEACHING?

Teaching can be defined as the axon moving education impulse to deliver growth, development and knowledge. Oyekan (1994) described teaching as an all-purpose profession engaged in human resource development for individual and economic growth. Olatunji (1996) defined teaching as a social function that aims at necessary growth in others. Teaching as an act of guiding and imparting knowledge in and outside the classroom, can only be done professionally by qualified and trained teachers. Teaching profession in Nigeria has been under a flash flood warning of unqualified "cheaters" who cannot constantly as a matter of bounden duty bring about effective teaching and learning process.

Teaching task is so challenging that it surpasses holding chalk, standing before students and giving out different kinds of instructions. Teaching as an application of intellectual technique is the only hope that can bring about overall national progress and development to every citizen of Nigeria.

#### III. CONCEPT OF A PROFESSION

The concept of a profession has been defined by so many authors in different ways. Amaele and Amaele (2003) defined a profession as a service occupation, which applies a systematic body of knowledge to problems that are of great relevance to the needs and yearnings of the society. Yahyah (2004) described a profession as an occupation which has its basis on specialized and organized skills, knowledge and intellectual competence. He further stated that profession derives its raw materials from the society and utilizes the raw materials to achieve set and desired objectives. Thus professionals usually have clients who seek their services and terminate such relationship at will.

Oyekan (2004) said viable professions are so much appreciated for their crucial and distinct rides from their repertoire of cherished knowledge, practical skills and intellectual competence. Among them are teaching, journalism, engineering, medicine law, accountancy etc. These occupations render professional activities for certain fees by their clients.

A profession is therefore an occupation which renders services useful for the survival of individuals and the society, these valuable services are vital to survival and it is knowledge based, problem-solving, rare, managerial and full of expertise.

## IV. CHARACTERISTICS OF A PROFESSION

There are many attributes which can be used for judging profession and they vary based on the perception of different scholars. Garrison and Norreen(2003) highlighted four major characteristics of a profession which included maintenance of a high level of professional competence, maintenance of personal integrity and objectivity in all disclosures and treating sensitive matter with confidentiality. Nwachi (1991) listed six criteria as hallmark of a functioning profession, while Taylor, Gerald and Runte (1995) recorded six major characteristics of a useful profession for training and education (usually associated with a university), certification based on competency testing, formal organization, adherence to a code of conduct and altruistic service. As recorded by Richey (1979) eight criteria were listed as crucial features of any profession. They include knowledge, professional code of conduct or ethics, professional organization, legal recognition, freedom to practice, controlled entrance in to the profession and services to members of the larger society.

**1. Knowledge:** - A profession has its roots in a skill based systematic body of knowledge. Jekayinfa (2003) opined that a profession should require a specialized knowledge to equip the practitioners with the basic mental skills and good scientific foundations of such profession. This knowledge is to be acquired through attendance of formal recognised institution of learning .The mastery of the core relevant knowledge requires high intelligence, competence and long period of intensive training. Oyekan (2000) contended that professional competence and practical experience of a professional emanate from brilliant ideas and principles arrived at by creative research and logical

analysis towards a resolution of human concerns and problems. There is no doubt that the acquisition of knowledge by a professional usually takes a lengthy period of years so as to expose the trainee to the core knowledge competence require which includes: ethical conducts, practical skills, handling different circumstances, industrial training, strategic competence and mental alertness needed. Professionals exhibit high standard of professional and intellectual excellence. This is a major feature that differentiates a professional from other occupations

**2. Professional Code of Ethics**: A functioning profession rigidly adhere to profession's laid down rules, values, norms and standards to ensure control the mode of entry into the occupation. Profession is not a pop-corn business that cheaters or anybody can be invoiced in. Practitioners have their "yeses and nos" binding on all members. They are guided by principles of not exploiting the ignorance of their clients to enrich themselves. Practitioners have strong legal demeanour to withdraw the licence of any erring member and discipline as appropriate. They have strong insurance cover (e.g. professional indemnity) to prevent bring indebted to any client when a mistake or any error is committed. Maintenance of minimum standards of decorum for professionals included self confidence, vitality, honesty, transparency, dignity, integrity, loyalty, productivity excellence etc.

Oyekan (2000) emphasized that professional ethics are the basic habits made up of equitable principles or basic habits made up of equitable of practitioners of a profession. The ethics are philosophically inclined for being morally good in a wide spectrum of professional activities.

3. **Professional organization:-** A profession should have a strong organisation that would see to the welfare and protection of their members. Asides all other provisions, practitioners are better protected by the organization they belong to. All professional organisations are duly registered in Nigeria. They include the Nigeria Society for Engineers (NSE), the Nigeria Bar Association (NBA), Nigeria Medical Association (NMA), just to mention must few. But the Nigerian Union of Teachers (NUT) is only recognized as a trade Union not as a professional organization in Nigeria.

**<u>4. Controlled entrance</u>**: - Entry into the profession is guided by setting and enforcing standards for selection, training, licensure and certification (Jekayinfa, 2003). A very good example is the medical profession; nobody can belong to the profession, without attending mandatory one year housemanship and enrolled them as a practitioner.

**<u>5. Freedom of practice:</u>** The policies of government does not inhibit the autonomy of a profession. There is a total and absolute freedom to practice a profession. A practitioner has an unshakable display of quality job as a result of freedom granted him to perform altruistic service in the affairs of others.

<u>6. Professional and in service growth:</u> - Different organisations have avenues for training and re-training their practitioners. Various professions believe that knowledge is dynamic and ongoing. Practitioners attend mandatory and instituted seminars, lectures, conferences, workshops, presentations and exhibitions to update their practitioners' skills and knowledge. It is pertinent to note here that attendance of all the above in-service trainings is not an optional affair for all practitioners.

**7.Legal Recognition**:- Engineers, lawyers, medical doctors and teachers are highly recognized and respected professions in the society. Jekayinfa (2003) reported that the public trust their judgements and skills. The society cannot do way with the unique service to humanity. For example, Decree N031, of May 1993 gave legal recognition to teaching as a profession but it appears the decree is yet to be implemented in Nigeria.

<u>8Period of Internship of Apprenticeship:</u> In the process of acquiring process of acquiring professional knowledge needed to practice the occupation, extensive period of internship of apprenticeship is needed for practical knowledge and excellence. Engineering, pharmacy, medicine and law profession require one year mandatory practical knowledge of internship. A teacher requires a period of twelve weeks of teaching practice.

# V. THE CONCEPT OF TEACHING PROFESSION IN NIGERIA

Teaching profession in Nigeria have been handed a lot of criticisms, maybe it is a profession or not. These criticisms have been making needed changes difficult and often incur resentment. Critics of teaching profession have said, teaching lacks the germane characteristics of a viable profession. For example, entrance and certification is not strictly controlled by the set standards. This is believed to open the flood gate for cheaters and unqualified staff to erode the standard of teaching profession.

In Nigeria, teachers are poorly motivated and less paid. This makes the profession replete with some features of other occupations that make life worth living for the practitioners. The orientation of those in teaching profession is that of very low esteem and those permanently stucked on a plateau.

Okunloye 2003 opined that teachers, the Nigerian Union of Teachers (NUT) and others who have put up an advocacy about teaching as a profession have identify those features of a real profession which are true of teaching in Nigeria. The characteristics possessed by teaching profession includes, being an occupation, an activity that requires basic skills, acquisition of a systematic body of knowledge, profession code of ethics and by various tiers of government.

In retrospect, teaching profession since the ages has been an occupation that enjoys the unpleasant nickname of an "ungrateful trade" a profession for the "never-do-well or an occupation for the down- trodden (Ajayi, 1997). Other members of the society regard teaching profession with contempt, feeling that it is a refuse camp for mediocre; people who are industrious but unimaginative and uncreative; people with average drive for power, average ambition and escapism (Majasan, 1995)

Oyekan (2000) said the situation was worsened by the lingering social, economic and political crisis in Nigeria. Hence, the teachers were compelled to demand for:

- Full professionalization of teaching
- Better condition of service
- Full professionalization of teaching
- Prompt payment of the gratuities and pensions on retirement;
- Adequate public recognition for teacher sthat nurture all the productive citizens of the society
- Special teacher's salary structure (TSS)

The entire above mentioned requests are so important to the development of professionals, educational system and good citizenship.

Finally, teaching profession in Nigeria should be fully reckoned with and recognized so as to help keep the country (Nigeria) together in the midst of the tornado like frenzy we often find ourselves in without a lasting solution.

#### VI. PROBLEM OF TEACHING PROFESSION NIGERIA

Teaching profession has been dogged by so many problems and challenges that had attended its conception in Nigeria. A catalogue of problems has deprofessionalised teaching profession in Nigeria. They include;

- Low wages, bad motivation and poor welfares
- Irregular self esteem in the society
- Absence of education professional academy
- Lack of professional and in-service trainings
- Short period of internship
- High teacher –pupil ratio
- Politicizing education
- Lack of autonomy by Nigeria Union of Teachers(NUT)
- Unwarranted Governments' intervention
- Poor budgetary allocation to teaching profession
- Poor work environment (e.g. infrastructures amenities etc)
- Governments inability to register NUT as a profession organization
- Massive unqualified staff.
- Porous entry qualification

#### VII. CONCLUSION

The above challenges are bane and sheer difficulties smearing the image of teaching profession in Nigeria. The extent to which these challenges are solved will determine the prospects of teaching as a profession Nigeria. If the populace and the three tiers of government can develop a gnawing unfettering and flaming urge to tackle these problems, teaching profession will surely move into over drive to be the best profession in Nigeria. If the problems are not ruthlessly dealt with or peripherally addressed, teaching profession will surely go into a bad shift in Nigeria and degenerate into "off-purpose and pap occupation where body can be invoiced in for making ends meet. The nation at large will sure pay bitterly for it by being on the bottom rungs of economic ladder.

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#### AUTHORS

**First Author** – Mr Tosin. E. Akinduyo (08034187392), tosigno07@yahoo.com, Department of Guidance and Counselling , Adekunle Ajasin University, Akungba-Akoko, Ondo-State, Nigeria

# **Does Proficiency in the Second Language Influence Bilingual Word Retrieval and Pronunciation?**

# Rohini Chandrica Widyalankara

English Language Teaching Unit, University of Kelaniya, Sri Lanka

Abstract- During empirical sociolinguistic research this correlational study statistically compares quantitative scores of an independent variable Proficiency in English against the quantified dependent variable Rate of occurrence of deviations from Standard Sri Lankan English (SSLE) pronunciation across the 185 users of Other Varieties of Sri Lankan Englishes. The participants diversified in their first language. 100 participants had Sinhala while the first language of 85 participants was Sri Lankan Tamil. a questionnaire cum word elicitation process compiled data. The instrument consisted of 25 lexical items which gave rise to pronunciation deviations compiled from literature on Sri Lankan English. Descriptive statistics posit that there is a negative correlation between the two variables while the percentage variance explained for the correlation between the variables was a medium 9% for the Sinhala and 24% for the Tamil bilingual participants. This study concludes that other exogenous factors too would have influenced the rate of occurrence of deviations from SSLE. Most importantly it informs pedagogy that devoid of the diversity of the first languages Sinhala and Tamil, Proficiency in English influences deviations from SSLE pronunciation which is the target of Teaching English as a Second Language in Sri Lanka.

*Index Terms*- Sri Lankan English, Sinhala. Tamil, pronunciation, Proficiency, Rate of occurrence of pronunciation deviations

#### I. INTRODUCTION

**T**racing the contact dynamics of Sri Lankan English (SLE) the I first exposure of the monolingual Sinhala/Tamil speech communities of Sri Lanka to English would have occurred as far back as in 1796 when the British East India Company annexed the maritime provinces of Ceylon. Thus the timeline for the evolution of SLE commenced with the linguistic interactions between the colonial rulers and Sinhala and Tamil monolinguals of the country. Then SLE progressed through exonormative stabilization, nativization and endonormative stabilization stages. It could be stated that at present SLE has passed the endonormative stage and has codified phonological norms, identified morphological, syntactic behaviour; defined standard usage and dialectal variation within the variety. This evolution of English within the linguistic ecology of Sri Lanka has taken place over a period of more than 200 years. This signifies the intense cross linguistic interference between English and the vernaculars as they began to coexist within the linguistic ecology of the country and contributed to variety formation and dialectal variation within the variety. The nativization of SBE pronunciation was a heterogeneous process which was

influenced by the language specific markedness constraint rankings of the vernaculars Sinhala and Tamil. This resulted in the creation of a prestigious, norm forming variety SSLE and Other Varieties of Sri Lankan Englishes (OVSLEes). The adherence to SSLE phonological norms due to the influence of the parity in language specific markedness constraints of Sinhala/Tamil identifies Sinhala/Sri Lankan English (S/SSLE) and Tamil/Sri Lankan English (T/SSLE) bilingual speech communities respectively. Deviation from SSLE pronunciation identifies the users of OVSLEes. The participants of this investigation are bilinguals with Sinhala/OVSLE and T/OVSLE in their code repertoire. This study selects two variables Proficiency in SLE and Rate of occurrence of selected deviations from SSLE pronunciation and aims to investigate the correlation between them as well as ascertain whether the diversity in the first languages influence the correlation. This investigation is informed by theory on dual language lexical processing in bilinguals, their word retrieval mechanisms and how proficiency in the second language (L2) affects their pronunciation.

#### II. THE LITERATURE

### 2.1 Word retrieval and bilingual mental lexicon

Theorists (Abutalebi and Green, 2007<sup>[1]</sup>; Costa and Santesteban, 2004<sup>[2]</sup>; Fabbro, 2001<sup>[3]</sup>; Illes et al., 1999<sup>[4]</sup>; Sia & Dewaele, 2006<sup>[5]</sup>) state that the first stage of word retrieval in bilinguals is the accessing of mental lexicon. According to Costa et al (2000)<sup>[6]</sup> in bilinguals the conceptual information both in L1 and L2 is stored in one common conceptual store, regardless of the language of input. This common conceptual store is connected to the L1 and L2 lexical stores, which are also connected with each other (Centowska, 2006)<sup>[7]</sup>. Concurring Kroll (2008)<sup>[8]</sup> states that mental juggling which is necessary to negotiate the use of two languages is a natural outcome of bilingualism. If both languages are active and compete for selection, the bilingual then needs to acquire a mechanism that provides a means to control this activity and the corresponding decision process. Thus lexical production in a bilingual involves, when compared with a monolingual, a more complex dual language processing architecture.

# 2.2 Dual language lexical processing: The case of bilinguals

Discussing cross language lexical processes Linck et al (2008: 349)<sup>[9]</sup> states 'both languages are active when balanced bilinguals and second language learners are reading, listening, or speaking one language only'. They further state that 'The intention to use one language only does not suffice to restrict activation to one language and does not appear to be restricted to

a particular task' (ibid). Other current research (Colome, 2001<sup>[10]</sup>; Costa et al., 2000<sup>[11]</sup>; Costa et al., 2005<sup>[12]</sup>; La Heij, 2005<sup>[13]</sup>) on lexical selection in bilingual speech production theorizes that the two languages of a bilingual are activated in parallel. Simple production tasks such as naming a picture or reading a word engage cross-language activity in the mind of even highly proficient bilinguals (Costa, 2005<sup>[14]</sup>).

The models of bilingual language production theorize that the activation of common semantic representations for the two languages of a bilingual occurs at the conceptual non-linguistic level (Finkbeiner et al., 2002<sup>[15]</sup>; Li & Gleitman, 2002<sup>[16]</sup>; Kroll & Stewart, 1994<sup>[17]</sup>). Then, most researchers (Levelt et al, 1999<sup>[18]</sup>; Peterson and Savoy, 1998<sup>[19]</sup>; Tokowicz et al, 2002<sup>[20]</sup>) identify synonymous lexical node activation in the two languages. Furthermore this activation of the lexical system occurs regardless of the language programmed for response (De Bot, 1992<sup>[21]</sup>; Green, 1986<sup>[22]</sup>; Poulisse and Bongaerts, 1994<sup>[23]</sup>; Poulisse, 1997<sup>[24]</sup>). Neurological evidence is cited to prove that in the brain of a bilingual lexical nodes i.e., syntactically specified lexical concepts in different languages may compete for selection during a task schema which targets one language. A neurocognitive study by Abutalebi & Green (2007: 242)<sup>[25]</sup> adds support to the above notion and they state that,

Neural representation of a second language converges with the language learned as a first language and language production in bilinguals is a dynamic process involving cortical and subcortical structures which must manage competing phonological, syntactic and prosodic systems.

Due to this multiple activation Finkbeiner et al (2006: 153)<sup>[26]</sup> state that the bilingual speakers find it harder than monolinguals to access the target lexical node as each concept is associated with multiple synonymous lexical nodes. Tokowicz et al  $(2002)^{[27]}$  note that many concepts, especially the concrete, are associated with translation equivalent lexical nodes in a bilingual's mind. If these translation equivalent lexical nodes share a common concept at the conceptual level, retrieving the lexical node that corresponds to the target concept from the translation equivalent lexical nodes will cause hardship. Finkbeiner et al (2006: 153)<sup>[28]</sup> state that,

If two translation equivalent lexical nodes are activated to roughly equal levels every time their shared semantic representation becomes activated the lexical selection mechanism should find it difficult to decide between the two. The deciding processes are identified in literature as language specific and the language non-specific lexical selection models. Of the two this study surveys the latter as the participants of this study are weak learner bilinguals.

# 2.3 Proficient to weak learner bilinguals: language specific lexical selection to inhibition

Santesteban (2006: 119)<sup>[29]</sup> based on empirical research evaluating the different performance profiles of L2 learners and highly-proficient bilinguals have indicated that these two groups make use of qualitatively different language control mechanisms. More specifically, they propose that increase of the L2 proficiency level leads bilinguals to utilize language-specific selection mechanisms during lexical access. That is, while highly-proficient bilinguals' language control mechanisms will be flexible enough to allow them to use non inhibitory processes the language control mechanisms the L2 learners will struggle to guarantee selection in the response language by means of L1 inhibitory processes (Green, 1986a<sup>[30]</sup>; 1998a<sup>[31]</sup>).

# 2.4 Language non-specific lexical production and inhibitory control in L2 learners

Green (1998a)<sup>[32]</sup> proposed the Inhibition Control Model (ICM) in which competing potential outputs of the lexicosemantic system are inhibited depending on the goals of the speaker. Agreement comes from Linck et al (2008)<sup>[33]</sup> who state that during lexical production inappropriate responses such as words from the non target language are inhibited to prevent their production. The main tenet behind the ICM is that in bilinguals, recognition of linguistic information is not language-specific. This tenet is shared by a plethora of theorists. Green (1986a<sup>[34]</sup>, 1998a  $^{[35]}$  and b $^{[36]}$ ) and de Bot & Schreuder (1993) $^{[37]}$  propose language non-selective models for lexical access and state that words from both languages are activated and compete for selection during lexical access. Finkbeiner & Caramazza (2006: 154)<sup>[38]</sup> and Costa & Santesteban (2004)<sup>[39]</sup> state that the language non-specific model allows competition for selection and candidates within and across languages actively compete with alternatives in the unintended language. All theorist cited above collectively agree that the non-target language lexical candidates are eventually inhibited to allow accurate production to proceed. Figure 1 below is an adaptation of Finkbeiner et al (2006a)<sup>[40]</sup> to suit the linguistic context of this study. It illustrates how the ICM explains lexical selection in bilinguals.



Figure 2: Inhibitory Control Model (Green, 1986a<sup>[41]</sup>; 1998a<sup>[42]</sup> and lexical processing in a Sinhala/SSLE bilingual Source: Adapted from Finkbeiner et al (2006a).



The thickness of the circles and arrows indicate the level of activation

Inhibitory link

In the above example, an S/SLE bilingual names a picture of a *cat* in English. At visual onset of the picture, the semantic system sends activation to many lexical nodes of English and Sinhala (the target, its translation equivalent and a cohort of related words which are not included in the above illustration). At the lexical level, each word contains a language tag. From these lexical nodes those belonging to Sinhala are inhibited as specified by the task schema which commands that the speaker intention is to speak in English. Note that *puusa* the lexical translation of the word *cat* gets equal activation as *cat*. Note that *dog* and *balla* have an equal but lower number of semantic links and gain equal and low activation though they differ in language. On the other hand, though *dog* is in the same language as *cat* it has a lesser number of semantic links than the translation equivalent *puusa* the translation equivalent of *cat*. Thus the main activated contenders are *puusa* and *cat*. Then inhibiting *puusa* (the Sinhala equivalent for *cat*) from selection criteria based on the language task schema the bilingual selects the word *cat* based on its higher activation level when compared with *dog*.

But note that in the ICM processing steps of the cascading activation is temporally ordered but might overlap in time. This results in phonological nodes receiving activation before the conceptual activation is complete. Thus inhibition at lexical level will not prevent the phonological nodes of all lexical nodes getting activated.

2.5 Factors that influence bilingual lexical pronunciation

According to Flege et al (2003)<sup>[43]</sup> bilinguals are unable to fully isolate the L1 and L2 phonetic systems, which necessarily interact with one another during lexical pronunciation. Information pertinent to factors identified in literature as potentially important to L2 pronunciation includes constrained subsystems such as language specific markedness rankings that can be activated and deactivated to varying degrees. The faithfulness or violation processes permit and influence different modes of pronunciation in the L1 and L2. The nature, strength, and directionality of the influence may vary as a function of factors which includes: number and nature of phonic elements of the L1 and L2 and L2 proficiency (see Flege, 1995<sup>[44]</sup>; Flege et al., 2003<sup>[45]</sup> for other factors). Out of these factors that influence bilingual lexical pronunciation this study selects proficiency of L2 for empirical investigation as a predictor of pronunciation accuracy/inaccuracy during lexical production. Neurological evidence from literature which posits that the lexical processing of weak L2 bilinguals is conscious, effortful, takes more time and is more prone to errors is scaffolded below.

# 2.6 Neurological evidence for bilingual lexical pronunciation 2.6.1 The convergence theory

Neurological investigations conclude that producing spoken words, whether in isolation or in the context of a larger utterance, involve an extensive neural network (Indefrey and Levelt, 2004<sup>[46]</sup>). Most emerging studies which examine brain activity during lexical processing agree with the convergence theory which concludes that L2 is essentially processed through the same neural networks underlying L1 processing. Based on behavioral and fMRI evidence obtained from high proficient bilinguals Dijkstra & Van Heuven (2002)<sup>[47]</sup> too state that due to the convergence in the semantic processing systems for the two languages 'bilingual lexical processing leads to language conflict in the bilingual brain even when the bilinguals' task only required target language knowledge' (ibid: 175).

The participants were twenty-four Dutch–English bilinguals with a high English proficiency and a regular use of English and twelve English monolinguals. The study investigated how bilinguals perform on single word processing tasks when language based conflicts are induced by stimulus. The instruments consisted of a set of Dutch–English homographs and a set of matched English control words. The stimulus based language conflict was examined at diverse levels: phonology, semantic and language membership.

According to Dijkstra & Van Heuven (ibid: 179), Recognition of interlingual homographs will suffer from a stimulus-based language conflict, because 1) they belong to 2 languages; 2) they are semantically ambiguous; and 3) their pronunciation is different for each language.

The instrument, for example, contained the word *room*. At the level of phonology *room* in English is /ru:m/, and in Dutch it transcribes as /ro:m/. Semantically *room* in Dutch means *cream* and in English connotes the noun 'a part of a building', and at the different language membership level *room* is both a Dutch and an English word. Thus Dijkstra & Van Heuven (ibid) generated a response-based language conflict for Dutch–English bilinguals. The interlingual homograph *room* generated a conflict in the

English Lexical Decision (ELD) task, as it is an English word as well as a Dutch word.

In ELD tasks, Dijkstra & Van Heuven (ibid: 180) state that 'participants were required to press a 'Yes' button when a presented letter string is an English word, and a 'No' button when the letter string is not an English word'. Dutch–English bilinguals reading an interlingual homograph as *room* during the ELD task can respond with a 'Yes', because *room* is an English words. But *room* could trigger a 'No', response too because it is also an existing Dutch word. As a consequence, in this task a response-based conflict arose due to interlingual nature of the selected homographs.

In contrast, in a Generalized Lexical Decision (GLD) no response conflict was generated as participants were required to press a 'Yes' button when a presented letter string is a word, irrespective of the language to which it belongs, and a 'No' button when the string is not a word in any of the languages involved. Bilingual brains showed greater activation in the ELD task than the GLD task for the contrast between interlingual homographs and English control words. The control group of English monolinguals presented a non conflict contrast as both tasks were necessarily ELD tasks. Analyzing the data Dijkstra & Van Heuven (ibid: 182) conclude that 'both languages of bilinguals are activated when they read the words from their second language. Importantly, bilinguals are not able to suppress the nontarget language to avoid interference'. Thus the brain activation during lexical production in a target language in high proficient bilinguals too triggers both languages and conflict between them is evidenced.

### 2.6.2 Language conflict and the pre frontal cortex

Conflict between languages activates the prefrontal cortex state Miller and Cohen  $(2001)^{[48]}$  and Koechlin et al  $(2003)^{[49]}$ . They concur that a main function associated with the prefrontal cortex is executive control to overcome word retrieval difficulties. Phonological retrieval (Gold and Buckner 2002)<sup>[50]</sup>, grapheme-to-phoneme conversion and lexical search (Heim et al.  $2005)^{[51]}$  too lead to activation in the prefrontal cortex.

Thus when a bilingual is required to name a word, if language conflict arises the pre frontal cortex is activated and is used to overcome retrieval difficulties. More evidence for activity in the pre frontal cortex comes from Bunge et al  $(2002)^{[52]}$  whose findings predict that the prefrontal cortex was recruited when there was a need to select between competing responses. They state that the prefrontal areas of the brain are involved in the selection among alternative response options. Furthermore it is this brain region which inhibits the activation of the non-target language representations. Abutalebi and Green  $(2007: 247)^{[53]}$  state 'on the basis of brain data we suggest that inhibition is a key mechanism in language control and lexical selection'. They claim that the prefrontal circuits are mainly equipped with inhibitory neurons and they provide the ideal mechanism for inhibitory control.

Though it is not the only brain region activated during lexical access one reason for the restricted interest on brain activity in the pre fontal cortex is the language conflict solving ability and as inhibiting unwanted lexical items is one of its neural functions. Additionally literature states high/ low L2 proficiency dichotomy affects its rate of activation.

Summarizing the reviewed literature above the following can be stated:

- 1. In the high proficiency L2 speaker less pre frontal activity is indexed as,
- a) There is less need for language control or L1 inhibition (Kroll et al., 2002)<sup>[54]</sup>.
- b) Word retrieval will be automatic and language specific (Hernandezet al., 2005)<sup>[55]</sup>.
- 2. When needed to produce words in the weak L2 the prefrontal cortex of the low proficiency L2 speaker is highly activated as,
- a) There is a need to overcome language competition which requires controlled, conscious processing (Francis, 1999<sup>[56]</sup>; Meuter & Allport, 1999<sup>[57]</sup>)
- b) Processing involves inhibiting highly activated unwanted L1 lexical items. As a result lexical retrieval is conscious, effortful, takes more time and is more prone to errors (Edmonds & Kiran, 2006<sup>[58]</sup>; Kroll & Stewart, 1994<sup>[59]</sup>; Kroll et al. 2002<sup>[60]</sup>; Segalowitz & Hulstijn, 2005<sup>[61]</sup>).

Thus neurological evidence for word naming proves that the difference in L2 proficiency clearly influences word processing and weak learner bilinguals undergo a strong L1 influence during L2 lexical naming tasks. Thus lexical retrieval in the weak L2 'is conscious, effortful, takes more time and is more prone to errors'. Extending this to the present study, 'more prone to errors' is of importance. This study recognizes rate of occurrence of deviations from SSLE pronunciation = 'proneness to errors' in OVSLE bilingual pronunciation.

### III. METHODOLOGY

#### 3.1 Research question

Is there a correlation between Proficiency in SLE and Rate of occurrence of selected deviations from SSLE pronunciation?

### 3.2 Participants

# 3.2.1 Participant population I: S/SLE bilingual undergraduates

Out of the total population of 1020 S/SLE bilingual undergraduates (2011/2012) from the Faculties of Humanities and Social Sciences of University of Kelaniya, a population of 200 (mean age 21 years) was selected through standard random sampling procedures as respondents to a questionnaire (Appendix A) and a pronunciation elicitation process. Table 2: Instrument I (§ see 3.4.2.1) was utilized for elicitations. Of the 200 participants 54 did not flout SSLE norms in the selected deviations from SSLE in Instrument I. Thus they were eliminated. From the 146 shortlisted participants who belonged to the S/OVSLE bilingual speech populations 100 were randomly selected as respondents to the questionnaire.

### 3.2.2 Participant population II: T/SLE bilinguals

100 respondents consisting of T/SLE bilingual Advanced Level students (mean age 17 years) from Sandilipay Hindu College, a rural, mixed school situated roughly eight kilometers from the Jaffna town were respondents to a questionnaire (Appendix A). They underwent the same pronunciation elicitation process utilizing Table 1: Instrument I (§ see 3.4.2.1). Of the 100 participants 15 did not flout SSLE norms in the selected deviations from SSLE in Instrument I. Thus 85 shortlisted participants who belonged to the T/OVSLE bilingual speech populations were respondents to the questionnaire.

### 3.3 Measuring proficiency

Norris and Ortega (2000)<sup>[62]</sup>, in a comprehensive analysis of a multitude of L2 research studies, observed that the L2 language proficiency of learners can be determined through a variety of methods that elicit their automatized knowledge of the L2 system. All formal ESL testing evaluate this knowledge and provide a reference point for categorizing learners based on their proficiency levels of L2. For the experimental purposes of this study, the L2 proficiency of the learners was operationalized through their performance at a standard summative examination. The statistics for this variable for the undergraduate S/OVSLE population was obtained from a one year, two credit issuing compulsory course English for Communication from the University of Kelaniya. This course evaluates grammar, vocabulary, reading and writing through a written paper while speaking and listening skills are evaluated at the assignment level. A similar process of was followed for the T/OVSLE bilinguals where the final marks obtained for two most recent tests at school were collated as the formal measurement of proficiency.

#### 3.4 Inquiry systems

## 3.4.1 Inquiry system I: Short questionnaire

This instrument (Appendix A) collected data on personal information such as age, sex and ethnicity from all S/OVSLE and T/OVSLE bilingual participants of this study.

# 3.4.2 Inquiry system II: Interviews for pronunciation measurement of respondents

According to Fraenkel and Wallen, (1996<sup>)[63]</sup> interviewing is an important way for a researcher to verify or refute the impressions he or she has gained through observation. They consider interviewing as the most important data collection technique a researcher possesses. Concurrence comes from Cheshire et al (2005)<sup>[64]</sup> who state 'phonological variables show up with high frequencies in sociolinguistic interviews, and can be easily elicited through word lists'.

#### 3.4.2.1 Word List for pronunciation elicitation

This research instrument was compiled from lexicon suggested as representing pronunciation features of OVSLEes obtained from literature on SLE. The target phonological feature in each lexicon is relatively easy to perceive and define and could be specified binarily for their variety discrimination load. Furthermore the tokens were evaluated for word frequency for English through the Brown Corpus (Francis and Kucera, 1982)<sup>[65]</sup> and the selected instrument consists of high frequency words.

25 lexica from surveyed literature compiled the list for pronunciation elicitations. Recorded lemmas which give rise to pronunciation deviations from SSLE in bilinguals who use OVSLEes were obtained from sources and 5 for each target pronunciation area were randomly shortlisted.

#	Target deviation	Lexicon with target phoneme/phonotactic feature					
		1	2	3	4	5	
1.	o / o	bowl	ball	hole	yoghurt	boat	
2.	f/p	paddy field	program	past	profit	airport	
3.	s / ∫	auction	push	sheet	pressure	cousin	
4.	i+s	station	screen	style	smile	screw	
5.	Syllable omission	environment	identity	exercise	temporary	government	

Table 1: Instrument I - Lexical tokens for testing target deviations from SSLE in S/OVSLE and T/OVSLE bilinguals

#### 3.5 Procedure

The data collectors for participant population I (S/SLE) were staff members of the English Language Teaching Unit (University of Kelaniya). They were graduates who had read English as a subject with post graduate qualifications in Linguistics. Participant populations II (T/SLE) from Sandilipay Hindu College, Jaffna was examined by a team of experienced teachers of English (mean average of teaching experience = 12 years) headed by Ms. Yamini Baskeran. In all data collecting procedures I instructed and supervised the personnel involved and was a parallel data collector. Each member of the data collecting team had exposure to Linguistics, could transcribe using IPA and was sensitive to pronunciation deviations from SSLE in their respective bilingual populations. Their word list had the target deviation in pronunciation highlighted (as in Table 1 above).

Each respondent was interviewed by a panel of two data collectors. On arrival at the examining locale the respondents handed over their completed questionnaires and read the 25 word list provided to them. They were required to pronounce each word with maximum clarity. The two data collectors recorded whether the target deviation from SSLE was evidenced in the

pronunciation of each word. The perceptive accuracy was dependent on both data collectors perceiving evidence for the target deviation from SSLE in a participant. During shortlisting the respondents who did not deviate from SSLE pronunciation were eliminated from the analysis.

#### 4.1 Research question: Analysis of correlation

Is there a correlation between Proficiency in SLE and Rate of occurrence of selected deviations from SSLE pronunciation?

#### Hypotheses:

If X is the Proficiency in SLE and Y the frequency of occurrence of selected deviations from SSLE pronunciation:

 $H_{0}$ - Proficiency in SLE (X) has **no correlation** to the frequency of occurrence of deviations from SSLE pronunciation (Y).

 $H_1$  – Proficiency in SLE (X) is **negatively correlated** to the frequency of occurrence of deviations from SSLE pronunciation (Y).

 $H_2$  – Proficiency in SLE (X) is **positively correlated** to the frequency of occurrence of deviations from SSLE pronunciation (Y).

### IV. RESULTS AND ANALYSIS





Figure 3: Scatter diagram illustrating correlation between Proficiency in English and Rate of pronunciation deviations from SSLE in S/OVSLE bilinguals

## 4.1.1.2 T/OVSLE bilinguals



Figure 4: Scatter diagram illustrating correlation between Proficiency in English and Rate of pronunciation deviations from SSLE pronunciation in T/OVSLE bilinguals

D Ints placed on the x-axis

The dispersion of the data points in the above scatter plots in Figures 2 and 3 illustrate that there is a negative correlation between the two variables in all three populations. Thus the independent variable Proficiency in English affects the dependent variable Rate of occurrence of deviations from SSLE pronunciation in the two populations and indicates a negative relationship.

But note the dispersion of the data points in the above scatter plots indicate that proficiency in English is not the only gauge for the rate of occurrence of deviations from SSLE in individual bilinguals in both populations above as many data points are placed far away from the linear trendline. Note the data points placed on the x-axis. The participants had 0 deviations from SSLE pronunciation but they had differing levels of Proficiency in English.

# 4.1.2 Analysis of correlation between Proficiency in English and Rate of occurrence of deviations

# 4.1.2.1 Descriptive statistics for S/OVSLE bilingual population

The Pearson correlation between Proficiency in English and rate of occurrence of deviations is - 0.305, i.e. the two variables of interest have a moderate positive correlation as Higgins  $(2005)^{[66]}$  states that for values of *r* between -0.3 and -0.4.9, correlation is moderate.

Thus for the S/OVSLE bilingual population,

 $H_2$  – Proficiency in English is <u>negatively correlated</u> to the estimated frequency of occurrence of deviations from SSLE pronunciation is <u>validated</u>.

Furthermore the correlations are statistically significant at the 5% level. Any p-values less than .05 indicate that the result is not due to chance. Thus the p-value of 0.003 evidences that there is an actual correlation between the variables.

The Pearson Correlation for this population is - 0.305. Thus  $R^2 = -0.305 \times -0.305 = 0.09$ . So the variance explained is 0.09 x

100 = 9%. Thus the coefficient of - 0.305 shows a medium (Brown and Rodgers, 2002:  $190^{[67]}$  state medium is 9%) 9% variance explained. This also means that 91% of the variance is unexplained which indicates that influences other than Proficiency in English influence the rate of occurrence of deviations from SSLE in the S/OVSLE bilingual population.

# 4.1.2.2 Descriptive statistics for T/OVSLE bilingual population

The Pearson Correlation between Proficiency in English and rate of occurrence of deviations for this population is -0.497, i.e. the two variables of interest are moderately negatively correlated. Thus for the T/OVSLE bilingual population,

 $H_2$  – Proficiency in English is <u>negatively correlated</u> to the estimated frequency of occurrence of deviations from SSLE pronunciation is <u>validated</u>.

Furthermore the correlations are statistically significant at the 5% level (i.e. it can be concluded that the correlation is not purely due to chance but due to actual correlation between the variables.) Any p-value less than .05 indicates that the result is not due to chance. Thus a p-value of 0.000 evidences an actual correlation between the variables.

The Pearson correlation is -0.497. Thus  $R^2 = -0.497 \times -0.497 = 0.245$ . So the variance explained is 0.245 x 100 = 24.5%. Thus the coefficient of -0.313 shows a large (Brown and Rodgers, 2002: 190<sup>[68]</sup> state large is 25%) 24.5%. variance explained. This also means that 75.5% of the variance is unexplained which indicates that variables other than Proficiency in English influence on rate of occurrence of deviations from SSLE in the T/OVSLE bilingual population.

Table 3: Percentage of variance explained for the two populations of this study

Variable		% of variance explained	
		S/OVSLE	T/OVSLE
Proficiency	in	9.0	24.5
English			

### V. CONCLUSIONS

This paper examined the correlation between Proficiency in English and the Rate of occurrence of selected deviations from SSLE pronunciation. De Lacy (2007)<sup>[69]</sup> argues that markedness is part of our linguistic competence and the rate of occurrence of L1 features transferring to L2 is dependent on the competence of L2. Thus through deductive reasoning it could be stated that learner English users do more repairs to L2 lexical phonology and as a corollary deviate from norms of SSLE pronunciation. The findings of the Research question of this study validated the above tenet as it showed a significant negative correlation between Proficiency in English and the Rate of occurrence of selected deviations from SSLE pronunciation i. e. as Proficiency in L2 increases the Rate of occurrence of selected deviations from SSLE pronunciation decreases. Thus Proficiency in L2 has a strong influence on pronunciation deviations from a standard variety of English.

Summarizing the findings of the Research question though Proficiency in SLE influence the rate of occurrence of deviations from SSLE in a bilingual user of OVSLEes it cannot be stated that it is the only factor that causes the deviations. This is evidenced in the correlation analysis where the total percentage of variance explained for the two factors across the two populations of this study was S/OVSLE: 9.0% and T/OVSLE: 24.5%. Thus with high % of variability unaccounted for it is concluded that other exogenous factors too would have influenced the rate of occurrence of deviations from SSLE. Agreement comes from Rasinger (2008: 159)<sup>[70]</sup> who states that with high % of variability unaccounted for there is plenty of space for other factors to influence an independent variable. Literature identifies many other factors such as aptitude (phonemic coding ability), psychomotor skills, age, gender, age of L2 acquisition, the learner's attitude, motivation, language ego, and other sociocultural and sociopsychological variables clearly influence the degree of pronunciation variation. One contribution of this correlational investigation is that it informs pedagogy of the influence Proficiency in English on deviation from SSLE pronunciation which is the native target of Teaching English as a Second Language in Sri Lanka.

### AUTHORS

**First Author** – Rohini Chandrica Widyalankara, English Language Teaching Unit, University of Kelaniya, Sri Lanka rdhrcw@yahoo.com

# Finite Element Analysis and Vibration Aspects of Rotating Turbine Blade with Known Stress Concentration Factors

# Rajesh.M<sup>1</sup>, Tejesh.S<sup>2</sup>, Mohan Kumar.B<sup>3</sup>

<sup>1</sup>Assistant Professor, Dept of Mechanical Engineering, Dr. Ambedkar Institute of Technology, Bangalore, Karnataka, India
<sup>2</sup>Assistant Professor, Dept of Mechanical Engineering, Dr. Ambedkar Institute of Technology, Bangalore, Karnataka, India
<sup>3</sup>Assistant Professor, Dept of Mechanical Engineering, Dr. Ambedkar Institute of Technology, Bangalore, Karnataka, India

*Abstract*- Modal analysis has been important to the designers and operators since the inception of the Turbo machinery. Blades typically fail because of low-cycle fatigue (LCF), and high-cycle fatigue (HCF), environmental attack, Creep, Oxidation, erosion, embrittlement. In the present work the turbine blade is modeled and analyzed using finite element method the eigen value extraction for flexural and torsional modes is obtained. Foreign object damage is simulated by considering a circular crack along the leading edge of the blade. It was found that the stretching induced by the centrifugal inertia force due to the rotational motion of the blades was the cause for the increment of the bending stiffness of the structure. This resulted in maximum operational Vonmises stresses; the object is to provide understanding and information for designers to improve the life and efficiency of gas turbines.

*Index Terms*- Turbine blade, Eigen value, Low cycle fatigue, High cycle fatigue

### I. INTRODUCTION

c) esonance is an important failure mechanism that arises when R a periodic force acts at a frequency corresponding to a blade natural frequency. If the damping is inadequate for absorption of the periodic input energy, amplitude and stresses grow until failure occurs by overstress or by propagation of fatigue crack. A complex and irregular distribution of minor indentations covers the surface, including leading edge impacts. The damage caused by foreign objects often in the form of a geometric discontinuity like a notch. However the presence of residual stress and substructural damage in regions adjacent to the notch prohibit the use of simple notch analyses. FE analysis is used to estimate stress concentration effect of the geometry of the notch. For this purpose, the compressor aerofoil blade is idealized into simple rectangular cantilever plate for FEM study. The complexity of the problem is reduced to a simplex problem by assuming the aerofoil section to a flat rectangular plate. Because of the nonpresence of the aerofoil section, analysis is so simple for finding the stress concentration effect of the geometrical notch made. To analyze the stress concentration effect of foreign object damage (FOD), different notches are made by varying the notch dimensions viz., depth, radius of the notch and the location of the notch on the trailing edge of the rectangular plate.



**Figure 1: Circular shaped impacts** 

Foreign object damaged compressor blades with nicks, dents and cracks can be ground into the smooth curved cut-outs to reduce the stress intensification and stress concentration with a high speed grinding wheel. In doing so, depending on the extent and type of damage, designer has a requirement to estimate size and shape of the cut-out to be made on the aerofoil that generates the known SCF. With the estimated values of SCF for different geometry of cut using FEM further a modal analysis has been conducted to assess the variation of frequencies for different geometry of cut-outs with known values of SCF to aster the correctness of the solution, the finite element analysis is carried out on a rectangular cantilever plate for which literature is available. Further the study is extended to an idealized problem of cantilever rectangular plate both in static and rotating conditions with and without the notches.

### II. THEORETICAL BACKGROUND

In a normal mode, each element of the beam oscillates up and down at the same frequency. The amplitude of oscillation varies along the beam as shown below for each of the first four normal modes (with Y(x) exaggerated). In figure 2 Y(x) shows the shape of the beam at the extreme of the oscillation when all points on the beam are instantaneously at rest. All the points also go through zero displacement at the same time. Y(x) is the vertical displacement relative to the fixed end, and the horizontal
scale is expressed as a fraction of the full length,  $\ell$ , of the beam. In formal terms, a cantilever is a beam that is constrained to have

$$\frac{dY(x)}{dx} = 0$$
 and  $\frac{dY(x)}{dx} = 0$  at x = 0 and the other end free.



Figure 2: Mode Shapes

The parameters that determine the shape, Y(x), are as follows:

 $\ell$  The length of the beam [m]

A The cross-sectional area of the beam  $[m^2]$ 

- $\rho$  The mass density of the material [kg m<sup>-3</sup>]
- E Young's modulus for the material  $[kg m^{-1} s^{-2}]$

I A geometrical property called the second moment of area of the cross-section. For a rectangular cross-section of

$$I = \frac{wd^3}{12}$$

width, w, and thickness, d, this is given by

The theoretical expression for the displacement of the free end of a static cantilever is:

$$Y(\ell) = \frac{\rho Ag}{8EI} \ell^4$$

[g is the acceleration due to gravity]

If, in addition, a load of mass m is suspended from the free end the displacement is increased to

$$Y(\ell) = \frac{\rho Ag}{8EI} \ell^4 + \frac{mg}{3EI} \ell^3$$

Measurements on the static beam can therefore give information about groups of parameters,

such as EI or EI. We shall see that these parameters are relevant to its dynamic behaviour.

In mode 1, all parts of the beam move, except the fixed end. In mode 2 there is a stationary point, or *node*, away from the end (at  $x/\ell = 0.784$ ). In mode 3 there are two nodes, and so on.

## 2.1 For Flexural Modes

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The Natural frequency of flexural modes  $\omega_n = \beta_n^2 \sqrt{(EI \ / \ \rho L)}$ 

The vibration of beam with constant mass and stiffness is given by

$$EI \frac{\partial^4 \bar{y}}{\partial \bar{x}^4} + m \frac{\partial^2 \bar{y}}{\partial \bar{t}^2} = \bar{f}(\bar{x}, \bar{t}), \qquad \qquad 0 < x < l,$$

Substituting the above expression into the homogeneous form

$$Y^{(4)}T + Y\ddot{T} = 0,$$

$$\frac{Y^{(4)}}{Y} = -\frac{\dot{T}}{T} = \beta^4,$$
  
where  $\beta_i$  is the *j*th positive root of the equation

$$\cos \beta_j \cosh \beta_j = -1$$
, and  $\alpha_j = \frac{\cosh \beta_j + \cos \beta_j}{\sinh \beta_i + \sin \beta_i}$ 

## 2.2 For Torsional Modes

The angular frequencies,  $\boldsymbol{\omega}_n,$  of the normal modes, are given by

$$\omega_{n} = 2\pi \upsilon_{n} = \frac{\theta_{n}^{2}}{\ell^{2}} \sqrt{\frac{EI}{\rho A}} = \theta_{n}^{2} \sqrt{\frac{EI}{\rho A \ell^{4}}}$$

 $\theta_n$  is a number. The general solution Y(x) of the form

$$Y_{n}(x) = \cosh\left(\theta_{n} \frac{x}{\ell}\right) - \cos\left(\theta_{n} \frac{x}{\ell}\right) - \sigma_{n}\left[\sinh\left(\theta_{n} \frac{x}{\ell}\right) - \sin\left(\theta_{n} \frac{x}{\ell}\right)\right]$$

In which the  $\theta_n$  are the solutions of  $\cosh(\theta_n)$ 

 $\cosh(\theta_n)\cos(\theta_n) = -$ 

$$\sigma_n = \frac{\sinh(\theta_n) - \sin(\theta_n)}{\cosh(\theta_n) + \cos(\theta_n)}$$

And the  $\square_n$  are given by

1

#### **III. FINITE ELEMENT FORMULATION**

The plate geometry shown in figure is modeled and meshed by using ANSYS *macros* which is to be entered in the command prompt box of ANSYS. The dimensions of the plate are length L=200mm, width D=50mm and thickness t=5mm and modeled by using the RECTNG or BLC4/ BLC5 *macro* commands under /PREP7 pre-processor by giving the equalent dimensions of the plate in the respective working plane coordinates.



Figure 3: Finite Element model of a Rectangular Blade

The material taken for the plate is steel, have properties Young's Modulus = 2.1e5 MPa. Density = 7850 Kg/m<sup>3</sup> Poisson's ratio = 0.3

The material is assumed to be in linear isotropic elastic condition.

The blade is assumed to be rotating at a speed of 15000 rpm and the angular velocity of the blade is calculated from the available data as

$$\omega = \frac{2\pi N}{60} = \frac{2\pi * 15000}{60} = 1570.796 \text{ rad / sec}$$

The model is marked into areas by lines for map meshing around the notch geometry and the macros used issued for material properties are entered by the commands MP, DENS-for density, MP-EX for Young's modulus and MP-PRXY-for Poisson's ratio in this context. The element type for this model taken is PLANE42 and SOLID45and written in macro commands by using ET-for element type. The model is fine meshed and coarse meshed the LESIZE-line element size and divisions and AMESH-area mesh as shown in figure .after meshing the plane 42 element, then the plane 42 element type is extruded to SOLID45 by using the EXT command. After extruding the PLANE42 elements are deleted and the nodes along z=0 are selected. The model is arrested in X, Y and Z direction by selecting the nodes to be fixed with D. The node selection is made by the NSEL with S or R command.

The solution phase begins with /SOLU command and the modal analysis type is switch on by writing ANTYPE, 1. The problem is solved by using the SOLVE *macro* command. The Post processing of results can be carried by the sequence of /POST1. The model consists of 4800 SOLID45 elements.

#### IV. RESULTS AND DISCUSSIONS

The Free and Forced Vibration Analysis of Rectangular Cantilever beam were done for various notch parameters to obtain the Natural frequencies and Dynamic responses of the beam. The average natural frequency for First Flexural (1F) and First Torsion(1T) for notch dimension h=20mm is shown in figure 4 and notch radius ranging from 1 to 10mm increased in steps of 1mm are 371.928 Hz and 892.041 Hz respectively. It is observed that the 1 F frequency decreases. The centrifugal force is applied along the leading edge where the notch is present.



Figure 4: FEA model of rectangular blade with semicircular notch at h = 20mm

The centrifugal force is obtained from the angular velocity which is calculated from the constant engine speed of 15000 rpm. The notch radius is varied from 2 mm to 10 mm in steps of 2 mm with the various location heights of 20 mm, 80 mm, 100 mm, 120 mm, and 150 mm from the root to tip of the blade along the leading edge It is observed that for 2 mm, radius of notch and for the locations mentioned, frequency decreases from the root to the tip of the blade. The percentage decrease in 1F frequency for 2 mm notch radius, from the initial height of 20 mm to the final height of 150 mm is 0.145%. as shown in figure 5.



Figure 5: 1F mode of rectangular blade with semicircular notch at h = 20mm

For further increase of the notch radius in steps of 2 mm for the locations mentioned, frequency increases from the root to the tip of the blade. The percentage increase in 1F frequency for 4 mm notch radius, from the initial height of 20 mm to the final height of 150 mm is 0.02%. For further increase of the notch radius for 6 mm, and for mentioned height the percentage increase in frequency for 1F frequency is 0.3%, as shown in Graph 1.



Graph 1. 1F Modal Frequency for different Notch Radius and at different Heights

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First Torsional frequency (1T) for notch location at a distance of 20 mm from the root and for the notch radius of 1 mm, the 1T frequency is 906.605 Hz shown in figure 6. As the notch radius is increased from 1 mm to 10 mm in steps of 1 mm, the 1T frequency decreases, the decrease in the frequency is marginal. For 10 mm notch radius 1T frequency obtained is 868.439 Hz, the maximum percentage decrease in frequency is around 4.20%.

Comparison of First Torsional (1T) frequency for different notch radius varied from 2 mm to 6 mm in steps of 2 mm with varying location of the notch height of 20 mm, with the varying location of notch height 80 mm, 100 mm, 120 mm and 150 mm from the root to the tip of the blade along the leading edge variation in the frequency is marginal as shown in graph 2. For the initial parameters the Second



Figure 6: 1T mode of rectangular blade with semicircular notch at h = 20mm

Flexural (2F) frequency is 1201 Hz, as the notch radius is increased from 1 mm to 10 mm in steps of 1 mm, with constant location height of 20 mm, the 2F frequency decreases. The (2F) frequency for 10 mm notch radius is 1195 Hz. The maximum percentage decrease in 2F frequency is around 0.499%.

Second Torsional frequency (2T) of 1 mm radius notch at a distance of 20 mm from the root of the blade is 2783 Hz as shown in figure 7. As the notch radius is increased from 1 mm to 10 mm in steps of 1 mm, at constant location height of 20 mm from the root, the frequency obtained for 10 mm notch radius is 2698 Hz,



Graph 2: 1t Modal Frequency Vs Notch Radius



Figure 7: 2T mode of rectangular blade with semicircular notch at h = 20mm

the frequency is decreases and the maximum percentage decrease in the frequency (2T) is 3.05%. Similarly for various location heights of notches (like 50 mm, 80 mm, 100 mm, 120 mm and 150 mm from the root on the leading edge of the blade) and also with radius of semicircular notches varied from 1 mm to 10 mm in steps of 1 mm, are analyzed and it is observed that 1F, 2F, 1T and 2T frequencies shows the similar trend as observed and discussed above. When the notch is at the tip of the beam the Natural frequency is slightly greater than those obtained when the notch is at the root of the beam. The Natural Frequencies of the beam increase for the notch location far from the root of the cantilever beam.

#### V. CONCLUSIONS

The natural frequency and mode shapes of rectangular cantilever beam rotating at constant speed (15000 rpm) has been carried out for various possibilities of notch parameters used for converting the nicks and dents to notch of known geometry and thereby predicting the modal values. An attempt has been made to address the effect of notches on cantilever beam which is an idealization of blades subjected to FOD. As the notch location moves from the root to tip, the frequency increases. The frequency of the cantilever plate under rotation increases as notch diameter increase, in case of increase in location height from the root frequency decreases. Large notch sizes are not possible at the mid section and tip of the aerofoil blade because of the high increase in the modal frequency. Large notches are not possible at root of the blade as the centrifugal field get altered drastically which can affect the overall strength of aerofoil adversely. This methodology can be extended to Aerofoil as the Finite Element Method results are in good agreement with the closed form solution.

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#### AUTHORS

**First Author** – Rajesh.M, Assistant Professor, Dept of Mechanical Engineering, Dr. Ambedkar Institute of Technology, Bangalore, Karnataka, India **Second Author** – Tejesh.S, Assistant Professor, Dept of Mechanical Engineering, Dr. Ambedkar Institute of Technology, Bangalore, Karnataka, India

**Third Author** – Mohan Kumar.B, Assistant Professor, Dept of Mechanical Engineering, Dr. Ambedkar Institute of Technology, Bangalore, Karnataka, India

# The Development of Language Education Policy: An Indian Perspective; a View from Tamil Nadu

# Niruba Sarath Jayasundara

Seinior Lecturer in Linguistics, Department of Languages and Communication Studies, Trincomalee Campus, Eastern University Sri Lanka., PhD Research Scholar, Centre of Advanced Study in Linguistics, Annamalai University, Tamil Nadu, India

*Abstract*- The present paper presents a detailed account of the Indian Language Education Policy from a historical perspective and the issues associated with policy- making for language in education in the Indian socio-political context; It argues the outcome of the policies implemented in the colonial period and discusses the current status of implementation of these policies in the present Indian Educational scenario. It further elaborates the adoption of national and regional language policies of India in general and its outcomes in Tamil Nadu state in particular. Finally it discusses and evaluates the consequences and aftermath to be taken into account by the policy makers.

*Index Terms*- language Education Policy, Colonization, National Language Policy, Official Language, Indian Constitution, Regional Languages, Three Language Formula, Scientific Tamil, National Education Policy, Equitable System of Education

#### I. INTRODUCTION

A multi-ethnic and multi-lingual pluralistic nation needs to evolve education and language policies in such a way that all the segments that constitute that nation develop a sense of participation in the progress of governance and nation-building. In addition, the specific aspirations of the individual segments of the nation need to be met to the satisfaction of the various ethnic, religious, and linguistic communities.

Education, however, is considered a state responsibility, and while national policies exist, individual states play a primary role in the execution of language decisions. The relationship between India's language and education policies further complicate the tension between cultural preservation and economic growth. India's constitutional policies concerning the use of language reflect the economic and cultural evolution within this diverse and multilingual country.

The Republic of India has hundreds of languages. According to the Census of 2001, there are 1,635 mother tongues and 122 languages with more than 10,000 speakers. Language planners and policy makers have to grapple with the complex problems of multilingualism and of keeping the Indian languages center stage by giving them their due place in the educational process and national development. Owing to the defective planning by the policy makers both at the state level and the federal levels, the English language has emerged as the favored language in education.

Sanskrit was the link language of India for many centuries, Later Persian also coupled with Sanskrit and both were the link languages of India until the arrival of English to the nation. Not only English rulers, but English also ruled India for many centuries. English rulers went out but not English.

Education policy debates in India provide an additional lens for understanding the tensions of India's language policy. Experts have observed that "the states are supposed to arrange for the teaching of all minor or minority languages in schools having at least 10 students who speak these languages as their native tongue. But in practice, most state governments discourage the use of minor languages in schools." (Mohanty 2011)

Academics such as Bruthiaux note the overarching governmental framework that further affects these education and language policies: "India is a tumultuous democracy operating within a federal system, a combination that does not facilitate smooth decision making or efficient policy implementation." (Bruthiaux 2009)

## II. LANGUAGE EDUCATION POLICY IN COLONIAL PERIOD

The first language education policy of India was made for the promotion of English language that is on February  $2^{nd}$  in 1835, Thomas Babington Macaulay's minute on Indian Language policy was introduced. It says "we must at present do our best to form a class who may be interpreters between us and the millions whom we govern.... We need a class of persons, Let them Indian in blood and colour, but English in tastes, in opinions, in morals and in intellect".

This minute implies that English was introduced in the Indian educational system for the purpose of getting servants with English language knowledge. During the freedom struggle periods Gandhi vehemently opposed and wanted to throw out English from Indian nation, but he failed in his attempt. After independence, he proposed some suggestions to the government for the promotion of regional language for the state affairs, Hindustani for national affairs, and English for world affairs.

## III. LANGUAGE EDUCATION POLICY AFTER INDEPENDENCE;

#### i) National Language Policy

The Indian constitution assembly was established on 9 December 1946, for drafting a constitution when India became independent. The Constituent Assembly witnessed fierce debates on the language issue. The adoption of a "National Language", the language in which the constitution was to be written in and the language in which the proceedings of the assembly were to be conducted were the main linguistic questions debated by the framers of the Constitution. On one side were the members from the Hindi speaking provinces moved a large number of pro-Hindi amendments and argued for adopting Hindi as the sole National Language. On 10 December 1946, Dhulekar declared "People who do not know Hindustani have no right to stay in India. People who are present in the House to fashion a constitution for India and do not know Hindustani are not worthy to be members of this assembly. They had better leave."

The adoption of Hindi as the national language was opposed by members from South India like T.T.Krishnamachchari G. Durgabai, T.A.Ramalingam Chettiyar N.G.Ranga. Gopalaswamy Ayyangar (all belonging to Madras) and S. V. Krishnamurthy Rao (Mysore). This anti-Hindi block favoured retaining English as official language.

# ii) Official Language Policy

After three years of debate, the assembly arrived at a compromise at the end of 1949. It was called the Munshi-Ayyangar formula (after K.M. Munshi and Gopalaswamy Ayyangar) and it struck a balance between the demands of all groups. Part

http://en.wikisource.org/wiki/en:Constitution\_of\_Indi a/Part\_XVII17th of the Indian Constitution was drafted according to this compromise. It did not have any mention of a "National Language". Instead, it defined only the "Official Languages" of the Union.

Hindi in Devanagari script would be the official language of the Indian Union. For fifteen years, English would also be used for all official purposes (Article 343). A language commission could be convened after five years to recommend ways to promote Hindi as the sole official language and to phase out the use of English (Article 344). Official communication between states and between states and the Union would be in the official language of the union (Article 345).English would be used for all legal purposes - in court proceedings, bills, laws, rules and other regulations (Article 348).The Union was duty bound to promote the spread and usage of Hindi (Article 351).

## IV. LANGUAGE POLICY IN INDIAN CONSTITUTION

When developing its Constitution, Indian leaders enacted language policy that placed emphasis on both languagedevelopment and language-survival. The language policy contained within Part III of the Constitution defines language rights as fundamental rights – linking these language rights to education as well. The text acknowledges the innate challenges of educating a multilingual society with the legacy of a caste system by stating: "All minorities, whether based on religion or language, shall have the right to establish and administer educational institutions of their choice."

This policy and subsequent documents have produced a school system that encourages tri-lingual education, with students learning their mother tongue, Hindi, and English. However, while the Constitution highlights the importance of mother tongues, in practice it has proven unfeasible to protect the 22 scheduled languages it lists, let along the hundreds of additional languages spoken by significant numbers of people.

In 1950 the Indian constitution was established. Gandhi emphasized on Hindustani, and wanted it to be the official language of India. Later the concept of Hindustani was given up by the rulers. Gandhi achieved politically a lot but linguistically a little. In 1952, 15 major languages of India were recognized and placed in Eighth schedule.

Indian states were established in 1956 on the basis of the regional languages of the majority people. Thus English was introduced in the Indian education system and rooted in all the lines of education. During the freedom struggle periods, Mahatma Gandhi vehemently opposed English and wanted "Hindustani' to be the prime language of our nation. Later in 1992 three more languages were added, and during 2002-2006 again four languages were added to the schedule. Now 22 languages are placed in the eighth schedule. They are Assami, Bangla, Boda, Dogri, Gujarathi, Hindi, Kashmiri, Kannada, Konkani, Maithili, Malayalam, Manipuri, Marathi, Nepali, Oriya, Punjabi, Tamil, Telugu, Santali, Sindi, Sanskrit and Urdu.

## V. REGIONAL LANGUAGE POLICY: CHRONOLOGICAL CHANGES IN TAMIL NADU GOVERNMENT POLICY

In 1956, Indian states were established on the basis of majority regional languages and states were allowed to make their own official language for state affairs. According to the 345 section of the Indian constitution, in 1957, Tamil was made as the official language of the Tamil Nadu state by the official language act of the state number 39/1956 on 19<sup>th</sup> January 1957. (When Bhavatchalam was chief minister and C.Suramaniyan was the minister for education)

In 1960, President of India formed a committee for the promotion of Hindi to the status of official language of the nation. In 1965, Hindi was made as the official language of the nation and English was given the status of Associate official language. In1963, Three language formula was introduced in the nation, According to this formula a student who has completed the high school education, must have command of two languages besides English. That is first in his state language, second in Hindi, third in English. This three language formula was sincerely adopted by the Tamil Nadu government during 1963-65 and Hindi was introduced as a school subject. Insertion of Hindi in Tamil Nadu, created different attitudes in the minds of Tamilian and C.N. Annadurai lead the Hindi agitation movement. His language power and presence of mind attracted student community and many students involved in Hindi agitation movement under the leadership of Anna. Periyar, E.V.Ramaswamy also supported Arignar Anna in opposing Hindi and supporting English.

The Tamil script reform developed by Periyar, was adopted by the MGR government and enforced on 19<sup>th</sup> October 1978. Since 1978 many more activities were carried out for the development of Tamil "engum Tamil – etilum Tamil"

Former Chief Minister J. Jayalalithaa decided that no student studying in Tamil Nadu should leave the school system without learning Tamil. Hence she took the 'landmark' decision to introduce the subject "Ariviyal Tamil" (Scientific Tamil) from LKG to 12th standard in all categories of schools. At the same time, as also stated earlier the Tamil Nadu government is extremely trade-savvy and realises that knowledge of Tamil, while instilling a sense of pride in one's culture, is useless in the global scenario unless one is fluent in today's lingua franca, English. English-speaking Tamils also have great opportunities in the IT industry. Thus while publicizing the decision on Tamil to gain political mileage, Jayalalithaa also quietly declared that English would be taught as a subject in all State Board schools from class I onwards. The government has also since 2003-04 been introducing English Language Laboratories in selected government High and Higher Secondary schools to combat the large number of students failing in the English subject. Unlike in the national boards, a second language is compulsory in all state board schools right until class 12.

In 1986, Indian Prime minister Rajiv Gandhi introduced the "National Education Policy". This education policy provided for setting up Navodaya Schools, where the DMK claimed teaching of Hindi would be compulsory. The ADMK led by MGR (which had split from the DMK in 1972), was in power in Tamil Nadu and the DMK was the main opposition party. Karunanidhi announced an agitation against the opening of Navodaya Schools in Tamil Nadu. On 13 November, the Tamil Nadu Legislative Assembly unanimously passed a resolution demanding to abolish of Part 17<sup>th</sup> of the constitution and for making English the sole official language of the union.

On 17 November 1986, DMK members protested against the new education policy by burning Part XVII of the Constitution. Rajiv Gandhi assured Members of Parliament from Tamil Nadu that Hindi would not be imposed. As part of the compromise, Navodhaya schools were not started in Tamil Nadu. Currently, Tamil Nadu is the only state in India without Navodhaya schools.

The Karunanidhi government's Samacheer Kalvi (Equitable System of Education) policy is in force from the academic year 2010-2011. It is certain that due to the policy, based on two-language system (Tamil and English), the state will not allow, after 2015, Hindi, Urdu, Arabic, Persian, Telugu, Malayalam and Kannada in public examinations.

The object of the government is to do away with all the languages except Tamil and English from 2016. The text books will contain syllabi extolling the Tamil scholars and Periyar's teachings.

Tamil Nadu government gives a great deal of importance to Tamil language. Those who study Tamil as main language obtain government scholarships and get great job opportunities. Tamil leaders such as Periyar, Annadurai and Karunanidhi all strong advocates of atheism, no doubt brought a renaissance in Tamil language. Their prolific writings were quite popular. Theatres and films helped them to bring alarming progress and great craze for the Tamil language. Within the span of fifty years there was a sea-change in the language both in spoken and written. All signboards bear Tamil language and all government buses carry the Tamil poet Valluar's couplets.

## VI. OBSERVATIONS AND CONCLUSION

- i. Two language formulas seem to be purely political, because medium of instruction in Tamil was accepted in three language formula also.
- For politicians, language is not for communication but for power. Hindi played a major role in the Tamil Nadu politics, and the political power was generated upon Hindi, so Hindi is a powerful

language so far the Tamil Nadu politics is concerned.

- iii. Language agitations were held for the betterment of Tamil on three different phases. First it was against Hindi in 1960s and 70s, second it was against Sinhalese in 1980s and third it is running now against English.
- iv. Two language formula now getting turned towards one language formula. If it is turned so, our younger generation may find difficulties in getting job markets in the globalized world, because globalization is nothing but Englishization.
- v. The hatred that the people developed upon each other's language does not allow any Indian language to be the lingua franca of India instead of English.

With over 1,600 mother tongues from five different language families, the attempt to determine a single language as the "authentic" voice of India is ongoing but it is unlikely to be resolved. Given India's increasingly prominent role on the world's stage, the tension between supporting myriad cultures and economic forces put increasing pressure on the pragmatism of India's language policies. India's language policies demonstrate this duality. They waver between preserving the country's rich language diversity and supporting economic objectives that increasingly depend on English, the widespread use of which is one of India's greatest economic advantages.

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#### AUTHORS

**First Author** – Niruba Sarath Jayasundara, Seinior Lecturer in Linguistics, Department of Languages and Communication Studies, Trincomalee Campus, Eastern University Sri Lanka. PhD Research Scholar, Centre of Advanced Study in Linguistics, Annamalai University, Tamil Nadu, India, niruba2371@gmail.com

# Comparative Analysis of the Proximate and Nutritional Compositions of Nigerian Bitter and Sweet Honey from *Apis mellifera*.

Adeniyi, K. A<sup>1</sup>, Daudu, O. A. Y<sup>1</sup>., Abubakar, A<sup>1</sup>., Ismail, A. D<sup>2</sup>., Busari, M. B<sup>3</sup>., Abdulsalami, H.<sup>1</sup>, and Oyibo-Usman, K. A<sup>1</sup>.

<sup>1</sup>Department of Biological Sciences, Federal University of Technology, P. M. B. 65, Minna, Nigeria.

<sup>2</sup> Centre for Genetic Engineering and Biotechnology, Global Institute for Bio-exploration Unit, Federal University of Technology, P. M. B. 65, Minna, Nigeria.

<sup>3</sup>Department of Agricultural and Bioresource Engineering, Faculty of Engineering and Engineering Technology, Abubakar Tafawa Balewa

University, P.M.B 0248, Bauchi State.

Corresponding Author: aosbmbas@gmail.com, +2348050501497

Abstract- Honey, a natural product of the genus Apis, usually contains a variety of nutritional and mineral substances which varies depending on the plant species on which the bee forage. It had been noted that over the years, there have been a greater increase in the demand of bitter honey over the sweet honey; this has led to increase in price of this honey type and more gain for the apiculturists. This study was then undertaken to compared the nutritional and mineral compositions of Nigeria bitter and sweet honey. The honey samples used were collected from ADEKAM apicultural farm in Ala community, Akure, Ondo State and analysed following Standards Association of Official Analytical Chemists protocol for nutritional composition and mineral compositions using standard calibrated machines. Analysis of the results obtained showed that the two honey samples were significantly different (p < 0.05), both in nutritional and mineral compositions. The bitter honey samples were richer in protein  $(0.74\pm0.04)$  and carbohydrate  $(77.86\pm0.84)$  composition required by human body for growth. However, significant (p < 0.05) slight higher values of all the minerals composition (Na, K, Ca, Fe, P and Mg) was recorded in sweet honey samples, with Potassium (K) being the most abundant of all as earlier reported by previous authors. It can be concluded that although both types of honey are rich in nutritional and mineral elements. However, they are slightly different from each other, not only in taste, but also in some of the parameters studied. Therefore, further study is recommended to be undertaken to ascertain the types and quantities of amino acids and as well as the simple sugars in them.

Keywords: Honey, Nectar, Proximate composition, Minerals, Nutritional

#### I. INTRODUCTION

Honey is a sweet natural food made by bees using water, pollen and <u>nectar</u> from flowers (Cantarelli *et al.*, 2008). The variety produced by <u>honey bees</u> (the <u>Genus Apis</u>) is the one most commonly referred to, as it is the type of honey collected by most <u>beekeepers</u> and consumed by people (Famuyide *et al.*, 2014). Folayan and Bifarin (2013), reported that honey is produced by honey bee workers mainly from nectar of flower or honey dew on leaves. Nectar is reduced to honey containing predominantly carbohydrates with a very little protein, vitamins, minerals, enzymes, amino acids and as well as other several compounds like phenolic compound thought to function as antioxidants (Surendra, 2008, Oyeleke *et al.*, 2010, James *et al.*, 2013).

These chemical components are of great importance as they influence the keeping quality, granulation, texture, as well as the nutritional and medicinal efficacy of honey (Surendra, 2008). The major constituents of honey are nearly the same in all honey samples, however, the biochemical composition and physical properties of natural honeys varies greatly according to the plant species on which the bees forage (Cantarelli *et al.*, 2008; Ebenezer & Olubenga, 2010; James *et al.*, 2013). Furthermore, the properties of natural honeys also vary depending on the differences in climatic conditions and vegetation of the areas. Buba *et al.* (2013), reported that natural honey is one of the most widely sought products due to its unique nutritional and medicinal properties, which are attributed to the influence of the different groups of substances it contains.

The production of quality honey to assure food safety and hygiene depend on the variation in the active components of the honey which is base on the plant species differences. However, despite the nutritional and health value of bee honey and its produce it has been reported that comparative relationship between the nutritional components and biochemical composition of honeys is very limited. For these reasons, this research was carried out to compare the biochemical active ingredient and nutritional composition of Nigerian bitter and sweet honey

#### II. MATERIALS AND METHODS

#### Sample collection

The honey samples (Bitter and Sweet) harvested during the late dry season 2013, were collected from ADEKAM apiculturist farm, Ala community, Akure, Ondo State, Nigeria. The honey was kept in air tight container to avoid moisture absorption. It was later transported to the laboratory of Department of Biological Sciences, Federal University of Technology, Minna, for analysis.

#### **Determination of Nutritional Compositions**

Proximate analysis carried out on the honey samples to determined their composition were; protein, fat, dietary fiber, carbohydrate, water and ash. All the samples were analysed in triplicate using standard analytical methods described by Association of Official Analytical Chemists (AOAC).

Moisture content (M.C) was determined by drying 2.0g of each of honey samples at  $70^{\circ}$ C to constant weight in hot air oven (AOAC, 1990).

$$\% M.C = \frac{fresh weight - dry weight}{fresh weight} \times 100$$

Ash content was determined by drying 5.0g of each sample in porcelain crucible at  $105^{\circ}$ C for 3 hours in hot air oven to prevent loss by boiling. The dried samples were ignited in an ash in furnace at  $600^{\circ}$ C to constant weight, cooled and weighed in milligram.

The determination of protein content was carried out using the Kjeldahl method. The total nitrogen content was first estimated from which the protein content was calculated using the 6.25 conversion factor for protein nitrogen using the AOAC Method, 2005. The fat content was determined by using acid hydrolysis method based on the AOAC Method.

The dietary fibers consisted of the total, soluble and insoluble fibers of honey samples were determined based on AOAC Method.

Carbohydrate value of the honey samples were estimated using the difference method of Charrondiere *et al.* (2004). %Carbohydrate = 100% - (%Moisture + %Crude Fat + %Crude Protein + %Ash).

The energy values of the samples were determined by calculation as follows:

Energy (KJ/100g) = 4.186 [(%Crude Protein x 4) + (%Crude Fat x 9) + (%Carbohydrate x 4)]

## **Determination of Mineral Compositions**

The mineral compositions presented in the honey samples evaluated include: Sodium and Potassium determined using flame photometer (Model: Corning 410), Magnesium, Calcium and Iron were determined using atomic absorption spectrophotometer (Model: Buck VGP 210) and Phosphorus was determined calorimetrically (Gallenkamp UK Model).

## III. STATISTICAL ANALYSIS

Data collected from this study were represented in mean $\pm$ standard error of mean. The data were thereafter subjected to paired sample T-test using statistical package for social science 20<sup>th</sup> version.

# IV. RESULTS AND DISCUSSION

The results of the nutritional composition showed that with the exception of carbohydrate, there were significant differences (P<0.05) between all the compositions; moisture, ash, fat contents and crude fiber of the two honey samples. Higher values for fat, protein, crude fiber and carbohydrate content were

recorded in bitter honey while the sweet honey had significantly higher content for moisture and ash table 1.

## Mineral compositions

The mineral composition present in the honey samples Sodium, Potassium, Phosphorus, Calcium, Iron and Manganese. Statistical analysis showed that there were no significant differences (P>0.05) between Na, K, Ca, Fe and Mn determined for two honey samples. In addition, significant values (P<0.05) were recorded for phosphorus  $(3.00\pm0.02)$  and energy  $(333.64\pm0.35)$  contents. With the exception of Iron  $(0.01\pm0.00)$ and Manganese  $(0.01\pm0.00)$  the sweet honey had higher mineral constituent of all the element analysed. The variations in the mineral compositions might be due partly, to the different plant species and habitats from which the nectar are sought by the insects (Agunbiade *et al.*, 2013)

## **Nutritional Compositions**

Moisture content has been reported by Malika et al. (2005) to be the most important parameter that determines quality of honey, since it affects storage life and processing characteristic. The moisture content of both the sweet and bitter honey recorded in this study fall within the range as earlier reported by Nigerian authors. They reported that the moisture contents of honey ranged from 12.5 to 25.22%, (Badawy et al., 2004; Oyeleke et al., 2010, Buba et al., 2013). The low moisture content recorded in the bitter honey sample forms an important part of its qualities which protects honey from being degraded by microorganisms. The results of the ash content recorded in this study was similar to the result of Avansola and Banjo (2011) who recorded range value of (0.140±0.158) to (0.708±0.754) from honey obtained in southwestern Nigeria. for ash content of sweet honey. However, this was contrary to the report of some Nigerian honey samples and other locations which showed that ash content of honey samples varied between 0.05 and 0.79% (Odeyemi et al. 2013), Agbagwa et al. (2010); Adeleke et al. (2006); Malika et al. (2005)].

This present work is also in conformity with the results of buba *et al.* (2013) on honey samples collected from north-east which ranged from 0.10 - 0.50 with mean values of  $0.29 \pm 0.11$ , the fat content recorded in this study were within the range of 0.23 and 0.33.

The results of protein contents obtained in this research work were in agreements with the work of Buba *et al.* (2013) who reported that the protein content of honey in north-east of Nigeria ranged between 0.35 and 1.08. The results were also in conformity with an average amount of 0.70mg per 100g reported by National Honey Board. Contrary to the results obtained in this study Agunbiade *et al.* (2012), reported that the protein contents obtained from three state in Nigeria ranged from 1.43 -2.72%. This is an indication that honey is not an adequate sources of dietary protein.

The result of the carbohydrate contents (76.44 - 77.86) obtained were similar to work reported by earlier scientist (Oyeleke *et al.*, 2010; Buba *et al.*, 2013) as well as National Honey Board (77.60 - 87.70). However, significant (P<0.05) higher carbohydrate content recorded in bitter honey could be

attributed to forage plant difference of bees. This is in conformity with the report of (Doner, 1977) that Carbohydrates are the main constituents of honey comprising about 95% of honey dry weight.

The result obtained for Iron in both the sweet and bitter honeys (1.25 and 1.53 respectively) are in agreement with the work of Ankrah (1998) but in disagreement with that of Cantarelli et al. (2008). Similar to the results obtained in the study Agunbiade et al. (2012) reported that there is a wide variation in the mineral composition of honey obtained from three states in Nigeria. They reported that the wide disparity may be due to variation in the vegetations and soil composition of minerals at the different locations from which the honeys were produced. The results of Potassium (14.74±0.16 - 16.50±0.01) reported in this study were in conformity with the results of Adenekan et al. (2012) and Ajao et al. (2013) who recorded  $(0.97\pm0.01 - 1.38\pm0.01)$  and  $(0.93\pm0.05 - 1.40\pm0.01)$ . The Conformity of this present result in terms of some mineral compositions by earlier scientists might be due to similar source of nectar and ecological zone. The results of the Phosphorus and

Magnesium obtained with range values (2.62 - 3.45) and (0.10 - 0.22) respectively, were in agreement with the works of Agunbiade *et al.* (2012).

#### V. CONCLUSION

It is concluded from this study that both sweet and bitter honey were slightly different in proximate and minerals composition. The differences observed in some of these parameters are attributed to their different flora sources.

#### ACKNOWLEDGMENTS

We wish to express our gratitude to the Department of Biological Sciences, Federal University of Technology Minna, Nigeria for providing the facilities.

Table	1:	Nutrition	al Com	position	of Niger	ia Bittei	· and	Sweet	Honey	Bee
					· · •					

SAMPLE	Moisture Content %	Ash Content %	Fat Content %	Protein Content %	Crude fiber Content %	Carbohydrate %
Bitter Honey	19.93±0.10 <sup>a</sup>	$1.18{\pm}0.15^{a}$	$0.33 \pm 0.03^{b}$	$0.74{\pm}0.04^{b}$	$2.03 \pm 0.08^{b}$	77.86 $\pm$ 0.84 <sup>a</sup>
Sweet Honey	20.14±0.04 <sup>b</sup>	$1.73{\pm}0.74^{b}$	$0.23 \pm 0.02^{a}$	$0.69{\pm}0.03^{a}$	$1.25 \pm 0.08^{a}$	76.44 $\pm$ 0.64 <sup>a</sup>

Values with different superscripts along a column are significantly different (P<0.05) Values are mean  $\pm$  SE of triplicate determinations.

#### Table 2: Mineral Composition of Nigeria Bitter and Sweet Honey Bee in mg/kg

SAMPLE	Na	K	Ca	Fe	Mg	Р	Energy
Bitter Honey	$2.80{\pm}0.00^{a}$	$7.50{\pm}0.00^{a}$	$3.90{\pm}0.21^{a}$	$1.53 {\pm} 0.00^{b}$	$0.22 \pm 0.00^{b}$	$2.62 \pm 0.07^{a}$	$329.12{\pm}1.82^{a}$
Sweet Honey	$3.10{\pm}0.00^{a}$	$9.50{\pm}0.01^{b}$	$4.30{\pm}0.15^{a}$	$1.25 \pm 0.00^{a}$	$0.10{\pm}0.00^{a}$	$3.45{\pm}0.02^{b}$	$333.64 \pm 0.35^{b}$

Values with different superscripts along a column are significantly different (P<0.05)

Values are mean  $\pm$  SE of triplicate determinations.

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#### AUTHORS

**First Author:** Adeniyi, K. A, Department of Biological Sciences Federal University of Technology Minna, PMB 65, Niger State Nigeria, abukauthar2011@yahoo.com

Second Author: Daudu, O. A. Y., Department of Biological Sciences Federal University of Technology Minna, PMB 65, Niger State Nigeria., dauduoladipupoyusuf@yahoo.com
Third Author: Abubakar, A., Department of Biological Sciences Federal University of Technology Minna, PMB 65, Niger State Nigeria. abuakim2007@yahoo.com
Fourth Author: Ismail, A. D., Department of Agric And Bioresources Engineering, Tafawa Balewa Univerity Bauchi Stata Nigeria., wahabibnismail2008@gmail.com
Fifth Author: Busari, M. B<sup>3</sup>, Centre for Genetic Engineering and Biotechnology, Global Institute for Bio-exploration Unit, Federal University of Technology, P. M. B. 65, Minna, Nigeria.

**Sixth Author:** Abdulsalami, H., Department of Biological Sciences Federal University of Technology Minna, PMB 65, Niger State Nigeria. hallyrxn@yahoo.com

**Seventh Author:** Oyibo-Usman, K. A. Department of Biological Sciences Federal University of Technology Minna, PMB 65, Niger State Nigeria.

# Integrated Effect of Organic manures and Nitrogen on Yield Contributing Characters and Yield of Rice (BRRI dhan29)

M. S. Islam \*, A. K. Paul\*, A. S. M. Fazle Bari\*, Syfullah Shahriar\*, Mst. Sharmin Sultana\*, M. T. Hosain \*\*.

<sup>\*\*</sup>Department of Soil Science, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh. <sup>\*\*</sup>Department of Agricultural Botany, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh.

*Abstract*- An experiment was conducted to asses the integrated effect of organic manures and nitrogen on yield contributing characters and yield of rice (BRRI dhan29). The experiment consisted of 12 treatments, T<sub>1</sub>: Control condition (No chemical fertilizer, no organic manure); T<sub>2</sub>: 100% recommended N (120 kg N ha<sup>-1</sup>) + recommended P, K, S and Zn); T<sub>3</sub>: 100 kg N from urea + 20 kg N substituted by vermicompost (VC) + P, K, S and Zn; T<sub>4</sub>: 100 kg N from urea + 20 kg N substituted by cowdung (CD) + P, K, S and Zn; T<sub>5</sub>: 80 kg N from urea + 40 kg N substituted by VC + P, K, S and Zn; T<sub>5</sub>: 80 kg N from urea + 40 kg N substituted by VC + P, K, S and Zn; T<sub>5</sub>: 60 kg N from urea + 60 kg N substituted by VC + P, K, S and Zn; T<sub>5</sub>: 60 kg N from urea + 60 kg N substituted by CD + P, K, S and Zn; T<sub>9</sub>: 100 kg N from urea + 20 kg N substituted equally by VC and CD + P, K, S and Zn; T<sub>10</sub>: 80 kg N from urea + 40 kg N substituted equally by VC and CD + P, K, S and Zn; T<sub>12</sub>: 120 kg N substituted equally by VC and CD. Highest plant (88.87 cm) was recorded from T<sub>10</sub> and lowest plant (61.95 cm) was observed from T<sub>1</sub> as control condition. The highest grain (6.73 t ha<sup>-1</sup>) and straw (7.10 t ha<sup>-1</sup>) yield were recorded from T<sub>10</sub>, while the lowest grain (2.16 t ha<sup>-1</sup>) and straw (4.33 t ha<sup>-1</sup>) yield from T<sub>1</sub>. The highest N (43.99 kg ha<sup>-1</sup>) and K (7.72 kg ha<sup>-1</sup>) and K (19.66 kg ha<sup>-1</sup>) uptake by grain were recorded from T<sub>11</sub>, while the lowest N (16.38 kg ha<sup>-1</sup>), P (6.32 kg ha<sup>-1</sup>) and K (7.72 kg ha<sup>-1</sup>) from T<sub>1</sub>. The highest N (30.87 kg ha<sup>-1</sup>) and K (50.76 kg ha<sup>-1</sup>) from T<sub>1</sub>. Applications of 80 kg N from urea + 40 kg N substituted equally by VC and CD + P, K, S and Zn + P, K, S an

Index Terms- Cowdung, vermicompost, NPKS, Rice, Yield.

## I. INTRODUCTION

Rice (Oryza sativa L.) is the most important food for the people of Bangladesh and it is the staple food for more than two billion people in Asia (Hien et al., 2006). The national average rice yield in Bangladesh (4.2 t ha<sup>-1</sup>) is very low compared to those of other rice growing countries, like China (6.30 t ha<sup>-1</sup>), Japan (6.60 t ha<sup>-1</sup>) and Korea (6.30 t ha<sup>-1</sup>) (FAO, 2009). The efficient N management can increase crop yield and reduce production cost. An increase in the yield of rice by 70 to 80% may be obtained from proper application of N-fertilizer (IFC, 1982. The optimum dose of N fertilizer plays vital role for the growth and development of rice plant and its growth is seriously hampered when lower dose of N is applied, which drastically reduced yield; further, excessive N fertilization encourages excessive vegetative growth which make the plant susceptible to insect pests and diseases which ultimately reduces yield. Depleted soil fertility is a major constrain to higher crop production in Bangladesh. The increasing land use intensity has resulted in a great exhaustion of nutrient in soils. The farmers of this country use on an average 102 kg nutrients ha<sup>-1</sup> annually (70 kg N + 24 kg P + 6 kg K + 2 kg S and Zn) while the crop removal is about 200 kg ha<sup>-1</sup> (Islam *et al.*, 1994). In Bangladesh, most of the cultivated soils have less than 1.5% organic matter while a good agricultural soil should contain at least 2% organic matter (Ali, 1994). Moreover, this important component of soil is declining with time due to intensive cropping and use of higher dose of chemical fertilizers with little or no addition of organic manure in the farmer's field. The long-term research of BARI revealed that the application of cowdung @ 5 t ha<sup>-1</sup> year<sup>-1</sup> improved rice productivity as well as prevented the soil resources from degradation (Bhuiyan, 1994). Soil organic matter improves the physicochemical properties of the soil and ultimately promotes crop production. More recently, attention is focused on the global environmental problems; utilization of organic wastes, vermicompost and poultry manures as the most effective measure for the purpose. Organic fertilizer enhances soil porosity by increasing regular and irregular pores and causes a priming effect of native soil organic matter. Application of both chemical and organic fertilizers needs to be applied for the improvement of soil physical properties and supply of essential plant nutrients for higher yield. The main target of the study was to select a suitable combination of organic manures and nitrogenous fertilizer as a source of nitrogen for successful growth and vield and evaluate the integrated effect of organic manure with the combination of chemical fertilizer on the growth and yield of BRRI dhan29 and uptake pattern of NPKS by BRRI dhan29 rice from organic and inorganic combine treated plot.

The research work was conducted at the farm of Sher-e-Bangla Agricultural University, Dhaka from January to April 2010. The soil of the experimental field belongs to the Tejgaon series of AEZ No. 28, Madhupur Tract, classified as Deep Red Brown Terrace Soils in Bangladesh soil classification system. The soil texture was silt loam having pH 5.8 and contains organic matter 1.19%, total N 0.06%, available P 19.85 ppm, available K 0.12 ppm and available S 14.40 ppm. BRRI dhan 29 was used as the test crop in this experiment. The experiment consisted of 12 treatments. The treatments were as follows:T<sub>1</sub>: Control condition (No chemical fertilizer, no organic manure), T<sub>2</sub>: 100% recommended N (120 kg N ha<sup>-1</sup>) + recommended P, K, S and Zn), T<sub>3</sub>: 100 kg N from urea + 20 kg N substituted by vermicompost (VC) + P, K, S and Zn, T<sub>4</sub>: 100 kg N from urea + 20 kg N substituted by cowdung (CD) + P, K, S and Zn, T<sub>5</sub>: 80 kg N from urea + 40 kg N substituted by VC + P, K, S and Zn, T<sub>6</sub>: 80 kg N from urea + 40 kg N substituted by CD + P, K, S and Zn, T<sub>7</sub>: 60 kg N from urea + 60 kg N substituted by VC + P, K, S and Zn, T<sub>8</sub>: 60 kg N from urea + 60 kg N substituted by CD + P, K, S and Zn, T<sub>1</sub>: 60 kg N from urea + 20 kg N substituted equally by VC and CD + P, K, S and Zn, T<sub>10</sub>: 80 kg N from urea + 40 kg N substituted by CD + P, K, S and Zn, T<sub>1</sub>: 60 kg N from urea + 60 kg N substituted by CD + P, K, S and Zn, T<sub>12</sub>: 100 kg N from urea + 20 kg N substituted equally by VC and CD + P, K, S and Zn, T<sub>12</sub>: 120 kg N substituted equally by VC and CD.

The experiment was laid out in randomized complete block design (RCBD) with three replications. Thus the total numbers of plots were 36. The unit plot size was 5 m  $\times$  2.5 m and was separated from each other by 0.5 m ails. The distance maintained between two blocks and two plots were 1.0 m and 0.5 m respectively. The experimental plot was opened by a tractor, and then the land was ploughed and cross-ploughed several times with the help of a power tiller followed by laddering to obtain a good tilth and puddled condition Weeds and stubbles were removed, and the large clods were broken into smaller pieces to obtain a desirable tilth. Finally, the land was leveled and the experimental plot was partitioned into the unit plots. Full amounts of TSP, MP, gypsum, zinc, cowdung and vermicompost were applied as basal dose before transplanting of rice seedlings. Urea were applied in 3 equal splits: one third was applied at basal before transplanting, one third at active tillering stage (30 DAT) and the remaining one third was applied at 5 days before panicle initiation stage (55 DAT). Thirty days old seedlings of BRRI dhan 29 were transplanted on 30 January, 2010 at two seedlings per hill in a spacing of  $20 \text{ cm} \times 20 \text{ cm}$ . Intercultural operations were done whenever required. The crop was harvested at full maturity when 80-90% of the grains were turned into straw color on 24 April, 2010. Ten hills of rice plant were selected randomly from the plants for measuring yield contributing characters. After drying, the grain and straw yields were determined. Biological yield and harvest index were also determined. The plants, soil and manure samples were collected, processed and analyzed for N, P, K and S. The N concentration of cowdung and vermicompost were 1.48 and 1.9% respectively. The available (soil) and total P (plant) were determined by ascorbic acid blue color method (Olsen et al, 1954). Exchangeable (soil) and total K (plant) were determined by using flame photometer. The available (soil) and total S (plant) were analysed by turbidimetric method as described by Hunter (1984). N was determined by Micro-Kjeldahl method. The statistical analysis was done using the Duncan's Multiple Range Test (DMRT) at 5% level of probability (Gomez and Gomez, 1984).

## III. RESULTS AND DISCUSSION

# III.1. Integrated effect of organic manures and nitrogen on yield contributing characters of BRRI dhan29

Different treatments of organic manure and N showed significant variations in respect of all yield contributing characters of rice (Table 1). Among the different treatments,  $T_{10}$  (80 kg N from urea + 40 kg N substituted equally by VC and CD + P, K, S and Zn) showed highest number of effective tillers/hill (13.43), plant height (88.87 cm), panicle length (24.50 cm), number of filled grain/panicle (91.40), highest 1000 grain weight (21.8 g) and lowest values were found from control treatment. Nayak *et al.* (2007) reported a significant increase in effective tillers/hill due to application of chemical fertilizer with organic manure. Yang *et al.* (2004) recorded that 1000-grain weight was increased by the application of chemical fertilizer along with organic manure.

# III.2. Integrated effect of organic manures and nitrogen on yield of BRRI dhan29

Yield of rice was significantly influenced by integrated use of organic manures and nitrogen (Table 2). The highest grain yield (6. 73 t/ha), straw yield (7.10 t/ha), biological yield (13.83 t/ha) and harvest index (48.67 %) were obtained from  $T_{10}$  (80 kg N from urea + 40 kg N substituted equally by VC and CD + P, K, S and Zn) and the lowest values were found with  $T_1$  treatment where no fertilizer was applied. Rahman *et al.* (2009) reported that the application of organic manure and chemical fertilizers increased the grain and straw yields of rice. It is clear that organic manure in combination with inorganic fertilizers increased the vegetative growth of plants and thereby increased straw yield of rice.

Treatments	No. of effective	Plant height	Panicle length	No. of filled	1000 grain weight (g)
	tillers/hill	(cm )	(cm)	grain/panicle	
$T_1$	5.90 f	61.95 f	15.28 e	52.63 g	15.5 bc
T <sub>2</sub>	11.03 cd	82.17 cd	22.20 bcd	82.70 cde	20.33 ab
T <sub>3</sub>	11.77 bcd	84.23 bc	23.05 abcd	84.80 bcd	21.02 a
$T_4$	10.37 de	81.70 cd	22.87 abcd	81.40 de	20.53 a
T <sub>5</sub>	11.53 bcd	83.97 bc	22.67 abcd	84.77 bcd	20.53 a
T <sub>6</sub>	11.67 bcd	85.94 ab	22.75 abcd	87.90 abc	21.07 a
T <sub>7</sub>	12.47 abc	85.33 abc	22.52 abcd	88.33 abc	21.3 a
T <sub>8</sub>	9.27 e	79.50 d	21.14 cd	78.93 ef	20.17 ab
T <sub>9</sub>	12.37 abc	86.80 ab	23.16 abc	88.57 abc	21.5 a
T <sub>10</sub>	13.43 a	88.87 a	24.50 a	91.40 a	21.8 a
T <sub>11</sub>	12.90 ab	86.01 ab	23.66 ab	90.17 ab	21.5 a
T <sub>12</sub>	9.23 e	75.81 e	21.06 d	73.70 f	19.83 ab
LSD(0.05)	1.504	3.340	1.806	5.248	1.45
CV(%)	8.08	8.41	4.83	7.77	6.33

Table 1. Integrated effect of organi	e manures and nitrogen on yield	contributing characters of BRRI dhan29
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In a column figures having same letter do not differ significantly whereas figures with different letter differ significantly by DMRT at 5% level.

T<sub>1</sub>: Control condition, T<sub>2</sub>: 100% recommended N (120 kg N ha<sup>-1</sup>) + recommended P, K, S and Zn),T<sub>3</sub>: 100 kg N from urea + 20 kg N substituted by vermicompost (VC) + P, K, S and Zn,T<sub>4</sub>: 100 kg N from urea + 20 kg N substituted by cowdung (CD) + P, K, S and Zn, T<sub>5</sub>: 80 kg N from urea + 40 kg N substituted by VC + P, K, S and Zn, T<sub>6</sub>: 80 kg N from urea + 40 kg N substituted by CD + P, K, S and Zn, T<sub>7</sub>: 60 kg N from urea + 60 kg N substituted by VC + P, K, S and Zn, T<sub>8</sub>: 60 kg N from urea + 60 kg N substituted by CD + P, K, S and Zn, T<sub>9</sub>: 100 kg N from urea + 20 kg N substituted equally by VC and CD + P, K, S and Zn, T<sub>10</sub>: 80 kg N from urea + 40 kg N substituted equally by VC and CD + P, K, S and Zn, T<sub>10</sub>: 80 kg N from urea + 40 kg N substituted equally by VC and CD + P, K, S and Zn, T<sub>11</sub>: 60 kg N from urea + 60 kg N substituted equally by VC and CD + P, K, S and Zn and T<sub>12</sub>: 120 kg N substituted equally by VC and CD.

# Table 2. Integrated effect of organic manures and nitrogen on yield of BRRI dhan29

Treatment	Grain yield (t ha <sup>-1</sup> )	Straw yield (t ha <sup>-1</sup> )	Biological yield (t ha <sup>-1</sup> )	Harvest index (%)
T <sub>1</sub>	2.16 g	4.33 e	6.49 e	33.26 d
T <sub>2</sub>	5.00 def	6.04 bcd	11.04 bcd	45.29 bc
T <sub>3</sub>	5.67 bcd	6.46 abc	12.13 ab	46.54 ab
$T_4$	4.26 ef	5.56 cd	9.81 cd	43.29 c
T <sub>5</sub>	5.10 cde	6.11 abcd	11.21 bc	45.45 bc
T <sub>6</sub>	5.79 abcd	6.93 ab	12.72 ab	45.72 abc
T <sub>7</sub>	6.03 abcd	6.69 ab	12.72 ab	47.33 ab
T <sub>8</sub>	4.45 ef	5.16 de	9.61 cd	46.22 abc
T <sub>9</sub>	6.06 abc	6.78 ab	12.84 ab	47.17 ab
T <sub>10</sub>	6.73 a	7.10 a	13.83 a	48.67 a
T <sub>11</sub>	6.46 ab	7.05 a	13.52 a	47.78 ab
T <sub>12</sub>	4.03 f	5.24 de	9.28 d	43.51 c
LSD(0.05)	0.934	0.882	1.714	2.670
CV(%)	10.72	8.50	8.99	5.50

In a column means having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly as per 5% level of probability

## III.3. Integrated effect of organic manures and nitrogen on NPKS concentration in grain and straw of Boro rice

The nitrogen, phosphorus, potassium and sulphur content in grain and straw were significantly influenced with the different levels of fertilizer and manure application (Table 3). The higher levels of N, P, K and S concentrations in grain and straw were recorded in control treatment and similar results were also obtained from  $T_{12}$  (120 kg N substituted equally by VC and CD).

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Treatment		Concentrati	on (%) in grai	n	Concentration (%) in straw				
	Ν	Р	K	S	Ν	Р	K	S	
T <sub>1</sub>	0.759 a	0.293 a	0.358 a	0.126 ab	0.506 a	0.087 a	1.175 a	0.098 a	
T <sub>2</sub>	0.682 bc	0.255 b	0.315 cde	0.109 bcd	0.442 c	0.073 abc	1.084 abc	0.083 ab	
T <sub>3</sub>	0.639 c	0.235 cd	0.296 f	0.098 d	0.404 d	0.064 cd	0.969 c	0.074 bc	
$T_4$	0.700 b	0.265 b	0.326 bc	0.111 abcd	0.470 b	0.078 abc	1.140 ab	0.087 ab	
T <sub>5</sub>	0.688 bc	0.262 b	0.315 cde	0.109 bcd	0.444 c	0.074 abc	1.137 ab	0.088 ab	
T <sub>6</sub>	0.668 bc	0.250 bc	0.322 cd	0.108 bcd	0.446 c	0.068bcd	1.070 abc	0.079 ab	
T <sub>7</sub>	0.637 c	0.237 cd	0.304 def	0.106 cd	0.409 d	0.067bcd	1.030 bc	0.076 bc	
T <sub>8</sub>	0.700 b	0.285 a	0.331 bc	0.118 abc	0.489 a	0.078 abc	1.154 ab	0.089 ab	
T <sub>9</sub>	0.657 bc	0.215 ef	0.301 ef	0.104 cd	0.401 d	0.064 cd	0.991 c	0.073 bc	
T <sub>10</sub>	0.566 d	0.201 f	0.265 g	0.075 e	0.332 e	0.051 d	0.778 d	0.058 c	
T <sub>11</sub>	0.681 bc	0.227 de	0.304 def	0.108 bcd	0.413 d	0.065 bcd	1.043 abc	0.076 bc	
T <sub>12</sub>	0.717 ab	0.284 a	0.344 ab	0.129 a	0.501 a	0.084 ab	1.149 ab	0.091 ab	
LSD(0.05)	0.054	0.017	0.017	0.017	0.017	0.017	0.120	0.017	
CV(%)	7.08	6.29	8.47	6.93	5.93	8.24	6.52	5.58	

Table 3. Integrated effect of organic manures and nitrogen on NPKS concentration in grain and straw of Boro rice

In a column figures having same letter do not differ significantly whereas figures with different letter differ significantly by DMRT at 5% level.

# III.4. Integrated effect of organic manures and nitrogen on NPKS uptake by grain and straw of Boro rice

Statistically significant variation was recorded for NPKS uptake by rice grain and straw due to the integrated effect of organic manure and nitrogen (Table 4). Highest N (43.99 kg/ha), P (14.63 kg/ha), K(19.66 kg/ha) and S (6.96 kg/ha) uptake by grain was recorded from  $T_{11}$  (60 kg N from urea + 60 kg N substituted equally by VC and CD + P, K, S and Zn) and Highest N (30.87 kg/ha), P (4.72 kg/ha), K(73.98 kg/ha) and S (5.48 kg/ha) uptake by straw was recorded from  $T_6$  (80 kg N from urea + 40 kg N substituted by CD + P, K, S and Zn). On the other hand, the lowest nutrient uptake by grain and straw was found from control treatment. Duhan *et al.* (2002) also reported similar result.

Treatment	Uptake by grain (kg ha <sup>-1</sup> )				Uptake by straw (kg ha <sup>-1</sup> )				
	Ν	Р	K	S	Ν	Р	K	S	
T <sub>1</sub>	16.38 e	6.32 c	7.72 g	2.72 e	21.85 d	3.77 bc	50.76 d	4.24 cd	
T <sub>2</sub>	34.10 bcd	12.76 ab	15.77 def	5.44 bcd	26.69 bc	4.39 abc	65.48 abc	5.04 ab	
T <sub>3</sub>	35.75 bc	13.11 ab	16.48 bcde	5.39 bcd	25.82 bc	4.07 abc	61.80 bc	4.69 abcd	
$T_4$	29.78 cd	11.25 b	13.86 f	4.73 d	26.10 bc	4.31 abc	63.38 abc	4.82 abcd	
T <sub>5</sub>	35.10 bcd	13.36 ab	16.02 cdef	5.58 bcd	27.19 abc	4.53 ab	69.54 ab	5.37 ab	
T <sub>6</sub>	38.70 ab	14.45 a	18.68 ab	6.30 abc	30.87 a	4.72 a	73.98 a	5.48 a	
T <sub>7</sub>	38.44 ab	14.38 a	18.35 abc	6.42 ab	27.38 abc	4.51 ab	68.92 ab	5.06 ab	
T <sub>8</sub>	31.14 cd	12.67 ab	14.70 ef	5.23 cd	25.22 bcd	4.00 abc	59.55 bcd	4.59 bcd	
T <sub>9</sub>	39.88 ab	13.00 ab	18.23 abcd	6.31 abc	27.19 abc	4.34 abc	67.24 ab	4.95 abc	
T <sub>10</sub>	38.13 ab	13.51 ab	17.87 abcd	5.05 d	23.72 cd	3.65 c	55.21 cd	4.12 d	
T <sub>11</sub>	43.99 a	14.63 a	19.66 a	6.96 a	29.07 ab	4.55 ab	73.51 a	5.38 ab	
T <sub>12</sub>	28.91 d	11.46 b	13.87 f	5.19 d	26.28 bc	4.40 abc	60.38 bcd	4.77 abcd	
LSD <sub>(0.05)</sub>	5.899	2.197	2.272	0.977	3.541	0.694	9.893	0.694	
CV(%)	10.19	10.32	8.42	10.59	7.90	9.60	9.11	8.41	

Table 4. Integrated effect of organic manures and nitrogen on NPKS uptake by grain and straw of Boro rice

In a column means having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly as per 5% level of probability.

# III.5. Integrated effect of organic manures and nitrogen on the pH, Organic matter, N, P, K and S of post harvest soil

Organic matter, pH and nutrient content in post harvest soil were statistically significant due to the combined application of organic manure and nitrogen (Table 5). Highest pH (6.47), total nitrogen (0.053) and available phosphorous (25.58 ppm) was found from  $T_{12}$  as 120 kg N substituted equally by VC and CD. The lowest total nitrogen (0.024) and available phosphorous (19.42 ppm) was found

from  $T_{10}$  as 80 kg N from urea + 40 kg N substituted equally by VC and CD + P, K, S and Zn. Highest exchangeable k (0.166 me %) and available sulphur (20.69) were recorded from  $T_1$  control condition which was statistically identical (19.86 ppm) with  $T_{12}$  as 120 kg N substituted equally by VC and CD, while the lowest available sulphur in post harvest soil (12.45 ppm) was observed from  $T_{10}$  as 80 kg N from urea + 40 kg N substituted equally by VC and CD + P, K, S and Zn. The highest organic matter in post harvest soil (1.533%) was recorded from  $T_9$  (100 kg N from urea + 20 kg N substituted equally by VC and CD + P, K, S and Zn and the lowest organic matter in post harvest soil (1.110%) was observed from  $T_7$  as 60 kg N from urea + 60 kg N substituted by VC + P, K, S and Zn. Similar results were also found by Mathew and Nair (1997); Azim (1999) and Hoque (1999).

Treatment	pН	Organic	Total N (%)	Available P (ppm)	Exchangeable K	Available S
		matter (%)			(me %)	(ppm)
T <sub>1</sub>	6.05	1.34	0.052 a	25.53 ab	0.166 a	20.69 a
T <sub>2</sub>	5.93	1.26	0.044 ab	23.57 abcd	0.146 bcd	17.79 bcd
T <sub>3</sub>	5.92	1.21	0.036 abc	22.03 cde	0.129 d	15.84 d
T <sub>4</sub>	6.13	1.29	0.050 ab	24.98 abc	0.156 ab	18.93 ab
T <sub>5</sub>	5.9	1.22	0.046 ab	24.05 abcd	0.154 ab	18.00 bcd
T <sub>6</sub>	5.95	1.21	0.040 abc	23.66 abcd	0.141 bcd	17.44 bcd
T <sub>7</sub>	5.67	1.11	0.038 abc	22.48 bcd	0.132 cd	16.30 cd
T <sub>8</sub>	5.83	1.28	0.048 ab	23.89 abcd	0.151 abc	18.89 abc
T <sub>9</sub>	5.8	1.53	0.032 bc	21.09 de	0.128 d	16.05 d
T <sub>10</sub>	5.85	1.16	0.024 c	19.42 e	0.103 e	12.45 e
T <sub>11</sub>	5.85	1.22	0.041 abc	23.26 abcd	0.135 cd	17.43 bcd
T <sub>12</sub>	6.47	1.29	0.053 a	25.58 a	0.158 ab	19.86 ab
LSD(0.05)	0.53	0.019	0.017	2.674	0.017	2.316
CV(%)	3.59	2.03	9.95	6.78	5.74	7.83

Table 5. Integrated effect of organic manures and nitrogen on the nutrient content of post harvest soil

In a column means having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly as per 5% level of probability.

#### IV. CONCLUSION

The integrated effect of organic manures and nitrogen significantly influenced the yield contributing characters and yield of rice (BRRI dhan29). Sole and integrated use of different types of organic manure (vermicompost and cowdung) and nitrogen fertilizer were used in the study. The highest plant height (88.87 cm), maximum number of effective tillers per hill (13.43), length of panicle (24.50 cm), maximum number of filled grain plant<sup>-1</sup> (91.40), weight of 1000 seeds (21.80 g), grain yield (6.73 t ha<sup>-1</sup>), straw yield (7.10 t ha<sup>-1</sup>) and highest biological yield (13.83 t ha<sup>-1</sup>) was recorded from T<sub>10</sub> (80 kg N from urea + 40 kg N substituted equally by VC and CD + P, K, S and Zn)and all the cases lowest values were observed from T<sub>1</sub> as control condition.

The highest N (43.99 kg ha<sup>-1</sup>), P (14.63 kg ha<sup>-1</sup>), K (19.66 kg ha<sup>-1</sup>) and S (6.96 kg ha<sup>-1</sup>) uptake by grain were recorded from  $T_{11}$  and the lowest values were recorded from  $T_1$ . The highest N (30.87 kg ha<sup>-1</sup>), P (4.72kg ha<sup>-1</sup>), K (73.98 kg ha<sup>-1</sup>) and S (5.48 kg ha<sup>-1</sup>) uptake by straw were recorded from  $T_6$  and the lowest values were recorded from  $T_1$ . The highest pH of post harvest soil (6.47) was found from  $T_{12}$  and the lowest (5.67) was recorded from  $T_7$ . The highest organic matter in post harvest soil (1.533%) was recorded from  $T_9$  and the lowest (1.110%) was observed from  $T_7$ . The highest total nitrogen in post harvest soil (0.054%) was recorded from  $T_1$  and the lowest (0.024%) was obtained from  $T_{10}$ . The highest exchangeable potassium in post harvest soil (0.166 me%) was recorded from  $T_1$  and the lowest (0.103 me%) was observed from  $T_{10}$ . The highest available sulphur in post harvest soil (20.69 ppm) was obtained from  $T_1$  while the lowest (12.45 ppm) was observed from  $T_{10}$ .

From the above discussion it can be concluded that applications of 80 kg N from urea + 40 kg N substituted equally by VC and CD + P, K, S and Zn was the superior among the other treatments in consideration of yield contributing characters and yield of BRRI dhan29.

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#### AUTHORS

First Author – Md. Sariful Islam, MS Student, Department of Soil Science, Sher-e- Bangla Agricultural University, Dhaka-1207, Bangladesh.

Second Author – Alok Kumar Paul, Professor, Department of Soil Science, Sher-e- Bangla Agricultural University, Dhaka-1207, Bangladesh.

**Third Author** – A. S. M. Fazle Bari, Assistant Professor, Department of Soil Science, Sher-e- Bangla Agricultural University, Dhaka-1207, Bangladesh.

Fourth Author – Syfullah Shahriar, Lecturer, Department of Soil Science, Sher-e- Bangla Agricultural University, Dhaka-1207, Bangladesh.

Fifth Author – Mst. Sharmin Sultana, Lecturer, Department of Soil Science, Sher-e- Bangla Agricultural University, Dhaka-1207, Bangladesh.

Sixth Author – Md. Tofail Hosain, Lecturer, Department of Agricultural Botany, Sher-e- Bangla Agricultural University, Dhaka-1207, Bangladesh.

**Correspondence Author** -- A. S. M. Fazle Bari, Assistant Professor, Department of Soil Science, Sher-e- Bangla Agricultural University, Dhaka-1207, Bangladesh. Email: <u>fbarisau@gmail.com</u>, Contact No. +8801726937283.

# Ackerman's Tumour of Mouth: Review with Case Reports

# Nagalaxmi V, Swetha Reddy A, Srikanth K, Faisal Zardi, Anshul Singh

Department of Oral medicine and Radiology, Sri Sai College of Dental Surgery, Vikarabad

Abstract- Verrucous carcinoma is the uncommon variant of squamous cell carcinoma characterized by exophytic overgrowth. It constitutes 1-10% of cases of squamous cell carcinoma. It is locally invasive with low metastatic potential. It usually occurs in  $6^{th} - 7^{th}$  decade of life. Larynx and oral cavity are the common sites of involvement in head and neck region, with buccal mucosa frequently involved in oral cavity. Tobacco is considered as chief etiological agent in this disease entity. Many treatment modalities are currently available, surgery being the most preferred treatment modality. In this article, we report case series of verrucous carcinoma seen in older female patients who gives history of chronic usage of tobacco along with review of literature.

# *Index Terms*- CARCINOMA, PAPILLARY, PROJECTIONS, TOBACCO, VERRUCOUS

#### I. INTRODUCTION

Verrucous carcinoma(VC)was first described by Ackerman in 1948 as a distinct clinicopathological entity.<sup>1</sup>It is defined as " A warty variant of squamous cell carcinoma characterized predominantly by exophtic growth of well differentiated keratinising epithelium having minimal atypia and with locally destructive pushing margins at its interface with underlying connective tissue".<sup>2</sup>It is also called as Ackerman's tumor, snuff dipper's tumor, buscke Lowenstein tumor, florid oral papillomatosis, epitheliomacuniculatum or carcinoma cuniculatum.<sup>3</sup> It is seen at several extraoral sites such as skin, from the breast, axilla, earcanal, soles of feet, vaginal and rectal mucosa.4

The mucosal membrane of head and neck are sites of predilection, with oral cavity and larynx being at risk.<sup>5</sup>Male predilection is seen and usually occurs in 6<sup>th</sup>- 7<sup>th</sup> decade of life. Tobacco is considered as one of the major risk factor for verrucous carcinoma of oral cavity.<sup>7</sup>

## II. CASE REPORT 1:

A 70 year female patient reported to the department of Oral Medicine and Radiology, SSCDS, Vikarabad with a chief complaint of pain in the upper right back tooth region since 2 months. The patient had paanchewing habit for 20 years. She used to have 2-3 paancontaining betel nut, zarda and slaked lime per day and placed the quid in the right buccal mucosa.

On inspection, a proliferative exophytic growth was seen in maxillary right posterior alveolus and posterior hard palate, of approximately size  $3 \times 4$  cms. It extended anteroposteriorly from

distal surface of 1<sup>st</sup> molar to maxillary tuberosity area and mediolaterally from 1.5 cms away from the midpalatine raphe towards the alveolus. Colour was white interspersed with red areas. Surface is rough and pebbly. On palpation, the growth was firm in consistency with rough surface and nontender. Borders were raised, no bleeding / discharge was seen. . Lymphnodes were not palapable. Incisional biopsy was performed. Verrucous carcinoma was confirmed histopathologically and patient was sent for surgical excision and was kept under regular follow up.



Figure 1: Verrucous carcinoma of right alveolus and right posterior palate

# III. CASE REPORT 2

A 60 year female patient reported to the department of Oral Medicine and Radiology, SSCDS, Vikarabad with a chief complaint of growth in the left side of cheek since two months. The patient had paan chewing habit from the past 30 years. She used 2-3 pan per day containingzarda, slaked lime and betel nut.

On inspection, a diffuse exophyticgrowth was seen in the left buccal mucosa of approximately  $2\times 2$  cms in size at the level of occlusion extending anteroposteriorly 2cms beyond the corner of the mouth to 2cmd behind and superoinferiorly 1cm above and below the level of occlusion. Surface appeard to be rough withcolor same as that of adjacent mucosa interspersed with keratotic areas. On palpation, the surfacewas rough and raised, borders were well demarcated with induration present in the anterior border, mobile over the underlying structures

A white plaque was seen in the posterior buccal mucosa on left side approximately of size  $3\times3$  cms. Surface appeard to be

rough. On palpation, it was non tender, leathery in texture, firm in consistency, non scrapable.

Incisional biopsy was performed and vertucous carcinomawas confirmed histopathologically .The patient was sent for surgical excision and was kept under regular follow up.



Figure 2: verrucous carcinoma of left buccal mucosa

# IV. DISCUSSION

Verrucous carcinoma is a peculiar variant of squamous cell carcinoma, first described by Ackerman in 1948. It has distinct clinical and histopathological features and mode of behaviour. It can be differentiated from squamous cell carcinoma by growth pattern , rare dysplasia and no metastasis.<sup>2</sup>**Tobacco** - mostly in the chewing form and snuff dipping is considered as the main etilological agent.<sup>2,6</sup> Human papilloma virus 16& 18 are thought to be associated with few cases of verrucous carcinoma.<sup>4</sup>Due toViral carcinogenesis there is suppression or mutation of gene p53, which is responsible for cellular tumor suppression activity.<sup>18</sup> Few cases are also associated with Epstein Barr Virus.<sup>7,8</sup>According to Sorger&Myrden syphilis, chronic dental infection and plummer-vinson syndrome are considered as predisposing factors.<sup>9</sup>

Verrucous carcinoma shows male predilection attributing to the tobacco usage but can also be seen in elderly females with tobacco chewing habit.<sup>2</sup> In the oral cavity buccal mucosa is frequently involved followed by gingiva, palate and floor of the mouth.<sup>2,4</sup>Clinically, it is exophytic, with pebbly or papillary surface. Colour is white interspersed with red areas.<sup>2</sup>Patients usually complain of pain and inability to eat.<sup>4</sup>In the initial stage, the neoplasm is soft in consistency but in advanced stages induration may be seen. It is sometimesassociated with leukoplakia.<sup>10</sup>Lymphnodes are often tender and enlarged due to inflammation.<sup>4, 10</sup>Metastais is infrequent. It should be distinguished from large papillomas, veneral warts, papillary sqaumous cell carcinoma and inflammatory hyperplasias.<sup>17</sup>Histopathologically, there is an increase in the number of epithelial cells leading to papillary projections, however there is inward movement of epithelium into connective tissue which leads to formation of wide and elongated retepegs which are delineated by basement membrane.<sup>10</sup> A chronic inflammatory cell infiltrate is seen in connective tissue.<sup>4</sup> Epithelium is well differentiated and shows only little mitotic activity and only minor degree of cellular atypia is seen .There is an increase in the amount of keratin production i.e., parakeratin which is filled in the clefts present between the epithelial projections .this parakeratin plugging also extends in to the epithelium.<sup>2,4</sup>

The histopathological features are misleading which leads to misdiagnosis as papillomas and benign epithelial hyperplasias.<sup>4</sup> The diagnosis of verrucous carcinoma is difficult, therefore a second biopsy is usually required.

There are different treatment modalities for vertucous carcinoma which includes Surgery, Radiotherapy, Chemotherapy, Cryotherapy, Laser therapy, Photodynamic therapy and using Recombinant Interferon. Surgical excision is usually preferred.<sup>6</sup>

**Surgery**:Mohs microsurgery is the treatment of choice. NationalCancer Data Base report stated that 5 year survival rate of patients treated by surgery is 85% whereas those treated with radiotherapy showed only 42%.<sup>11</sup>Therefore, surgery is preferable treatment for verrucouscarcinoma. If the lesion is present on gingival or alveolar mucosa, the excision should also involve the underlying bone.

**Radiotherapy**: Considerable controversies are present in the literature regarding the treatment of VC by radiotherapy. According to Perez and co-workers, 47% patients treated with radiotherapy showed anaplastic transformation.<sup>12</sup> Hence, the lesion is less radiosensitive.

**Laser therapy:**  $CO_2$  Laser can be used to treat VC. The main advantage of LASER therapy is that, the lymphatic vessels are sealed<sup>13</sup> which may prevent metastasis.<sup>14</sup>

**Cryosurgery:** The use of extreme temperatures to destroy the abnormal tissue is called as cryosurgery. It is used extensively to treat skin lesions .Cryosurgery is not used frequently to treat oral mucosa.<sup>6</sup>

**Photodynamic therapy**: Here, the photosensitising compound is used which is activated at specific wavelength of light to destroy the targeted cell via strong oxidizers, which cause cellular damage, membrane lysis and protein inactivation. It is effective to treat head and neck cancers and premalignant lesions.<sup>6</sup>

**Interferon**: It reduces the production of fibroblast growth factor (FGF) which is responsible for neoangiogenesis in tumors. But, the treatment takes longer time.<sup>6</sup> the side effects are flu like symptoms and fatigue.<sup>15</sup>

**Chemotherapy:**Bleomycin can be used as an adjunct to other treatment modalities as it reduces the size of the tumor.<sup>16</sup>

**Prognosis and recurrence:**It has excellent prognosis because of its slow growth and lack of metastasis.<sup>6</sup>According to Alper et al, local reccurence rate is 57%. Hence, long term follow ups are required.

## V. CONCLUSION

Although verrucous carcinoma shows male predilection, it can also occur in female patients who are chronic tobacco

chewers. A thorough knowledge about the clinical and histopathological features of verrucous carcinoma is required to diagnose it at the early stages as there are high chances of it transforming into squamous cell carcinoma. Indepth sectioning of the lesion has to be done for prompt histopathological diagnosis. Surgery stands as the first line treatment, with radiotherapy and chemotherapy being only adjunctive therapeutic modalities. Early diagnosis, proper treatment protocol of conservative excision and regular follow helps in the prognosis.

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#### AUTHORS

**First Author** – Dr. Nagalaxmi.V, Professor and Head of the Department, Sri Sai College of Dental Surgery **Second Author** –Dr. Swetha Reddy. A, Post graduate student, Sri Sai College of Dental Surgery **Third Author** – Dr. Srikanth. K , Senior lecturer, Sri Sai College of Dental Surgery

Fourth Author – Dr. Faisal Zardi, Senior Lecturer, Sri Sai College of Dental Surgery

**Third Author** – Dr. Anshul Singh, Post graduate student, Sri Sai College of Dental Surgery

**Correspondence Author** – DR. Swetha Reddy, Email address: swethareddy.bds@gmail.com, Contact no. 09666028186

# Compact Hybrid Power Source Using Fuel Cell and PV Array

# Lourdes Laura.A

Technocrat Automation, 600 094, Chennai, India

*Abstract*- Different energy sources and converters need to be integrated to meet sustained load demands while accommodating various natural conditions. A hybrid system of a fuel cell, PV array and battery connected to a load is presented in this paper. This paper focuses on the integration of photovoltaic (PV) and fuel cell (FC) for sustained power generation. Fuel Cell and PV are the primary power sources of the system, and a battery combination is used as a backup and a long-term storage system. An overall power management strategy is designed for the proposed system to manage power flows among the different energy sources and the storage unit in the system. A simulation model for the hybrid power source has been developed using MATLAB/Simulink.

*Index Terms*- Fuel Cell, PV Array, Inverter, Hybrid energy storage system, Battery, Boost Regulator, Output Voltage .

#### I. INTRODUCTION

**S** olar energy is the most readily available source of energy. It is free. It is also the most important of the non-conventional This feature of directness of conversion has been largely responsible for making photovoltaic such a popular mode of generation of electricity sources of energy because it is non-polluting. Energy from the sun is the best option for electricity generation as it is available everywhere and is free to harness. On an average the sunshine hour in India is about 6hrs annually also the sun shine shines in India for about 9 months in a year. Electricity from the sun can be generated through the solar photovoltaic modules (SPV). Fuel cells have emerged as one of the most promising technologies for meeting new energy demands. They are environmentally clean, quiet in operation, and highly efficient for generating

Electricity .A fuel cell is an electrochemical energy conversion device. A fuel cell converts the chemicals hydrogen and oxygen into water, and in the process it produces electricity.The source of hydrogen is generally referred to as fuel and this gives the fuel cell its name, although there is no combustion involved. Oxidation of hydrogen instead takes place electrochemically in a very efficient way. During oxidation , hydrogen atoms react with oxygen atoms to form water; in the process electrons are released and flow through an external circuit as an electric current. The fuel cell in this hybrid power source is PEMFC (Prototype Exchange Membrane Fuel Cell).Generally hydrogen is used as fuel. It operates at relatively low temperature(100 c). The electrolyte of a PEM fuel cell consists of a layer of solid polymer, which allows protons to be transmitted from one side to the other.



#### Fig .1. Schematic Diagram of typical PEM Fuel

As mentioned earlier the Hybrid power Source is an integration of Fuel Cell, PV Array and battery. The Average power generated from the energy sources is fed to boost Regulator. The boost Regulator Steps up the voltage to the desired level. Once the required voltage is received from the boost regulator , it is in turn fed to inverter . The inverter converts the DC to AC voltage, as the output from Fuel Cell and PV array is DC.

#### II. HYBRID POWER SOURCE

The Hybrid power source as proposed in this paper consists on Fuel Cell, PV array and Battery. The system can work in three different modes:

> Mode I: Fuel Cell and Battery Mode II:PV Array and Battery Mode III: Fuel Cell, PV Array and Battery

When the Fuel cell runs out of Fuel then the energy from the PV array can be used and vice versa. When the load demand increases, both the energy sources in combination with the battery can be used. In this system battery is mainly used to store

the excess energy generated by PV array during the day. This energy stored in order to meet the high load demands. The block diagram below shows the Hybrid power source, Boost regulator and Inverter.



Fig. 2. Block diagram of Compact Hybrid Power Source

**PEMFC Model:** The PEMFC is mainly modeled using the Nerst Equation . The output voltage of a single cell can be defined as the result of the following expression [1].

Vfc= Enerst -Vact -Vohm - Vconc [1]

Where Vfc represents the Fuel Cell voltage (V), Enerst represents the Nerst voltage (V), Vact represents Actual voltage (V), Vohm represents Ohmic voltage drop (V) and Vconc represents Concentration Voltage (V).The reversible voltage of the cell, Enerst is calculated from a modified version of the equation [2].

# Enerst= 1.229-0.85\*10<sup>-3</sup> (T-298.15)+4.31\*10<sup>-5</sup>\*T $[\ln(PH_2) + \frac{1}{2}\ln(PO_2)]$ [2].

Where T represents the Temperature (K), PH2 represents the partial pressure of the Hydrogen (N/m2) and PO2 represents the partial pressure of the oxygen (N/m2). The following table shows the circuit parameters.

TABLE-I							
MATHEMATICAL CIRCUIT PARAMETERS							
Parameters	Values						
Temperature(T[K])	323						
Concentration resistance ( $R_c[\Omega]$ )	0.0003						
Membrane resistance ( $R_m[\Omega]$ )	6.29*10 <sup>-6</sup>						
Current density ( J[A/m <sup>2</sup> ] )	500						
Maximum current density $(J_{max}[A/m^2])$	1500						
Parametric co-efficient (B[V])	0.016						
Number of cells (N)	55						

# PV Array Model:

A photovoltaic system converts sunlight into electricity.

The basic device of a photovoltaic system is the photovoltaic cell. Cells may be grouped to form panels or modules. Panels can be grouped to form large photovoltaic arrays.



# Fig.3. Single Diode Model Of the theoretical photovoltaic cell and equivalent circuit of practical photovoltaic device including series and parallel resistances.

The basic equation for designing a photovoltaic cell is shown below:

$$I = I_{\rm pv} - I_0 \left[ \exp\left(\frac{V + R_{\rm s}I}{V_{\rm t}a}\right) - 1 \right] - \frac{V + R_{\rm s}I}{R_{\rm p}}$$
[3]

where Ipv and I0 are the photovoltaic and saturation currents of the array and Vt = NskT/q is the thermal voltage of the array with Ns cells connected in series. Cells connected in parallel increase the current and cells connected in series provide greater output voltages.

# III. MATLAB/SIMULINK MODEL

A complete system model composed of a hybrid energy source which is composed of Fuel Cell, PV Array and battery, Boost regulator, Inverter and load. PEMFC model, PV cell connected to a Ni-Metal Hydride battery model has been developed and simulated using MATLAB/Simulink program. This software offers the advantage allowing the user to view the system at different levels, such that the models are easily connected together. The parameters can be changed during simulation, and the results from different simulations are eventually analyzed.

**TABLE-II**SIMULINK MODEL PARAMETERS

PEMFC				
Maximum power(kW)	5000			
Number of cells	55			
NI-METAL HYDRIDE BATTERY				
Nominal voltage(V)	1.2			
Initial SOC(%)	50			
Rated capacity (Ah)	1.5			

TABLE II represents the values of the parameters used in modelling of Proton Exchange Membrane Fuel Cell and Ni-Metal Hydride Battery.TABLE III which is shown below represents the values of the parameters used in designing photovoltaic array.Based on thevalues of these circuit parameters , the simulation results are changed. Any changes in the simulation results can be achieved by changing the values of these parameters.

# TABLE-III

PV MODEL PARAMETERS	
G	600
Kv	15
Vocn(V)	70
Ipvn(A)	120
а	30
k	78
Ns	6
q	3
Gn	8.5
Ki	8
Iscn	17
Tn	200
Rs	1

The figure below shows the the full system MATLAB\SIMULINK model. The subsystems for the fuel cell and PV array is designed based on their respective design equations. Separate subsystems are created and incorporated into the main simulation . Also, the above circuit parameter values are used. In the case of PV Array the parameters are assigned in MATLAB program file. The rest are used for fuel cell and battery.



Fig.4. MATLAB/SIMULINK model of the full system.



Fig.5. Subsystem of the PEMFC



Fig.6. Subsystem for PV Array

# IV. SIMULATION RESULTS

An average of 44v system has been simulated and results and shown in the following figures.the simulation results for three different modes is analyzed and corresponding results are tabulated below.



Fig.7. Output Voltage with load for Mode I

In the Mode I the only energy source is fuel cell. Battery is used to store the excess energy generated. It is observed that the voltage from fuel cell is 27V. This voltage is then fed to the boost regulator which steps the voltage to 210V. this voltage is converted to AC by inverter and a 100kohm load is connected to the inverter terminals. The output measured across the Inverter terminals with load is 135V.



Fig.8. Output Voltage with load for Mode II

In Mode II the only energy source is PV Array .As usual the battery stays connected to the system in order to store the excess energy generated which can be used during high load demands.the voltage generated from PV Array is 39.4V. This in turn is fed to the boost regulator to step up. The stepped up voltage which is around 245V is given to the inverter. With a 100kohm load being connected to the inverter terminals, the output measured is 175V.



Fig.9. Output Voltage load for Mode III

In Mode III the both the energy sources are used. As usual the battery stays connected to the system in order to store the excess energy generated which can be used during high load demands. the voltage generated from PV Array is 44V. This in turn is fed to the boost regulator to step up. The stepped up voltage which is around 3155V is given to the inverter. With a 100kohm load being connected to the inverter terminals, the output measured is 230V.

## V. POTENTIAL APPLICATIONS AND ADVANTAGES

Hybrid renewable energy systems (HRES) are becoming popular for remote area power generation applications due to advances in renewable energy technologies and subsequent rise in prices of petroleum products. A hybrid energy system usually consists of two or more renewable energy sources used together to provide increased system efficiency as well as greater balance in energy supply. Hybrid system can guarantee the certainty of meeting load demands at all times at reasonable cost.

## VI. CONCLUSION

A compact Hybrid power source has been simulated and the experimental results show us that this power source is reliable at all times. The use of solar & FC hybrid power generation is an especially vivid and relevant choice for as these are power sources of technological, political, and economic importance in their state. Modelling and analysis of the system have been explained and simulation and experimental results are presented. A hybrid PEMFC, PV Array and battery model system is developed and simulated using the MATLAB/Simulink software. Simulation results show that using the hybrid system different load demands can be met.Also, by varying the design values of the models, output voltage is achieved at desired levels. A battery storage system solves these problems by charging or discharging, depending on the load demand. The battery is discharged to

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#### AUTHORS

**First Author** – Lourdes Laura.A, B.E,M.E, Technocrat Automation and lourdes.lovedale@gmail.com.

# Sociocultural change, territoriality and good live in the region Forest - Frontier of Chiapas, Mexico

# Dr. Agustín Avila Romero

Doctor en Desarrollo Rural, Profesor de Tiempo Completo Titular B de la Universidad Intercultural de Chiapas, México

*Abstract*- This paper gives account on socio-cultural changes, the territorial dispute and the different conceptions of the good life that we find among the indigenous peoples Tojolabal, Tseltal and tsotsil who live and have colonized Selva-Chiapas border region.

*Index Terms*- Chiapas, Socio-cultural changes, Good Live, Strategic resources

#### I. INTRODUCTION

For our study in the region Frontier Forest of Chiapas, we limit ourselves only to a region of the Mayan Forest, the called Forest Lacandona, located in the oriental part of Chiapas, limited by the river Chixoy-Usumacinta and the frontier parallel to the east and south respectively, international limits with Guatemala, and the level of 1 000 m.s.n.m. to the west one. In accordance with its biocultural differences, this region chiapaneca, it has split in six microregions, which are a Blue Water, Betania, Integral Reservation of the Biosphere Blue Mounts, Community Lacandona, Glens and Marqués de Comillas. The case studies were located in these last two microrregiones.

The microregion of Las Cañadas, comprises the municipalities of Las Margaritas and Maravilla Tenejapa. 5 000 km2 it contains eleven different types of vegetation of the 32 described for the planet. This gives you the ability to become platform for experimentation and support of all the branches of the biotechnology industry, from the pharmaceutical, agricultural and nutritional applications to genetic engineering in all its aspects.

The Microregion Marqués de Comillas includes the municipalities of Benemérito de Las Américas and Marqués de Comillas, has been a troubled region by the historical process that has had since the 1960's and in the subsequent years according to the area concerned.

The municipality of Maravilla Tenejapa belonged to the municipality of Las Margaritas and the Marques de Comillas to the municipality of Ocosingo, in 28 July 1999 date these free municipalities are created. All of them are the product of the process of colonization of the forest that occurs in the second half of the 20th century. Maravilla Tenejapa is formed from the migratory flow that starts in the 60s and part of Comitan-Lagos of Monte Bello eastward, following the route of what is now the southern frontier road. Marqués de Comillas and Benemérito de Las Américas were part of the so-called area Marqués de Comillas; the first is occupied to the 70s, by air and river, following the course of the Lacantún River; the second to the 80s, following the course of the Chixoy River and then west

along the road the southern frontier in the stretch that part of the city of Palenque. I.e., it has been an area of attraction formed by immigration.

At the end of the decade of 60's the dispute for the ground in wide regions of the state of Chiapas, passed him to the settlement of the region Forest, giving opportunity so that thousands of villages tojol-ab'ales, tseltales, tsotsiles and Ch'oles of the proper state, in addition to groups of settlers of other states of the republic, principally of Guerrero, Michoacán, Veracruz and the semidesert areas of the center of the country, went so far as to transform the reality of the south border of Mexico.

With colonisation arrived where tens of thousands of peasants was an expansion of the agricultural frontier "which involved a change in the use of the humid tropics: went from forest to agriculture". (Acevedo, 1995:148). This colonization is caused because the Mexican government refuses to continue affecting owners deprived of other areas of Chiapas. At first colonization started in the periphery of the Lacandon Jungle but when the land is saturated, the agrarian distribution had to continue towards the interior of the same, is highlighting all the studied population centers are communal land and most of them received lands that were part of the so-called national land.

All the emigrants carried out the same tasks: they clarearon the mountain to grow corn and beans, mainly, and subsequently disassembled new surfaces allowed the introduction of coffee. For example, for the case of the community in the municipality of Las Margaritas Mr. Sebastián Hernández talk us that the Foundation of the ejido Nuevo Jerusalem, "I was in a catechetical centre located in the city of San Cristobal de las Casas, coinciding with two Lords of Pacayal, they informed me that in the jungle still had national land", the little land with nice in Tenejapa made that some people decide to go in search of the land". Once known the place don Sebastian took the information to Tenejapa persons; initially eight families were established, they were subsequently arriving more, as well as they were leaving those who didn't like the climate.

"The community was first settled in the east near the Rio Grande, however, when it was raining the river grew and flooded to the small population, this made the people afraid and two years later decided to find another place, it was as well as they walked to the south and settle definitively where they are currently, taking as the main element of their settlement the source of the community".

In the decade of 80's, with the civil war in Guatemala; the Mexican government opened the doors to the Guatemalan indigenous groups chased, that in those icier moments of the Central American conflict, there went so far as to add more than 60,000 refugees, who in the first moment of its revenue to the country, were settling in the multiple camps that formed along

the south border; which were introducing its customs and traditions in each of the regions of its place; as well as its forms of social organization and of work, generating with it, a process of cultural enrichment, which allowed the strengthening of the linguistic diversity of the Mexican territory, with the later recognition in the Political Constitution of the State of Chiapas, of the speakers of languages Chuj, Kanjobal and Jacalteco.

Already in 90's since we it will note down further on a part of the corn surface I sacrifice myself to introduce cattle fundamentally, and already in the full XXIst century there coexist the basic sectors (corn and bean), the coffee and the cattle with "profitable cultivation" like the fruit trees (banana for example), the rubber, the African palm and the third sector of activities that comes being impelled decisively with the tourism.

#### II. SOCIOCULTURAL DYNAMICS

Cultural geography has made large contributions around the concept of territory. This current part of the notion of space and defines the territory as the space appropriate and valued symbolic or instrumental by human groups. (Giménez, 1999) Thus, the subjective dimension of the subjects becomes key factor in the creation and production of places, since the human thoughts and actions are that give sense to lots of space and turn them into territories.

The space is conceived as the raw material of the territory, i.e. the pre-existing material reality to all knowledge and all practice; as nature in its topographical dimensions or the floor with its own characteristics, flora, fauna, the particular climatic and hydrological characteristics. Seen thus, space is characterized by its value and use, and would have a relationship of previously with respect to the territory. In this way, analogically, the territory would result from the appropriation and valorization of the space.

He is thus conceived the territory as a social construction affected by the dynamic identity: are the territories that determine the identities, but these which help to configure them historically. Thus we introduce territorialities term to designate how are mobilized the collective identities by their sense of belonging to the territory. We consider this key because we agree with Zambrano (2002) when he says that: "while the property is the device that launches people into the conquest of lands, membership leads them to the production of social and political orders and converts to space in culture and identity".

Geographers began to think the territories as carriers of visions, stories and aspirations of the subjects than the werw experiencing and formed them, linking the concept of territory of identity, perception, and representation. We start from the idea that there is no loss of identity in historical processes but strong movements of modifications and rearrangements where man adapts to new situations from the changes. What we then live in the jungle border region is a dialogue between cultures where in the process identity of a people can make themselves changes, since this can assimilate by external influences that deemed important to be different to the others.

In history from below, from the subordinates and thus their knowledge is that colonial/regional difference that speaks of a specific way to insert to the national State and a way to build their region and therefore, its territorial and environmental appropriation.

Local and regional culture is thus an interaction with the national culture and culture of globalization presented to us in the zone through migrations, mobility of capital and resources, and new information systems. Networks or networks of meaning and communication that are located in certain key symbols that are rooted in institutions and forms of organization are reconstructed, with which national and global projects end up feeding and resulting in new social settings, in which the old gives way to the new. In synthesis; the attitudes of local cultures to national or global project are mediated by a particular set of values or references of the local culture. Culture thus means:

"... Patterns historically transmitted and meanings embodied in symbolic forms (which include actions, expressions and significant objects from the most varied species), under which individuals communicate with each other and share their experiences, concepts and beliefs" (Giménez, 1999:3).

Due to its location, Chiapas acquires a dynamic of its own, not by the administrative logic that becomes you by the State Government but it is a territorial space defined by the people who inhabit it. Here we return to the advances in the conceptual terrain of the region and territory; the region of Chiapas can be defined from their territorial identity and its historic building as a social space, while viewing the matrix of coloniality of power that was built in this area.

We usually consider to the region from the delimitation realized by diverse institutions (the government and the church fundamentally) to impel its economical, political, educational or religious projects; every limit differentiated by the particular proposal of every institution and tinted preferably to the geographical ambience. But in the fund, what we must observe is if the inhabitants are assumed inside a region; this means to be located if the identification of the individuals exists with its geography and if this one has relation with its life world, that is to say, we study the region from the reconstruction of the everyday life in the family, local, subregional, regional, national and international spaces.

In that sense the border jungles of Chiapas region shows with an amalgam of different alloys cultural, historical, economic and political are able to maintain its unity despite their difference.

# III. AGRICULTURE AND RELATIONSHIP WITH NATURE AND RELIGIOSITY

The basic nutritive sustenance of the families of the region Frontier Forest of Chiapas depends on the corn, the bean, the coffee and the banana; as the majority they are of low income they use neither fertilizers nor agrochemicals for the process of production, which is based fundamentally on the groove that is realized to pure machete. In the backyard it is possible to find different species of vegetables, like example the mexican spice, lemon, lime, cilantro, orange, grapefruit, sapota, guava, handle, papaya, coconut, banana, cocoa, paternal, chaya, guanábana, nance, between others; as well as domestic animals like hens, turkeys, ducks, goats, pigs, horses, cows.

The field of communities is usually very rough, you can find outstanding high-lift as well as plenty of hills and slopes, soils range from black in some plots, in the higher ground soils are yellow in color and with a high degree of compaction.

The climate is warm, with abundant rains in the months of May to February, wildlife includes a great diversity of animals many of them endangered, within which we can mention Tiger, tapir, armadillo, Howler monkey, night monkey, jaguar, wild boar, raccoon, squirrel, Badger, rabbit, with respect to the birds we find toucans, pheasantParrot, Peacock, chachalaca, pea, guaco, doves, heal, Eagle, and Falcon; reptiles such as the nauyaca, coralillo, cantil, flying or vine snake, mazacuata, among others. The vegetation consists of trees of precious woods, such as cedar, mahogany, one can also find sapote, chico zapote, chij, oil maria, bread or chestnut tree, flamboyan.

Between the young people we find those who keep on realizing the work of the field and do it preserving the traditions tseltales, tojolabales and tsotsiles that imply a big respect towards the mother ground and therefore, they carry out diverse rituals so much of request of rains, of good harvests and of protection of the wind, this young people maintains the cultural identity of the above mentioned villages and regularly they are gaining more rights to the internal of the community in relation to other young people who decide to emigrate or study out of the community.

Everything that is regularly harvested for subsistence but when needs arise not provided for, as for example common diseases, scarcity of salt, soap and the rice, sell their product in small quantities within the same community.

For example, Mr. Domingo Girón Lopez, of 77 years of age, founder of the community, in the same way is engaged in agriculture, harvesting corn, beans and coffee and working the livestock; in regard to the use of agro-chemicals, such as fertiliser, discard it, because he says " to apply fertilizer to the soil gets used, and the following year that to want to return to planting is no longer cosecharia nothing without fertilizer; in regard to the kills grass if they use a liter per year (application in the *milpa*).

Therefore, we can conclude that agricultural corn production is hybrid since on the one hand they make use of many new techniques of production brought on by the green revolution such as the use of agrochemicals and some tools, but on the other hand those who are Catholics maintain the prayer of the Earth at the time of sowing the feast of the tapisca at the time of harvest, as well as their participation in processions or pilgrimages at different times of the year.

In visited communities, we found that the Assembly of ejidatarios is the highest level of decision-making, even though there are various organizations in communities, agreements are still taking in that instance and it is open to the community, long discussion and reflection processes.

With the arrival of government institutions in the region along with the income that provides the production of corn, beans and livestock, the income of the population depend on government programs, such as OPORTUNIDADES, which has benefited several families, the majority of wives with children of ejidatarios in the school. There are also programs of school breakfasts, likewise clinics already operating in various communities and have received support in productive projects as farms of pigs, backyard poultry, vegetables, among others. In these communities, PROCAMPO is paid to the producers and they have support from the State Government as the solidarity corn that endows them with fertilizer and CODECOA which provide them with agricultural work tools.

Despite all this government policy the above mentioned communities keep on having an alienation high degree after the first decade of the XXI.th century The region appears before us as well as a mosaic of ecological, cultural, historical, social, economical and political diversity, but if something maintains the identity as people it is the ground, the mother earth , the *jnantik luum* in tojolabal lenguage.

Despite the sociocultural processes of change through that they live, the religious diversity and the processes of migration, for the tojolabales, tseltales and tsotsiles of this region of the Forest the ground keeps on being a space sacred and privileged not only in its material production but as regards all the symbolic meanings that are essential part of its culture.

For the indigenous world, that it has a culture and a particular worldview, their relationship with nature is carried out in a particular way, for them all that exists in the world has its own life. For example, for the tojol-ab'ales all, we are a set of things at heart, since the heart is the source of life in the history of how the gods created the world, we first find this vision:

"The first gods created all things by heart, so the only man he went to rest and did not work, because it was saying to the other things they had heart making tasks." So I said to short axe wood and she did, to the coa that sow and this did. The gods angry because the man was not working decided to make volcanoes burst and flooded the world, ash as some men took refuge in caves, the gods then sent it to rain for many years. After rain and ash once the world is dry the few men who survived, had much to work to rebuild the world but didn't have above all to eat, because everything had finished among the ashes and the rains. Some men both live in caves were transformed into animals, so was born the jalow (dishes), the iboy (armadillo), the chu 'u (squirrel), batz (sarahuato) and the chich (rabbit), all these animals as memory of her human form kept the shape of their hands. In those you are man hungry, when he saw a local Ant that tansportaba a grain of corn and decided to talk to her and ask her to tell him where had hidden corn, as the arriera is nego, I then take a horse hair bristle and I work clamped halfway through his belly demanding him to confess, - that the ants have that shape -After much pain and suffering, the arriera pointed out that it had a hidden rock among many stones. He was the man to see this place and gave counts that the maize was hidden and that was very hard to take out it, it was there where he was and I speak with Ray which you asked to help him, Ray was launched on the stone and achievement split rock, man might as well have corn and since then is a man of corn", in a new world, where the corn is attached to mother earth".

For the tojol-ab ales land is one of the beings who they want, why call him mother earth, she owes him life and his existence in the world. With the Earth established a particular relationship that is equated to a process of falling in love. Every day come to his encounter to see it and care for it. If not go to see it be heart gets sad.

Despite the increasing religious diversity in the region, peoples do not cease to conceive the Earth as mother earth jnantik lum to the Tojolabal - as something sacred and symbolic, to the territory as a space not only material but also full of meanings, are entering the Catholic processions, Carnival, carry out prayers to the Earth, the altars of Mayan, participate in Catholic parties that fit in the community such as the use of the kojtakin of the day for all deceased and that stays in the community life.

The wide range of religions that have arrived in the region tojol-ab'al in recent decades for example comes impacting to modify habits, demonize ritual and practical tojol - ab'ales and introducing readings or songs in latin or Spanish in disregard of the language tojol-ab'al. Even with this as every culture is part of a territory, and not only is a geographical space but above all a place from which life is marked, the culture tojol-ab'al remains because is expressed in the local cuisine, the local stories, legends, the forms of organization of many churches that take up the importance of the Council of elders, deacon, catechist and practices such as the kojtakin that many churches reproduce and that has to do as the equitable distribution of a beef between the group of participants. It also has to do with the fact that while theoretically what matters is the world of heaven for many of these religions, around corn, planting and harvesting are practiced many masses, petitions and carried flowers.

Whenever there is a deceased, any catechist, minister or priest of the four churches can make the prayer the deceased, apparently do not necessarily have to belong to a church in specified, so that the Catechist of a church that does not belong to him who died, performed the religious ceremony, in these issues there is no difference. The Pantheon of Jerusalem is divided into three parts. It must travel by dirt road, about a mile, which is equivalent to 30minute walk to reach the Pantheon on the northwest side. In the eastern part of the Pantheon, the burial place of Guatemalans is identified, a poultry plant, separates it to locate the burial place of the members of the community in Jerusalem, that could be said, is on the West side; an interesting fact is that on the Southeast side, by the weather above, as 50 meters, a place is located specific burial of emigrants to the United States, this is done by the family's own decision.

## IV. LANGUAGE AND CULTURE

The people in the community again Jerusalem communicates in her native language (Tseltal), but have knowledge of Spanish can therefore say they are bilingual, since they are people from the municipality of Tenejapa, located in the Altos de Chiapas region. However this language in a process of weakening by different factors, of which the most incidents are that at the level of secondary and high school classes are held in Spanish, since teachers are monolingual in Spanish, another factor is that most of the students are not of the community, i.e.they move from their communities to attend classes, different languages are found such as the ch'ol, tseltal, tsotsil, if classes occur in tseltal would have difficulties in understanding other languages, we cannot fail to mention that tourism has played a very important role in the weakening of the language, since the community is step to go to the ecotourism centre causes green clouds which has made that established businesses for tourist consumption, whereupon the people necessarily have to communicate in Spanish.

Issues of clothing has suffered a transformation at the beginning men and women still used the original of Tenejapa clothing, but with the passage of time and due to the weather they were adopting new forms of dress, mostly men have replaced their costumes for modern women clothes you can see that some still used the original costumesome use only the nahua accompanied by a shirt, however it appears that many of them have modified the model and original fabric of the suit, in the case of the nahua have transformed it into a kind of skirt leaving use the strip; in the case of the blouse the fabric is more thin and with little embroidery. Children do not use any kind of costume, girls only used the transformed nahua. On the clothing of the men tell us that when they recently came to populate Jerusalem, they brought with them their traditional costume of Tenejapa, but due to the weather factor, which is warm, they were forced to abandon it, because when they went to the work of the cornfield, they did not support the heat with its wool Chuj, then began to use guayaberas shirts, for them to cool during the work.

In matters of dress has undergone a transformation, at the beginning men and women still using the original clothing of Tenejapa, but with the passage of time and because of the climate were taking on new forms of dress, the men almost in its entirety have replaced their regional costume by modern clothes, in the case of the women you can see that some still use the original costume, some use only the nahua accompanied by a T-shirt, however, it is observed that many of them have modified the original model and fabric of the costume, in the case of the nahua have transformed it into a type of skirt leaving using the *faja*; in the case of the blouse the fabric is more thin and with little embroidery. Children do not use any type of suit, girls only used the nahua transformed.

On the dress of the men tell us that when newly arrived to populate Jerusalem, brought with them their traditional dress of Tenejapa, but due to the climate factor, which is warm were forced to abandon it, because when they went to the work of the milpa, did not bear the heat with his Chuj of wool, then began to use guayabera shirts, to refresh themselves during the work.

## V. STRATEGIC TERRITORY EN CHIAPAS

In the case of our study region we see as the peasant life and indigenous is in tension with the view that external actors have development in relation to tourism, mining, forest production, agro-industry, the introduction of crops such as African Palm, and rubber and the privatization of nature as factors that can boost economic growth in that area. So we talked about that occurs in the area a tension of territorialities between the defense of biocultural diversity, the peasant economy, community knowledge and tourist and real estate, agro-industrial, entrepreneurs and others who want to find natural wealth of the area.

This voltage is displayed because these territories that were relatively far away from the process of recovery of capital, will face in this phase epochal, that it is characterised by the capital spreads in geography, densifies in depth and invigorates the network of capitalist social relations today that surrounds the whole planet. The global expansion of the scale of wage-earning employment of the labor force, the incorporation of immense territories in the new circuits of the deregulated market and the breakdown of previous natural barriers and spatio-temporal to the enhancement of value are constituent trends of this process (Gilly, 2010). The peasant and indian communities are thus converted into strategic territories for businesses and corporations.

The problem for the capital is that not only the peasants possess good part of the ground but in its common lands and communities there is the little that stays of the forests, be already in biosphere reserves, national parks or as forestas community, as well as the springs, creeks and rivers that are constituted in important water reservations; both elements allow the presence of an important biological diversity in flora and fauna. Also, in the subsoil of mountains and vales there exist minerals that now are fundamental for the functioning of the encompassed economy, like the gold, the silver, the zinc, the coltan or the copper.

In this way an important aspect of the capital is focusing to deprive peoples of their natural resources. Waters, forests, mines, natural resources and ancestral knowledge and knowledge associated with common use are losing the character of common goods that for centuries have been maintained for the benefit of humanity, becoming on private property and for the same goods, representing a new colonialism, more predatory than the one suffered by the indigenous peoples of Latin America in the 15th and 18th centuries.

The capitalist appropriation of territories means the transformation of previous territorial structures. It is necessary to understand the territory not only as a given geographical space, but as a complex and dynamic network of relations (bio-cultural, social, economic, etc). Indigenous peoples and peasants to engage in their forms of Government, create and recreate territorial relationships in the community, among people against the powerful, with farmland, mountains and water. Service charges to the people, collective work, traditional farming systems, which become turned hand, tequio, food, party and community, knowledges, practices or the agreement, are complex forms of collective construction of a territory, which is what we find in the border jungles of Chiapas in communities such as Jerusalem, Veracruz, Nueva Nicaragua and Nuevo Huxitan.

Unfortunately in the vision of State institutions leave policies that cover regions with a spider's Web of decisions taken from another place and at another time, that seek to impose new meanings to the existence of peoples, while they override and exclude their initiatives. The role of subsidies has been strategic to change the territorial relations (with the ground, in the family or in the community for example).

Subsidies were abandoned to the production process, but it is still subsidizing the dependence on technologies and external inputs like chemical fertilizers or monetary support. Technological packages contributed to transform peasant relations of family farming and displace an entire generation. Thus, for example, instead of family work or turned hand for weeding the milpa, is supported with boats of gramoxone to seal the cultivation of hybrid maize as it is the case of maize program solidarity which is used in all the State of Chiapas. Both the technology and the subsidy limit the strength of the community, of the collective work with the family, and seek to generate dependency.

It is not supported to the production but created the assistance with subsidies to the reproduction of the labour force. All programs: opportunities, the special programme for food

security (SPFS), seventy and over, among others, are applauded by the World Bank as a panacea against poverty. However, the problem of poverty is not its origin nor its core in a question of income, but in exploitation, dispossession and discrimination. It is also individualize poverty, exclude many, changing the food and health, break down tissue and modes. What the State offers is to convert citizens in individual and hence customer, seeks also to break the social fabric, erasing the map any reference to the collective and its history of peoples living in community.

Thus the struggles for the community defense of the territory we can limit them only to a dispute between the rural thing and the urban thing, but in the fund they express the different visions of the space between a capitalist economic model in its phase agroexport and extractivist, predator of the communities and its natural resources, and of another side, indian and rural communities as those of the region Frontier Forest of Chiapas that rest on an intimate relation with the nature, in the history of its territory (the process of designing its space) and in the defense of a sociocultural project.

The jungle Chiapas border region is presented to us as well as plural territories where coexist peasant life and indigenous related to mother earth, to the respect for the nature, good living as everyday collective practice which involves a participatory democracy and a sense of commonality; beside a business rationale that external actors such as the Federal Government introduced mainly through its multiple institutions, international cooperation agencies and various civil associations followers of the environmental liberalism.

Part of the dispute of territorialities which are living in the jungle border region has to do with the productive projects coming through programs like Procampo, Aserca, Piasre, young entrepreneur, PESA or Promusag, the various programmes of the CDI, presenting various general elements in common: seek to impose so-called profitability criteria in crops or agricultural activities (this generates a strong dependence on the markets and put farmers at the mercy of coyotes); they seek to generate technical dependence, monetary and external input (often projects are tied to standards of technical offices or agencies in Rural Development (ADR), which, in turn, their suppliers have. In this way, agribusiness firms benefit but also the local coyotes often linked to the political class, regional chiefs and the peasant leadership); they seek to generate debt (through credits and often mortgaging the own lands); now they also seek food dependence, and the consequent loss of agrobiodiversity, through the conversion of crops.

In this region border jungle in addition thousands of poor farmers, temporary agricultural workers, are doubly hit: on the one hand, with the fall in the price of their crop product of the strategy of importation of food and trade liberalization continued in the federal Government; on the other, with the reduction of their wages and the deterioration in their working conditions since when the coffee harvest occurs for example, thousands of Guatemalan migrants arrive in various communities to help in the work of cutting and harvesting.

Thus, the Mexican State subsidizes the prosperity of large plantations, agro-industry export, the business of biofuels, while the country stops producing food and sufficient seeds and good quality for the power of the people. Along with this commitment to outsourcing of productive activities so that peasants revalue their collective identity, in full subordination to the agro-industrial processes that are being promoted in the región.

One of crops introduced into the jungle border region and greater tension territorialities generates is the cultivation of African Palm in the strategy of agro-industrial production in the area.

In the State of Chiapas, there are more than 37 thousand hectares of African Palm, some of them planted in the areas of the biosphere reserve Montes Azules as buffer - as it is the case of Chajul we have studied - the grave and the crossroads. The palm oil goes to the grupo BIMBO in Guadalajara and a concentration of production in AGROIMSA and Palma Tica oligopolistic there which speaks to us of a presence transnational in this business.

The cultivation of African Palm is a danger to the biocultural diversity, since it simplifies dramatically, agricultural practices and knowledge. It is a crop that has a technical planning returns to the farmer part of the agribusiness company that held the contract, whereupon it deepens their vulnerability and dependence. Also found that the cultivation of African Palm has effects on nesting birds, ostensibly deteriorates the ecosystem by introducing an exotic species to biodiversity-rich regions and practically useless quedan floors after the growth of these trees. In our study region we find African Palm in the communities of Chajul in the municipality of Marques de Comillas and Nuevo Huixtán of Las Margaritas, Chiapas.

There are three fundamental mechanisms that bring the African palm and the agrocombustibles that worry us according an investigation realized (Avila León, 2012): to 1. They are characterized by a concentration high degree, there are small the companies and private owners who benefit governmental from the supports. 2. The approach prevails productivista simplificador of the agroecosistema based on the massive use of fossil energy (fertilizers and agrochemicals) and; 3. A cultural imposition exists, the producers are seen like one more worker of the capitalist agribusiness, and therefore although they preserve the property of the ground, in practice

they turn into a lower worker of the scheme of plantation. The region of Chiapas also is characterized by its great natural attractions, its rivers and landscapes have a great potential tourist what has been displayed by governmental and private actors what has given rise to the implementation of various

projects in the area, another subject of friction of territorialities. In the globalized neoliberalism, the tourist theme is one of the significant axs that moves to the economies, societies and cultures and even now the world's ecology; is on the agenda of the countries as an alternative, investment, norming and growing source of territorial disputes and conflicts socio-environmental. Tourism is a modern productive activity that reproduces the uneven and combined development of capitalist territories within the nation-state , regularly tends to absorb the local cultures and unbalances the local modes of production. Within the dynamics of the capitalist accumulation is a sector that attracts new capital investment in these times of global economic crisis.

Tourism is a social and also economic, political, cultural and educational, practice where there are social relations of power between residents of the territories and tourists, between producers and consumers. We watched as the tourism sector become increasingly more transnational corporations that operate and subordinate Governments according to their interests. So there are regular confrontations between the strategies of the tourist capital and resistance daily of the locals, in the case of the region found that only some tourism projects have benefited some few people such as the project of the resort the clouds of the municipality of Maravilla Tenejapa having a promotion on an international scale.

The tourism in this accumulation phase has provoking new social configurations, geographical and sociocultural changes, increasing environmental impacts and demographic dynamics that express themselves also in big migratory flows towards the cities. Parts of these effects begin Nuevo San Juan Chamula living through communities like Jerusalem, Las Nubes, Gallo Giro, Nuevo Huixtan and Chajul in the region Border Forest of Chiapas.

# VI. THE GOOD LIVE

For the indigenous people of the State of Chiapas, Mexico and for the communities in the forest-frontier Region -, the good live- lekil kuxlejal for the Tzeltal and tsotsil people and jlekil altik for the tojol-abal - is part of the everyday life of peoples, in the exercise of a territoriality and a rationale of peasant (Bartra, 2010) facing dispossession of their lands and of the processes of cultural assimilation attempts.

Lekil kuxlejal has been translated as good live, that is it has reinvindicado as another way of thinking and living the life, other base materials, philosophical and spiritual. The good life involves then a rationality that is different to that scenario to Western culture. LEKIL is derived from lek and her approach to Spanish is well and good, il termination is maximizing what it is called, while kuxlejal would be life, therefore lekil kuxlejal translates as good life.

The good life express the desire for a life not better, nor better than others, or a continuous Unlearning to improve it, but simply a good life. For the tojol-ab'ales which is more closer to the good life is the jlekil altik, lek means good, right or just. Meanwhile il and son suffixes of determination and generalisation. The tik refers to the us, which means that the good is widespread and not individual. Put it another way, the lekilaltik refers to the good of our common good. The tojolabales not enough that a few are, so that no jlekil altik, requires that all beings is well.

# VII. CONCLUSION

The approach of good living is part of something much more near and close friend of the people and that is why it is that found in the knowledge of peoples one of their bases and sense. Then the good life is based on those constellations of knowledge that we find in the strategies of social organization, the bonds of community, oral histories, the environmental processes of appropriation, of knowledge of plants and animals, agricultural practices and livestock, of cultural processes. (Avila Agustin, 2011)

It is as well as the good live transits from the knowledge

toward the construction of meanings of transcendence of liberalism and the decolonization of the imaginary. If modernity is a product of christianity, the liberalism and marxism, the good life of the twenty-first century has as axs community democracy, multiculturalism, the defense of the biocultural diversity and the common good in the horizontality of the societies in movement. Part of these routes are spread in this region of Chiapas Jungle Border that is a cultural mosaic, ecological, social and political diverse that speaks to us of great hope for a new project for the nation to walk different paths to the exclusivity and to western capitalist rationality-business.

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#### AUTHORS

**First Author** – Agustin Avila Romero, Doctor and master in Rural Development, Economist of the UNAM, Professor and researcher in time full Intercultural University of Chiapas, author of the book Decoloniality and good living and a member of the national system of researchers CONACYT. agustinavila@yahoo.com

# **Antecedents of Entrepreneurial Intention**

# (With Reference to Undergraduates of UWU, Sri Lanka)

Weerakoon WMPGC<sup>\*</sup>, Gunatissa HHAJ<sup>\*\*</sup>

<sup>\*</sup>Faculty of Management, Uva Wellassa University of Sri Lanka <sup>\*\*</sup>Faculty of Management, Uva Wellassa University of Sri Lanka

Abstract- Entrepreneurial intentions are considered as more accurate predictors of entrepreneurial behavior. Understanding entrepreneurial intentions will enable the researchers to investigate the dynamics of entrepreneurial venture creation process. However, the controversial findings on the determinants of entrepreneurial intentions and the focus on the isolated variables without a theoretical rationale triggered this study to question what antecedents would predict the entrepreneurial intention of undergraduates. Thus, this study was conducted with the aim of identifying the antecedents of entrepreneurial intention of undergraduates. Accordingly, a sample of 209 undergraduates from Uva Wellassa University of Sri Lanka was studied by using a structured questionnaire on entrepreneurial intention, perceived desirability, perceived social norms and perceived feasibility. The results of the Binary Logistic Regression employed in order of achieving the objective of this study confirms that higher the perceived desirability and perceived feasibility higher the likelihood of entrepreneurial intention. Further, there was no adequate statistical evidence to support a significant predicting capacity of perceived social norms.

*Index Terms*- Entrepreneurial Intention, Perceived Desirability, Perceived Social Norms, Perceived Feasibility, Antecedents

## I. INTRODUCTION

Intention is an individual's specific propensity to perform an action or a series of actions and it is stemmed from conscious thinking that directs behavior (Parker, 2004). As Krueger (2003) and Fayolle & Gailly (2004), intention is the cognitive state immediately prior to executing a behavior. Additionally, Kim and Hunter (1993) stress that the attitudes predict intentions and intentions predict behavior.

Entrepreneurial actions require a perceived opportunity and intentions toward pursuing that opportunity since external phenomena are captured through the process of perception by people (Krueger, 2003). Thus, Bird (1988) defines entrepreneurial intention as the state of mind directing a person's attention and action towards self-employment rather organizational employment. In addition, entrepreneurial intention is a commitment to starting a new business (Krueger, 1993) and is being treated as a key element to understand the new-firm creation process (Bird, 1988).

Accordingly, understanding entrepreneurial intentions will enable the researchers to investigate the dynamics of entrepreneurial venture creation process. However, "many studies have considered isolated variables, often without a clear theoretical rationale, as drivers of entrepreneurial intentions" (Zhao et al., 2005) and as a result of that the literature witnesses a disagreement of the determinants of entrepreneurial intentions. Apparently, literature has extensively focused on situational and individual factors as the determinants of entrepreneurial intention. Nevertheless, Kolvereid (1996) found that demographic characteristics influence employment status choice indirectly, through the effects of those characteristics on attitudes, norms and self-efficacy. "Individuals seldom behave consistently in different times and situations, and hence, personality traits are not good predictors of future action" (Gartner, 1989). As cited by Autio (2001), "Starting up a new Ž firm clearly falls into the category of planned behavior (Krueger, 1993; Krueger & Carsrud, 1993; Davidsson, 1995; Kolvereid, 1997)". As mentioned by Shapero (1982), entrepreneurial intentions depend on perceptions of personal desirability, feasibility, and propensity to act.

It has been one of the critical roles of policy makers and academics to initiate and support the new venture creation targeting the economic development. This calls for a departure from traditional teaching and skill development enabling the students to equip with the appropriate motivation, knowledge and abilities for firm creation (Gibb, 1996; Etzkowitz et al., 2000; Johannisson et al., 1998). This emphasizes the entrepreneurial role to be played by the higher education institutes in 21<sup>st</sup> century. However, "there is little understanding of the factors that affect students' intentions of becoming entrepreneurs and the relationship between entrepreneurship education and students' entrepreneurial attitudes and intentions" (Souitaris et al 2007). According to Veciana et al. (2005), there is a consensus that the attitude towards entrepreneur, entrepreneurial activity and its social function are determinant factors for university students to decide an entrepreneurial career. Moreover, there is a paucity of understanding on the contextual differences in entrepreneurial intentions and attitudes among students (Wilson et al 2004).

Thus, this study questions what antecedents would predict entrepreneurial intention of undergraduates. Therefore, the main objective of this study is to identify the antecedents of entrepreneurial intention of the undergraduates with reference to Uva Wellassa University (UWU) of Sri Lanka which is the 14<sup>th</sup> National University. The rationale of taking UWU as the study context is its emphasis on entrepreneurial processes that are aiming at promoting entrepreneurial behaviours of undergraduates.

## II. LITERATURE REVIEW

The literature supporting the research question raised in this study is summarized below. Accordingly, conceptualizations on entrepreneurial intention will be presented initially. Secondly, theoretical clarifications on the antecedents of entrepreneurial intention will be discussed based on the Theory of Planned Behaviour (TPB).

#### A. Entrepreneurial Intention

Entrepreneurial intention is the proclivity or the potentiality of starting a new business (Uddin & Bose, 2012). Literature provides evidence on various ways of conceptualizing entrepreneurial intention. Such common forms include; "I intend to start my own business in the next 5-10 years" (Shapero & Sokol, 1982); "Have you ever considered founding your own firm?" and "How likely do you consider it to be that within one (or five) years from now you'll be running your own firm?" (Davidsson, 1995); "How likely is it that you will start a new firm of your own or with friends?"(Autio et al., 2001); "What would you say is the probability to start your own business in the next 3 years?" (Audet, 2002), (Veciana et al., 2005) and (Urbano, 2006); "Do you think you'll ever start a business?" (Krueger, 2006); "Intent to start my own business in the near future" and "I intent to start my own business sometime in the future" (Zampetakis, 2008); and "How would you describe your situation of starting a business?"(Giagtzi, 2013). Reitan (1996) had used an index measure of intention based on short and long term intentions and on the tradeoff between running one's own firm, as opposed to being employed by someone.

As cited by Arkarattanakul and Lee (2012), intention to act is considered as the most reliable predictor of actual behavior (Ajzen, 1991, 2001; Krueger, et al., 2000) and intentions necessitate the belief that the behavior is feasible and the belief that the behavior is desirable (Krueger, 2003). Entrepreneurial Event Theory (Shapero & Sokol, 1982) and TPB (Ajzen, 1991) can be considered as the main theoretical explanations on intentions in the literature. These intentions based models emphasize venture creation is stemmed from entrepreneurial intentions. However, according to Ajzen (1987; 2002), TPB is the most used model of conceptualizing the human intentions. Since starting up a new firm is considered as a planned behavior, TPB is well suited to the study of entrepreneurial behavior (Krueger, 1993; Krueger & Carsrud, 1993; Davidsson, 1995; Kolvereid, 1997) as cited by Autio et al., (2001).

According to TPB, attitude toward the act (Perceived Desirability), subjective norms (Perceived Social Norms) and perceived behavioral control (Perceived Feasibility) are the three main attitudinal antecedents of entrepreneurial intentions. The following section is a conceptualization of these variables.

## B. Perceived Desirability

Individual's assessment of the personal desirability of creating a new venture is known as perceived desirability (Boyd & Vozikis, 1994). Shapero (1982) defined perceived desirability as the attractiveness of starting a business. Conceptualization of this construct has been done with different approaches such as creating indexes and asking the respondents to answer a questionnaire item straightforward manner. For instance, "How appealing is the idea of one day starting your own business?" (Audet, 2002); "How attractive you find the idea of starting your own business?" (Guerrero et al., 2008) and, "How favourable is

being an entrepreneur?" (Giagtzi, 2013) had been used while Zampetakis (2008) had employed a global perceived desirability item, "The idea of being an entrepreneur is very desirable for me". However, this study employed the five point Likert Scale item with five statements developed by Kolvereid and Isaksen (2006) adapting the original questionnaire of Gundry and Welch (2001), so as to measure the perceived desirability. Wang et al. (2011); Linan et al. (2005, 2011); and Giagtzi (2013) have identified a positive impact of perceived desirability on entrepreneurial intention. Accordingly,

# $H_1$ : Higher the Perceived Desirability higher the likelihood of entrepreneurial intention

#### C. Perceived Social Norms

An individual's perceptions of what important people in an individual's life think about venture creation (Boyd & Vozikis, 1994). "The social norm measure is a function of the perceived normative beliefs of significant others, such as family, friends, and co-workers, weighted by the individual's motive to comply with each normative belief" (Elfving et al., 2009). Other studies (Kolvereid and Isaksen, 2006 and Souitaris et al., 2007) have asked for the stance of three important reference groups closest family, friends and other important people regarding the entrepreneurial career of the respondent. Since this study is based on undergraduates, the above questionnaire items have been adapted by incorporating the consensus of "lecturers" as a reference group omitting the "other important people" category of the original. However, perceived social norms have little explanatory power for entrepreneurial intentions as mentioned by Ridder (2008) and Autio et al., (2001). In contrast of that, Kennedy et al. (2003), Karimi (2012) and Engle et al., (2010) have found that the subjective norms positively related with entrepreneurial intentions. Thus,

 $H_2$ : Higher the Perceived Social Norms higher the likelihood of entrepreneurial intention

## D. Perceived Feasibility

According to Boyd & Vozikis, (1994), perceived feasibility means the individual's perception on his or her ability to successfully initiate a new venture and it is said to be identical with self-efficacy. Self-efficacy is the individual's personal belief on his or her competence and it is a belief that he can do something specific (Bandura, 1977, 2001). As to Krueger et al., (2000), the notion of perceived self-efficacy is a proxy for feasibility perceptions. Thus, General Self Efficacy Scale developed by Schwarzer and Jerusalem (1995) was employed in this study to measure the perceived feasibility. Wang et al. (2011) have identified a positive impact of perceived feasibility on entrepreneurial intention. "Studies have found that selfefficacy influences entrepreneurial intention (Boyd and Vozikis, 1994; Krueger & Brazeal, 1994; Kuehn, 2008; Shane, 2003) as cited by Arkarattanakul & Lee (2012.) and Bandura (1977, 1986). In addition, Segal et al (2002) found that students with higher entrepreneurial self-efficacy had higher intentions to become self-employed. Further, Linan et al. (2005, 2011); and Giagtzi (2013) have found that there is a positive impact of perceived feasibility on entrepreneurial intention. Therefore,

 $H_3$ : Higher the Perceived Feasibility higher the likelihood of entrepreneurial intention

Accordingly, the conceptual framework (Figure 1) can be established as follows.



**Figure 5 - Conceptual Framework** 

#### III. RESEARCH METHODOLOGY

#### A. Population and Sample of the Study

The population of this study was comprised with the final year undergraduates of UWU in the academic year 2013/2014. Accordingly, general intake is 50 students per batch of each degree programme and there are 11 degree programmes. Thus, the size of the population was 550 and a random sample of 50% from each batch was considered for the sample and intended sample size was 275. However, the emergent sample size was 209 due to the exclusion of incomplete questionnaires returned and the response rate was 76% accordingly.

B. Data Collection

Data were collected by using a structured questionnaire which was comprised with two main sections as follows (Table 1).

#### C. Data Analysis

The descriptive statistics; frequencies and percentages and graphs and tabulation techniques were used to describe the profile information of the sample. In order to achieve the main objective of identifying the antecedents of entrepreneurial intention of undergraduates was mainly achieved by the Binary Logistics Regression specified below.

 $Log (EI) = \beta_0 + \beta_1 PD + \beta_2 PSN + \beta_3 PF + \varepsilon$ 

Table 1 – Content of the Questionn	aire
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Part	Content	Source
Part A	Profile	
	Information of	
	the respondent	

Part B		
Sec. I	Questionnaire	(Shapero and Sokol,
	items on	1982)
	entrepreneurial	
	intention	
Sec. II	Perceived	General Self Efficacy
	Feasibility	Scale - Schwarzer and
		Jerusalem, 1995
Sec. III	Perceived	Kolvereid and Isaksen
	desirability	(2006)
Sec.	Perceived	Kolvereid and Isaksen
IV	Social Norms	(2006) and Souitaris et
		al. (2007)

#### IV. RESULTS AND DISCUSSION

The following section provides a brief account of the studied sample firstly and that will be followed by the interpretation and discussion of the outputs of Binary Logistic Regression employed so as to achieve the main objective of the study.

A. Profile of the Sample

According to Figure 2, majority of the sample (114) is comprised with female undergraduates. In addition, 138 undergraduates are having an entrepreneurial intention. However, 51.4% of those who have an entrepreneurial intention are male undergraduates and the majority of those who have no entrepreneurial intention (66.2%) is comprised with female undergraduates.



Figure 6 - Gender vs. Entrepreneurial Intention

Ethnicity of the sample includes Sinhalese, Tamil and Muslim and Majority (87.1%) of the undergraduates is Sinhalese (Figure 3).



Figure 7 - Composition of Ethnicity in the Sample

Furthermore, respondents were asked to disclose whether they have the experience of their parents' business (EPB) and closest friends' business (CFB) and the frequencies are portrayed in the Figure 4 and Figure 5.



Figure 9 - EPB vs. Entrepreneurial Intention



Figure 9 - CFB vs. Entrepreneurial Intention

Although the majority (145) of the undergraduates has no prior experience of their parents' business, 87 of them have an entrepreneurial intention (Figure 4). Interestingly, as to the Figure 5, closest friend of 107 undergraduates is having a business while the rest 102 undergraduates have no experience of his or her closest friends' business. In spite of having a prior experience of the closest friend's business, 56 undergraduates have an entrepreneurial intention.

#### B. Antecedents of Entrepreneurial Intention

The summary outputs of Binary Logistic Regression are presented below (Table 2-5).

 Table -2 Omnibus Tests of Model Coefficients

		Chi- square	df	Sig.
Step 1	Step	21.646	3	0.000
	Block	21.646	3	0.000
	Model	21.646	3	0.000

Table – 3 Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square			
1	246.227 <sup>a</sup>	0.098	0.136			
a. Estimation terminated at iteration number 4 because						

parameter estimates changed by less than .001.

Table – 4	Hosmer	and L	emeshow	Test
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Step Chi-square		df	Sig.	
1	11.743	8	0.163	

As to the Table-2, Omnibus Tests of Model Coefficients' Chi-square value is significant at P<0.05. Thus, it implies that there is a statistically significant improvement in the model with compared to the "null model". This was traceable from the classification accuracy of the null model (66%) and the populated model (71.8%). In addition, explanatory capacity of the model is varying from 9.8% to 13% (Table -3). The insignificant (P>0.05) Chi-square value of Hosmer and Lemeshow Test (Table- 4) confirms that the model is fitted well. According to the Table - 5, the Wald Statistics is significant only in the cases of Perceived Feasibility and Perceived Desirability confirming that entrepreneurial intention is predicted only by these two independent variables. Thus, Binary Logistic Regression equation can be estimated as follows.

Entrepreneurial Intention = -3.72 + 0.060 Perceived Feasibility + 0.146 Perceived Desirability

		В	S.E.	Wal d	df	Sig.	Exp (B)
Step 1 <sup>a</sup>	Perceived Feasibilit y	0.06 0	0.02 5	5.86 7	1	0.01 5	1.06 2
	Perceived Social Norms	0.00 5	0.02 3	0.04 9	1	0.82 5	1.00 5
	Perceived Desirabili ty	0.14 6	0.04 1	12.7 1	1	0.00 0	1.15 7
	Constant	- 3.72	1.16 8	10.1 3	1	0.00 1	0.02 4
a. Variable(s) entered on step 1: Perceived Feasibility Perceived Social Norms, and Perceived Desirability.						bility,	

Table - 5 Variables in the Equation

Hence, one unit increase in perceived feasibility and perceived desirability increases the probability of entrepreneurial intention of starting a business by odds of 0.060 and odds of 1.046 respectively when other things are constant. Additionally, the insignificant Wald statistics for perceived social norms implies that it is not a statistical predictor of entrepreneurial intention.

Social Norms might not be considered by the undergraduates when they are highly confident in their
competencies. This might be true for UWU undergraduates as there is a higher emphasis on entrepreneurial skill development in the curricular enabling the students to have a higher confidence in their self-efficacy. Further, the influence of technological advancement might increase the perceived desirability and feasibility and thereby a less sensitivity on social norms. "Young people make entrepreneurial career decisions more based on personal (attitudes, self-efficacy) rather than social (subjective norm) considerations" (Autio et al., 2001; Krueger et al., 2000). Further, after analyzing sixteen research works, Ajzen (1991) has found that perceived social norms tend to be a very weak contributor to the entrepreneurial intentions as cited by Linan et al. (2005). Further, the relevance of social norms may vary depending on cultural contexts. (McGrath & MacMillan, 1992; Davidsson & Wiklund, 1997; Krueger & Kickul, 2006). It is to be noted that as a result of cultural diffusion with the globalization, there might be a low concern for social norms.

#### V. CONCLUSIONS AND SUGGESTIONS

This study was conducted with the aim of identifying the antecedents of entrepreneurial intention by taking a sample of 209 undergraduates from UWU of Sri Lanka. The majority of the studied sample (66%) had an entrepreneurial intention. The findings related to the main objective support the first and third hypotheses established in this study:

 $H_1$ : Higher the Perceived Desirability higher the likelihood of entrepreneurial intention

 $H_3$ : Higher the Perceived Feasibility higher the likelihood of entrepreneurial intention

These findings are compatible with the findings of Wang et al. (2011); Linan et al. (2005, 2011); and Giagtzi (2013). However, there was no adequate evidence to support the second hypothesis;

 $H_2$ : Higher the Perceived Social norms higher the likelihood of entrepreneurial intention

This finding complies with the findings of Ridder (2008) Armitage & Connor (2001) and Autio et al., (2001) mainly.

All in all, what makes clear is that there is a higher need of changing the attitudes of undergraduates aiming to cultivate a higher perception on desirability and feasibility. In order of achieving this goal, it is one of the vital responsibilities of higher education institutes to design their curricular in such a way that further the self- efficacy of entrepreneurial actions and positive attitude on entrepreneurship among undergraduates. Accordingly, the future research can focus on the factors which would increase the perception on feasibility and desirability of undergraduates.

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#### AUTHORS

First Author – Weerakoon WMPGC, Faculty of Management, Uva Wellassa University of Sri Lanka

Second Author - Gunatissa HHAJ, Faculty of Management,

Uva Wellassa University of Sri Lanka

### Sympathetectomy as a Modality of Treatment for Chronic Phantom Limb Pain.

Kuda B Galketiya MS, FRCS<sup>1</sup>, Vasanti G Pinto MD, FRCA<sup>2</sup>, Anupa Herath MBBS<sup>3</sup>, R M D Rathnayaka MBBS<sup>4</sup>

<sup>1</sup> Consultant Surgeon/ Senior Lecturer, Department of Surgery, Faculty of Medicine, University of Peradeniya, Peradeniya, Sri Lanka.

<sup>2</sup> Consultant Anaesthetist/ Senior Lecturer, Department of Anaesthesiology, Faculty of Medicine, University of Peradeniya, Peradeniya, Sri Lanka. <sup>3</sup> Registra in Anaesthesiology, Teaching Hospital Peradeniya, Peradeniya, Sri Lanka.

<sup>4</sup> Temporary Lecturer, Department of Anaesthesiology, Faculty of Medicine, University of Peradeniya, Peradeniya, Sri Lanka.

*Abstract*- **Objective** - To evaluate cervical sympathectomy as a modality of treatment for chronic phantom limb pain

Design- Clinical Observation

Setting- Teaching Hospital Peradeniya, Sri Lanka

**Subject-** A patient presented with phantom limb pain following left upper limb amputation due to a trauma 31/2 years ago. He complained of a Phantom limb sensation with painful writhing movements in fingers for which medical management failed to offer a lasting effect.

**Methods** - Thoracic sympathectomy of sympathetic chain from the 2nd to 4th ganglion was performed by Thoracoscopic approach. The resulting relief was analyzed.

**Results-** Review at Two weeks and Three months revealed the phantom pain has disappeared leaving the phantom sensation of the existence of the hand only with no pain which felt connected to the stump.

**Conclusions-** Cervical sympathectomy needs to be explored as a treatment modality for phantom limb pain.

*Index Terms*- Phantom limb pain, thoracic sympathectomy, Thoracoscopic.

#### I. INTRODUCTION

**P**hantom limb pain is a painful sensation originating from an amputated limb, having an incidence of 60-80% of all amputees, which has made it a significant problem<sup>1</sup>. The incidence can be vary according to the age of the patient , congenital or traumatic in etiology, or the presence of infection or gangrene.<sup>2, 3, 4, 5, 6,7</sup>

These patients may be categorized as having a psychiatric problem and might not be subjected to proper treatment.<sup>8</sup>

Phantom limb pain can bear three different elements as painful sensation of the absent limb, sensation of the limb without pain or stump pain. These can present either in isolation or together <sup>1</sup>. Non painful phenomena are not considered as clinically important.

When considering the etiology of the phantom limb pain, even though not fully explained so far, different mechanisms have been proposed, involving brain, spinal cord and peripheral factors. Psychological factors do not seem to contribute to the causation, but it is suggested that it may have role in affecting the severity and the course of the pain.

Since the etiology is not well explained the treatment modalities also fall in to the same line of uncertainty. The current treatment of phantom limb pain includes medical, non-medical and surgical treatment. Pharmacological treatment consists of Sodium channel blockers, Anticonvulsants, Tricyclic Antidepressants, and Opioids. Surgical treatment options vary as Nerve block, Sympathectomy and CNS stimulation. As adjuvant therapy modalities transcutaneous nerve stimulation, Mirror BiofeedbackMassage, Ultrasound, Physiotherapy, therapy, Sensory discrimination training exists. The sympathetic block can be obtained pharmacologically by a venous local anesthetic or thoracic sympathetic chain block or sympathectomy by pulse radiofrequency or surgically, all having reported varied success and failures <sup>5</sup>

This report explains a management of a chronic phantom pain with surgical thoracic sympathectomy which approached thoracoscopically.

#### II. CASE REPORT

A father of two children presented with a history of trauma to his left upper limb to a laundry machine 3 <sup>1</sup>/<sub>2</sub> years ago. The limb was salvaged by orthopedic intervention, but 9 days later the upper limb had to be amputated leaving 15cm long stump. The wound healed without any complication. From the day one onwards from the amputation, he could feel a phantom limb together with a residual pain in the stump. Patient could feel painful writhing movements in his medial 2 fingers and lesser pain in the other fingers in his absent limb. The pain was explained as persistent sharp shooting type pain scored as 8-9 on the visual analogue scale with amplification 2-3 times a day. Initially patient received pharmacological treatment including, NSAIDs, Tramadol, Gabapentine, but the pain failed to respond to pharmacological treatment. An orthopedic intervention with reduction of the length of the stump bone segment and but did not alleviate the pain. The neurectomy was done medical treatment was escalated with Tricyclic anti-depressants, Carbamezapine, oral Ketamine and ultrasound guided local injection of Bupivacaine via a catheter to block the brachial plexus which only bought temporary relief for about 4 hours but failed to have a lasting effect.

Due to persistent pain in spite of the previous interventions patient underwent thoracoscopic Thoracic sympathectomy.

#### III. METHOD

After general anesthesia patient was placed semi prone and a near prone position was adopted by tilting the table. A single lumen endotracheal tube with both lung ventilation was used. The camera port was placed in the 7th intercostal space just inferior to the angle of the scapula.  $CO_2$  insufflation to a pressure of 8mmHg was used to obtain a partial lung collapse. Two 5mm working ports were placed; 5th intercostal space and 9th intercostal space in the mid axillary line . The thoracic sympathetic chain was identified . The mediastinal pleuron over the sympathetic chain from the 2nd ganglion to 4th was divided. Intercostal drainage was not used.

#### IV. RESULTS

There were no per or post operative complications. In the post op day one patient couldn't feel the existence of amputated limb except for the hand which he could feel as if connected to the amputated stump (fig1) together with the writhing and trashing movement of the fingers and the chronic persistent pain related to hand, but no residual limb pain. Post op hospital stay was uneventful and the patient was discharged on the post op day 2. Review at Two weeks and three months in the clinic revealed he did not have any pain but only the sensation of the existence of the hand connected to the stump .

#### V. DISCUSSION

It is reported the occurrence of Phantom limb pain presenting both early or late but having more incidence of early occurrence  $^{2, 10}$ . This patient too who was having an early presentation and treatment for the last 3 and 1/2 years.

Usually the pain is intermittent <sup>3</sup>but here in contrast he had a constant type of pain. Phantom pain is usually discussed in the distal parts of the missing limb<sup>11</sup>as this patient discussed his pain in the fingers.

Most instances the patients express the pain as same as pre amputation pain but in this patient it was not seen<sup>12</sup>. Stump pain can be connected with the phantom pain and many patients who had suffered from stump pain can subjected to phantom pain<sup>2, 11</sup>. This patient too had a symptom like stump pain which was treated surgically and subsided but leaving the phantom pain.

When considering treatment modalities, phantom limb pain is difficult to treat probably due to the uncertainty of the mechanism.<sup>1</sup>The ectopic and increased spontaneous and evoked activity from the periphery and Cell bodies in DRG, increase in this general excitability of spinal cord neurons, involvement of the sympathetic nervous system, increased activity in N-methyl d-aspartate (NMDA) receptor operated systems and Cerebral reorganization were described

In literature diverse treatment modalities were reported but surgical options are used as a last resort when other modalities have been tried. Surgical treatment options available are Stump revision, Sympatholytic Nerve block, Neurectomy, Sympathectomy and CNS stimulation consisting of Spinal cord stimulation .In this case patient has undergone various treatment including pharmacological treatment and other surgical treatment before attempting the sympathectomy.

There are no solid evidence for surgical and chemical sympathectomy for phantom pain, except stellate ganglion block

and thorasic sympathectomy in some neuropathic chronic pain conditions. <sup>9, 13, 14</sup> .The explanation of the pathophysiology may direct the rationale of how the treatment modality works .Sympathetic nerve sprouting in the dorsal root ganglia (DRG) contributes to the development and persistence of sympathetically maintained pain, Sprouting of sympathetic fibers and abnormal sympathetic sensory neuron interactions occur in the periphery were published in animal models.<sup>15</sup>

Sympathetic pre-ganglionic fibers for upper limb ganglia communicate with post-ganglionic fibers in T2, T3 and the stellate ganglion<sup>16, 17</sup>. Usually, thoracic sympathetic block target the T<sub>2</sub> and T<sub>3</sub> ganglia. Sympathetic nerve block with injection of drugs that prevent the transmission of signals along sympathetic nerves may temporarily relieve pain where as in sympathectomy, sympathetic nerves are permanently destroyed in which a portion of the sympathetic nerve trunk in the thoracic region is cauterized. The sympathetic nerve chain runs parallel to the spine in the posterior mediastinum. In the past, the sympathetic chain was approached either through a major incision in the chest wall through the axillary or supraclavicular fossa while both procedures carrying a risk related to major surgery outweighing any potential benefits. The surgical access by the video -assisted thoracoscopy made it possible with only very small incisions with its simplicity and time efficiency and less post operative morbidity. Sympathectomy at 2<sup>nd</sup> 3<sup>rd</sup> and 4th Thoracic levels was helped by the clear zoomed in Thoracoscopic vision.

Phantom sensation is common in many amputees as having the feeling of the existence of the limb at the same shape and size but fades off gradually and only in some persists as phantom pain<sup>3</sup>. Mostly this fading off elicit a phenomenon of telescoping which results in gradual absorption of the limb to the stump <sup>9, 3, 11</sup>. In this patient the fading off of the phantom pain (not only the phantom sensation) also showed the same telescoping.

#### VI. CONCLUSION

Cervical sympathectomy need to be explored as a treatment modality for phantom limb pain.

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#### CONFLICT OF INTEREST/DISCLOSURE SUMMARY

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#### AUTHORS

First Author – Kuda B Galketiya MS, FRCS, Consultant Surgeon/ Senior Lecturer, Department of Surgery, Faculty of Medicine, University of Peradeniya, Peradeniya, Sri Lanka. Second Author – Vasanti G Pinto MD, FRCA, Consultant Anaesthetist/ Senior Lecturer, Department of Anaesthesiology, Faculty of Medicine, University of Peradeniya, Peradeniya, Sri Lanka.

**Third Author** – Anupa Herath MBBS, Registra in Anaesthesiology, Teaching Hospital Peradeniya, Peradeniya, Sri Lanka.

**Fourth Author** – R M D Rathnayaka MBBS, Temporary Lecturer, Department of Anaesthesiology, Faculty of Medicine, University of Peradeniya, Peradeniya, Sri Lanka.

**Corresponding Author:** Dr. Kuda B Galketiya, Consultant Surgeon/ Sen or iLecturer, Department of Surgery, Faculty of Medicine University of Peradeniya, Peradeniya, Sri Lanka., Fax no: +94812388371, Telephone: +94 777 884008, Email: kbgalketiya@yahoo.com



Figure 1: The resulted Phantom limb sensation without pain after the thoracic sympathectomy.

# Evaluation of Biocontrol agents *in vitro* against *Fusarium oxysporum* causing Fusarium rot of Pleurotus spp.

#### Muneera farooq and Sahera nasreen

Department of botany, Govt institute of science, and research center, nipat niranjan nagar, caves road Aurangabad. 431004 (M.S).

Abstract- In vitro evaluation of Bioagents against both Fusarium oxysporum and Pleurotus sajor-caju revealed that all the bioagents more or less suppress the growth of Fusarium oxysporum. Out of six bioagents, Bacillus subtilis-115 expressed the efficient antagonistic activity against Fusarium oxysporum followed by P. flourescens-105, P. flourescens- 104 and P. flourescens-103. Among these bioagents tested P. flourescens-103 revealed more inhibitory effect against pathogen but also inhibited the mycelial growth of Pleurotus sajor-caju strongly. The bioagents Bacillus subtilis-115, P. flourescens-105 and P. flourescens-104 revealed less antagonistic activity against P. sajor-caju but their inhibitory effect against the pathogen was very strong.

*Index Terms*- pleurotus, Fusarium oxysporum, biological control agents

#### I. INTRODUCTION

**F**usarium rot is reported to be devastating disease in the crop production of mushrooms. It is occurring in almost all countries of world, where cultivation of this crop is in practice including India. It is also commonly occurring in mushroom houses in the Kashmir valley number of workers have recommended fungicidal treatment for management of this disease but growers are reluctant to use these chemicals as they inhabit the growth of the *Pleurotus* mycelium also (Rai and Vijay, 1992) and are non economical and results in environmental pollution. The present studies will be carried out to develop economically viable and eco-friendly management of this devastating disease of *Pleurotus* spp.

#### II. MATERIALS AND METHODS

Various bioagents were evaluated against *Pleurotus sajorcaju* and *Fusarium oxysporum*. The antagonists in this study were *Pseudomonas flourescens* isolate-103, *Pseudomonas flourescens* isolate-104, *Pseudomonas flourescens* isolate-105, *Bacillus subtilis* isolate-115, *Bacillus subtilis* isolate-116 and *Azospirillim*. Pure cultures of all these above mentioned microorganisms were procured from department of MRTC, SKUAST-Kashmir, Srinagar. All these bioagents were then tested for their antagonistic activity against both *Pleurotus sajor-caju* and *Fusarium oxysporum*. The culture discs of 5 mm size of each of the antagonists and the pathogen (*Fusarium oxysporum*) and *Pleurotus sajor-caju* taken from the margins of 7 days old cultures were aseptically transferred to solidified PDA on the opposite side (5 cm) apart in petriplates (9 cm). The petriplates having pathogen (*Fusarium oxysporum*) and *Pleurotus sajor-caju* separately served as control. The petriplates were incubated at  $26 \pm 1^{\circ}$  C, till the complete growth was observed in control plates. Colony diameter of the *Fusarium oxysporum* and *Pleurotus sajor-caju* were recorded and percent growth inhibition over control was calculated according to the formula given by Vincent (1947).

Mucalial	Radial growth in control – Radial	
inhibition -	growth in treatment	x 100
	Radial growth in control	-

#### III. RESULTS AND DISCUSSION

Data presented in the (Table 1) reveals that all bioagents more or less significantly, inhibited the mycelial growth of Fusarium oxysporum causing Fusarium rot in Dhingri (P. sajorcaju) mushroom .out of six bioagents tested, Bacillus subtilis 115 was most effective against Fusarium oxysporum, reduced the radial growth of Fusarium oxysporum by (66.65%) followed by Pseudomonas 105 (63.32%). It was followed by Pseudomonas 104 (62.21%). The maximum percent inhibition in radial growth of Fusarium oxysporum (49.25%) was observed in Bacillus subtilis 116 followed by Azospirillim (44.80%). The maximum percent inhibition of P. sajor-caju (63.69%) was exhibited by Pseudomonas 103 (Table 2). It was followed by Azospirillim (62.21%) followed by Pseudomonas 104 (58.51%) and Bacillus subtilis 116 (57.77%). Pseudomonas 105 show minimum inhibition of mycelial growth of P. sajor-caju (49.25%) followed by Bacillus subtilis 115 (52.95%), but showed high antagonistic property against pathogen (Fusarium oxysporum). None of the bioagents were able to cause complete inhibition of Fusarium oxysporum. Pseudomonas 104, Pseudomonas 105 and Bacillus subtilis were selected for in vivo trail, as all of them show good antagonistic effect on Fusarium oxysporum and least inhibition of *P. sajor-caju* in comparison to other bioagents (Plate-8 and 9). The mode of antagonisim observed with Bacillus spp. is antibiosis (Edward et al. 1994). Cho et al. (2002) reported the antagonistic activity of fluorescent Pseudomonas spp. against Pleurotus ostreatus (Bhanwar and Thakur, 2004) studied the effect of Azospirillim, Azatobacter, Bacillus Polymixa and Pseudomonas straita on vegetative growth and yield of oyster mushroom (P. sajor-caju).

This is supported by reports that most *Bacillus* spp. Produced many antibiotics such as bacillomycin, fengycin, mycosubtilin and zwittermicin, which are all effective in suppressing growth of pathogen both *in vitro* and *in vivo* (Pal and Gardener, 2006).

Concentration	Per cent inhibition of mycelial growth over control							
Bioagents	<b>R</b> <sub>1</sub>	$\mathbf{R}_2$	R <sub>3</sub>	Total	Mean			
P. flourescens-103	53.32	55.55%	61.10	169.9	56.65%			
P. flourescens-104	55.55	63.32%	67.77	186.64	62.21%			
P. flourescens- 105	61.10	64.43	64.43%	189.96	63.32%			
Bacillus subtilis-115	61.10	66.66%	72.21	199.97	66.65%			
Bacillus subtilis -116	45.55	48.88%	53.32	147.75	49.25%			
Azospirillim	39.99	46.66%	47.77	134.42	44.80%			
S.Em± =1.06								
C.D @ 0.05%= 2.73								

### Table-1 : In vitro evaluation of bioagents against Fusarium oxysporum the causal agent of Fusarium rot disease of Pleurotus sajor-caju

Table-2 : In vitro evaluation of bioagents against Pleurotus sajor-caju

Concentration	Per cent	er cent inhibition of mycelial growth over control						
Bioagents	<b>R</b> <sub>1</sub>	$\mathbf{R}_2$	$\mathbf{R}_3$	Total	Mean			
P. flourescens-103	61.10	63.32	66.66	191.08	63.69			
P. flourescens-104	55.55	58.88	61.10	175.53	58.51			
P. flourescens- 105	45.55	48.88	53.32	147.75	49.25			
Bacillus subtilis-115	49.99	53.32	55.55	158.86	52.95			
Bacillus subtilis -116	55.55	56.66	61.10	173.31	57.77			
Azospirillim	55.55	63.32	67.77	186.64	62.21			
S.Em± =0.88								
~ _ ~								

C.D @ 0.05%=2.29



Azospirillim

Bascillus subtilis 115



Bacillus subtilis 116

Pseudomonas flourescens 103



Pseudomonas flourescens 104

Pseudomonas flourescens 105

#### Plate-1: Evaluation of bioagents against Fusarium oxysporum



Azospirillim

Bacillus subtilis 115



Bacillus subtilis 116





Pseudomonas flourescens 104



Pseudonomas flourescens 105

Plate-2 : Evaluation of bioagents against Pleurotus sajor-caju

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#### AUTHORS

**First Author** – Muneera farooq and Sahera nasreen, Department of botany, Govt institute of science, and research center, nipat niranjan nagar, caves road Aurangabad. 431004 (M.S)., Email: muneerafarooq777@gmail.com

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# A Risk Management Framework for Clouds Using Big Data and Security Informatics using Attack Trees and Hidden Markov Model in Analysis and Prediction of Risks in Social Media Networks

K.D.B.H. Subasinghe<sup>\*</sup>, S.R. Kodituwakku<sup>\*\*</sup>, H.S.C. Perera<sup>\*\*</sup>

\* Department of Information Technology, Faculty of Computing, Sri Lanka Institute of Information Technology
 \*\* Department of Statistics and Computer Science, Faculty of Science, University of Peradeniya
 \*\*\* Department of Mechanical Engineering, Faculty of Engineering of Sri Lanka Institute of Information Technology,

*Abstract-* Social media refers to the means of interactions among people in which they create, share, and exchange information and ideas in virtual communities and networks. The growth of Information and Communication Technology (ICT) has resulted in an enormous volume of security related information present on the web largely when it comes to social media networks. Therefore, with the changing face of cyber security, although it is difficult, it was found that detecting the potential cyber-attacks or crimes is possible and feasible with the vast improvements in ICT. Cloud computing uses ICT resources that are delivered as a service over a network which has opened a promising opportunity across the globe thus resulting a greater popularity of e-commerce. The proposed framework is developed to manage risks of social media networks using the attack tree method which is used to model the risk of the system and identify the possible attacking strategies which the adversaries may launch. This paper presents the development of a Risk Management Framework by analysis of social media networks through web intelligence and security informatics using attack tree analysis based on the Hidden Markov Model for information extraction and prediction of risk factors of Social Media Networks.

Index Terms- Social Networks, Risk Management, Attack Tree, Big Data, Security Informatics, Web Intelligence.

#### I. INTRODUCTION

ndreas Kaplan and Michael Heinlein define social media as "a group of Internet-based applications that build on the ideological A and technological foundations of <u>Web 2.0</u>, and that allow the creation and exchange of <u>user-generated content</u> [1]." Furthermore, social media depend on mobile and web-based technologies to create highly interactive platforms via which individuals and communities share, co-create, discuss, and modify user-generated content. It introduces substantial and pervasive changes to communication between organizations, communities and individuals. Social networking platforms therefore allow organizations to improve communication and productivity by disseminating information among different groups of employees in a more efficient manner, resulting in increased productivity. Therefore, upon carrying out a detailed investigation on the social media networks, it was found that they facilitate open communication, leading to enhanced information discovery and delivery allowing employees to discuss ideas, post news, ask questions and share links where communication happens in seconds and perhaps in a button click. In addition, when the advantages of social media networks are analysed it was found that they provides an opportunity to widen business contacts, targets a wide audience, making it a useful and effective recruitment tool, improves business reputation and client base with minimal use of advertising and expands market research, implements marketing campaigns, delivers communications and directs interested people to specific web sites. On the other hand, when the disadvantages are considered it was found that they open up the possibility for hackers to commit fraud and launch spam and virus attacks, increases the risk of people falling prey to online scams that seem genuine, resulting in data or identity theft, may result in negative comments from employees about the company or potential legal consequences if employees use these sites to view objectionable, illicit or offensive material and potentially results in lost productivity, especially if employees are busy updating profiles, etc. On the other hand, since social networking websites are very famous, hackers and spammers are active on these websites and might use them to gather confidential information. However, as we discussed social networking websites do play an important role in gathering relevant information of an individual and organization; but, the privacy and security issues related to social networking websites are not new and it is not very easy to fight these problems due to the tremendous number of online users per second. Research reveals, there are so many ways that a hacker might use them for a bad purpose, but in general social networking websites are famous for Information gathering (intelligence gathering), Phishing, Fraud and Spamming.

Information gathering is the first and an important step of hacking and the success ratio is directly proportional with the information being available, where the social networking websites certainly do have the information which is required. For example, it was very common to hack an email account by using a social engineering technique, and the technique was to click on "forget password" and

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study show how dangerous a social networking website could be. Room sage is the networking material for this study. Here, the researcher chooses a picture of a very beautiful girl; and the logic is to attract the opposite gender and to connect with more and more people. Therefore, he created a fake profile on the famous social networking websites: Facebook, Twitter and LinkedIn. To give them a real and professional look he completed her profile with job and educational information which was fake too. Later, in the 28-day study, "Robin" contacted hundreds of people, most of them belonging to government sectors such as the DOD and military intelligence. Therefore, with this completely fake profile, Ryan was able to get email addresses, bank account numbers, invitations to conferences, and even a job. The most important aspect of this study is that Robin was offered to review confidential information and papers written by professionals.

In addition, while performing a detailed investigation on this scenario, according to a news report, it was found that 83 million Facebook profiles are fake, and the question arises as to who has created these fake profiles and for what purpose have they been created. Certainly, each purpose might be different, for example an individual might create a profile to spy on another individual, but the danger could be if actually the numbers of fake profiles belong to a particular organisation. The IT department of an organization is responsible to take care of this and to fight with the situation, which leads to a loss to the organization and can harm the reputation of organization. Subsequently, phishing is another dangerous attack which is very common in social networking websites. It seems that hackers usually target individuals for their phishing attack, but what if they target an accountant or any other person who is responsible to manage the finance of organization? In both cases it is very dangerous because the capital factor is involved. A phishing attack can easily lead to a very dangerous situation, as a smart hacker can compromise the complete computer network of an organization.

Consequently, upon carrying out a detailed background review it was revealed that it is an urgent requirement that the enormous volume of security relevant information is managed and that a risk management framework is set up in the Social networks. This involves exploration and analysis of the social media network data using a systematic approach such as attack trees which would be enhanced using the Hidden Markov Model for information extraction and prediction.

#### II. BACKGROUND

Currently Social media networks provide the people with the ability of ensuring complete connectivity, bringing people with common interests together, and creating a platform to share your life with the rest of the world. On the other hand, it has its negative aspects which are an enormous issue that needs attention. Therefore, upon carrying out a literature review on the advantages and the disadvantages of the available social media networks, it was found that there's a clearly visible threat to the critical information. Accordingly, this Social Media Era has brought with it new risks for employers, in terms of privacy, confidentiality and employee loyalty. Therefore, on the other hand, when the dangers of the presently available social media networks are considered, it was found that a balance of good and bad needs to be maintained and naturally when a far reaching medium such as the internet brings us social networking sites that spice up our lives a little, it also attracts the fractious few of society. Therefore, some of the things that could lead to potential social disaster mainly include the term hacking which is one e potential risk of social networking which is cited most often and the incidents of profiles and accounts being hacked into are commonplace. While this could be restricted to simply playing a practical joke on a friend, it sometimes leads to the more serious misdemeanour of identity theft. In fact, this requires a low level of technical skill and is referred to as social engineering. This technique banks upon the psychological aspect of a 'friend' connection; the hacker uses common interests, background and professional information all of which are posted on profiles, to extract sensitive information, like passwords and other details from the targeted individual and use them to create an alternate identity. Just using simple data like date of birth, name and location allows hackers to create fake social security cards, driver's licenses and ID cards.

In addition, it is reported that almost 15 million Americans are victims, either directly or indirectly, of identity theft. Despite this, on the other hand previously carried out research statistics show that even though people are adequately aware of the risks, only 40% of them manage their privacy settings which is according to a survey conducted by PC World Thus investing some time on securing your account against fraudsters and unknown individuals would prove to be beneficial in the long run. [2] People recruited in high security professions like the defense services, project engineers and scientists face an added disadvantage of hackers misusing any leaked classified information. It is seen that any unintended slip of information could have serious disasters, if it falls into the wrong hands. Another potential hazard of putting up pictures and videos on these websites is that they could be used for defamation where the reported cases include girls' photos being photo-shopped and used in objectionable places. In fact, it is also found instances where people use social networking sites to abuse or defame anonymously are constantly reported which is again a serious problem around the globe. Subsequently, Social media has brought to the world a common medium for thoughts, words and expression. However its correct and efficient usage is completely dependent on how it is managed. Nevertheless, being aware of the risks and vulnerabilities that we are exposed to through these media only empowers further to use them in a positive way. It is up to us to make sure that social networking does not turn into social dysfunction. With the rapid increase in the use of social media networks, some organizations

addressed social media risks by prohibiting its employees from participating on social media websites when at work. Subsequently, most organizations have now realized how social media can boost their marketing and advertising strategies and they are embracing that media is a part of their business strategy. However, when doing so, organizations would benefit greatly from properly understanding and managing the risks of social media.

Therefore, upon carrying out an exploration on the use of social media networks as a globe and upon analyzing the statistical information being obtained, it was decided that global security and international security are constantly evolving and traditionally, the terms have dealt with states and issues of interstate war and power. On the other hand as the World Wars and the Cold War wound down and the number of major interstate conflicts dwindled, the focus diverted to encompass international organizations and intrastate issues like civil wars. However, due to globalization and major terrorist attacks, the focal point has shifted to access the effects of non-state actors. Therefore, with the advancement in technology as a globe, it's pretty much clear and a vital fact that almost all countries and more that 75 percent of the population of a country in this entire globe has access to information communication technologies, therefore the use of these powerful technologies itself has advanced the ability of those non-state actors including terrorists, criminals and rioters to impact the international security.

In fact, it's important to understand that we live in a globally connected world and along the statistics proven it's seen that a single extraordinary action of a man can spark events that affect lives of billions of people living in this earth and bring about a terrible disaster which can account to a much terrific one worse than a nuclear war. So when we say global security or international security, it's important to understand that we mean everything that affects the safety and the livelihood of the people surrounding you. Currently, in the process of carrying out a detailed research on the usage of Social media networks as a globe we found certain statistical information upon a survey being carried out where, 63% respondents indicated "that employee use of social media puts their organization's security at risk" while 29% "say they have the necessary security controls in place to mitigate or reduce the risk" [2]. In a different study, 49% of executives surveyed said that they feel that the use of social media could damage company reputation, yet in that study "only one in three companies addressed those concerns" [3]. Indeed, the growth rate of some of the more popular social media networks is phenomenal. FaceBook, a social networking site, has reached close to 700 million users and when the statistics are analysed, when you take a count of the number of users, well if FaceBook was a country, it would be the third largest. According to a brochure released by Websense, FaceBook has an annual growth rate of 41% and Twitter is growing at 85% year after year [4]. Therefore, it is clearly seen that there's a great risk to the mankind with the development of social networks across the globe and it was also a major issue that was discussed during the Commonwealth Heads of the Government Meeting 2013 that was held in Sri Lanka where the Heads of Government reaffirmed the importance of addressing the increasing threat of cybercrime, which poses a major obstacle to socio-economic growth, peace and stability across the globe.

During the rigorous process of review of the past research it was also found that research was carried out which has initiated the development of an Attack tree based risk assessment for the Location Privacy in Wireless Sensor Networks (WSNs)[11]. Fault tree analysis (FTA) developed by Bell telephone Laboratories in 1962 is a top-down approach to failure analysis, commencing with the potential undesirable event, and then determining all the ways a particular vulnerability can happen [12]. Back in time from the 1990's the tree structure have been applied to investigate the attack profile based on FTA (Fault tree analysis) by discovering all possible attack paths of threat lists that evolve to form an attack tree. In fact, attack graphs can simulate complex attack scenarios, but its disadvantage is the complexity in visualization [5] [6]. The attack tree approach which provides a formal and a methodological way of describing the security of systems based on varying attacks was proposed by Bruce Schneier to model threats against computer systems[8][9]. In addition, on the other hand, the attack trees easily answer "what-if' games with potential attack or defense action, and allow the developer to refine the attacks to the level of detail desired [7]. Nevertheless, its disadvantage is that it is quite difficult to provide an effective means of stating the attack and defense profile in an interactive way. Consequently, attack trees seem to be more suitable for assessing the threats. In fact, for the purpose of statistical analysis using a probabilistic model, research proved the use of Hidden Markov Model[14] which is appropriate for the use of statistical pattern analysis and it was found that since the early 1970's HMM's have served application areas such as biological sequence analysis and SMS spam detection in the mobile communication industry[15]. Therefore, upon considering the currently performed research in this aspect, we claim that, in order to assess the safety/security properties of a target critical infrastructure, it is necessary to assess both the critical event chains caused by random events and by malicious cyber events.

#### III. METHODOLOGY

Risk assessment in social media networks focuses a major concern on the 'TRUST' of the content that is being shared on the World Wide Web [3]. In fact, it's always a question whether we can really trust the people with whom we are speaking to, or are the data we publish and share going to be secure over the wireless networks and rather are we communicating the data amongst the right people. Nevertheless the world is bloomed with the emerging technologies and the use of smart devices offering a tremendous convenience and service both to industry and its end users. In addition, the world has itself become an IOT or an Internet of Things. The proposed framework is developed using the attack tree method which is used to model and analyze the risk of the system and identify the possible attacking strategies which the adversaries may launch. Therefore, using this attack tree model, it is convenient to analyze the

capability of the attack source and estimate the degree or the impact of a certain threat that might bring to a system. Here, the multi attribute theory is adopted to calculate the total probability of reaching the attack goal [10]. Thereafter attack sequences are constructed in order to identify all the possible attacks on the social media networks. Therefore, according to the quantitative result the decision maker of the system is able to identify which attacks are of the greatest possibility and then decide what protection measures should be used to counter these attacks. In fact, here we would assign values to the leaf nodes and calculate the system's risk followed by carrying out the attack sequences on the basis of the attack tree.

Here, a tree named attack tree is constructed by identifying the vulnerabilities and threats of Social Media Networks and it is used to represent attacks against a system with the final desired goal as the root node and different ways of achieving that goal as child nodes. Each child node of the root becomes a sub-goal and children of that node are ways to achieve that sub-goal. If one of these nodes cannot be divided further, it's a leaf node. Otherwise those nodes are treated as sub-goals separately and are divided continually until all events become leaf nodes. Therefore, according to the logical relationship among them, those nodes which are linked with an OR-Gate or an AND-Gate are OR and AND nodes respectively. OR- gates are used to represent alternative attack methods and AND-gates are used to represent different steps towards achieving the same goal [13]. Our next step in successful development of the attack tree is the carrying out of the risk assessment by assigning attribute values to the attack tree nodes. There is no systematic method available to determine parameter values for each node in the attack tree. Therefore, in order to evaluate these values, certain aspects of details of the system including protocol, hardware, application, operating system, environment as well as attack software and tools are required. Therefore, here we would consider three attributes of the leaf nodes which are the attack cost which is the proportion of the costs and benefits, technical difficulty and the probability to be discovered.

A Hidden Markov Model (HMM) is defined as a statistical model that describes a series of observations generated by stochastic process or Markov process [14]. The HMM is used to make use of the observation information of social media risks to gain insight to various aspects of the underlying Markov process. In fact, a Markov process is a sequence of states where the progression to the very next state depends entirely on the present state, and not the past states. Therefore, the Markov process in the HMM is hidden and it can be described as a finite state machine which has some fixed number of states and it provides a probabilistic framework for modeling a time series of multivariate attack observations. The fundamental objective here is to make use of the observation information of social media risks to gain insight to various aspects of the underlying Markov process. Therefore, here it was decided to develop and train a HMM to represent a collection of risk data which is in the form of observation sequences produced by the attack trees. Therefore, a HMM is developed and trained to represent a collection of risk data which is in the form of observation sequences produced by the attack swhich are of the greatest possibility eventually decide what protection measures should be taken to counter these attacks thus developing an effective risk management framework for the risk analysis of social media networks.

#### IV. DISCUSSION

Subsequently, the risk associated with a specific attack on an asset can be reduced by reducing the level of threat to it, by reducing its vulnerability to that threat, or by reducing the consequences or impact of an attack should it happen. Accordingly, on the basis of the attack tree we can study the attacker's behavior by constructing attack sequences. An attack sequence S is a real path which an attacker can implement and is composed with a set of leaf nodes. The attacker can achieve the final goal in case all the attack events of the nodes in the attack sequence occur. Once the attack sequences have been known their probabilities can be worked out and we can compare them to figure out the attack sequence which the adversary may launch most likely. In fact, we can adopt the Boolean algebra method to get all the attack sequences of the attack tree. The probability of the attack sequence is the product of the probability of all the leaf nodes involved in the attack sequence.

Therefore, initially as a step for the development of a risk management framework, it is suggested and proposed that the use of Attack Trees for the Attack Sequence Analysis would enable us to clearly identify which attack sequences and paths are most likely to happen, where thereby we can mitigate the ability of an attacker reaching the final goal by avoiding the occurrence of the attack events of the nodes of the sequences which reduces the cost of recoverence from the threat once it would have already occurred as prevention is always extremely important [16][17]. A HMM is incorporated as a state machine where the transitions between the states are characterized by fixed probabilities and every state is associated with a single probability for observing a group of observation symbols. The states in the trained HMM are used to represent attributes of input data, while the transition and observation probabilities stand for statistical properties of these attributes. Therefore, for any given observation sequence. The probability computed is therefore high if a similarity is detected between the observed and trained sequence. Therefore, as the threat to social media networks is a widely spoken and researched area, we propose that more attention needs to be put forward in order to develop a well lit Risk Management Framework in order to mitigate the risks and losses being faced by the individuals around the globe.

#### V. CONCLUSION

Therefore, upon carrying out a comprehensive investigation on the cyber attacks of the social media networks we have proposed an innovative risk assessment approach for the risk management of social media networks. Here, we analyze the threats and vulnerabilities from the network point of view and build the attack tree by enhancing prediction probability using the Hidden Markov Model. In fact, the ongoing and future research that we are pursuing is targeting towards complete development of an expert system based on a trusted diagnosis model thus develop a fully automated Risk Management Framework for the Social Media Networks.

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#### AUTHORS

**First Author** – K.D.B.H. Subasinghe is with the Postgraduate Institute of Science, University of Peradeniya and Department of Information Technology, Faculty of Computing of Sri Lanka Institute of Information Technology - <u>buddhimahs@hotmail.com</u> / <u>buddhima.s@sliit.lk</u>

Second Author – Professor S.R. Kodithuwakku is with the Department of Statistics and Computer Science, Faculty of Science, University of Peradeniya - <u>saluka.k@gmail.com</u>

**Third Author** – Professor H.S.C.Perera is with the Department of Mechanical Engineering, Faculty of Engineering of Sri Lanka Institute of Information Technology - <u>chandana.p@sliit.lk</u>

### Titanium Dioxide Production by Hydrochloric Acid Leaching Of Roasting Ilmenite Sand

#### Sayekti Wahyuningsih\*, Ari Handono Ramelan\*\*, Edi Pramono\*, Ariantama Djatisulistya\*

\* Chemistry Department, Faculty of Mathematic and Natural Science Sebelas Maret University Department \*\* Physic Department, Faculty of Mathematic and Natural Science Sebelas Maret University

*Abstract-* Ilmenite ore (FeO.TiO<sub>2</sub>) is source of titanium dioxide (TiO<sub>2</sub>) production. Titanium dioxide occurs in polymorphic forms as rutile, and anatase phase. In Indonesia, ilmenite sand was found in Bangka island. Modification of a commercial process capable to produce TiO<sub>2</sub> high grade from ilmenite. In this research, the production of TiO<sub>2</sub> from ilminite had been conducted and resulted the excellent procedure through roasting and leaching process. Result of the hydrochloric acid leaching of roasted ilmenite deposited gradually in order to obtain TiO<sub>2</sub>. Fine crystallite anatase phase TiO<sub>2</sub> was generated through co-precipitation processes using hydrolysis and condensation route via titanium isopropoxide complexes formation. Further hydrolisis process in 2-propanol-water of 9:1 v/v solvent ratio produce the anatase TiO<sub>2</sub>.

Index Terms- roasted ilmenite, hydrochloric acid leaching titanium dioxide

#### I. INTRODUCTION

Titanium dioxide  $(TiO_2)$  is the most important white pigment used in the coatings industry. It is widely used because it efficiently scatters visible light, thereby imparting whiteness, brightness and opacity when incorporated into a coating. Titanium dioxide occurs in polymorphic forms as rutile, anatase and brookite. Titanium dioxide is commercially available in two crystal structures, anatase and rutile. Rutile TiO<sub>2</sub> pigments are preferred because they scatter light more efficiently, are more stable and are more durable than anatase pigments [4]. Rutile TiO<sub>2</sub> pigments imparts greater durability than anatase.

The black sands of ilmenite are found along the Bangka Island, Indonesia. Ilmenite, separated from black sands, which is the mineral of choice in the present article, is used economically for production of titanium dioxide. The last compound is used in many fields of application such as catalysts [2], cosmetics [10], solar batteries [12] and ceramic materials [14]. The extraction of titania from ilmenite (ore or mineral) was the subject of numerous studies [6, 8, 3, 11, 13]. Most of these studies were concerned with the extraction of titania from ilmenite by  $H_2SO_4$  and HCl, whereas few ones were directed to extraction of titania by interaction with alkaline reagents [9, 1, 7]. Sulfate process and chloride process produces  $TiO_2$  intermediates and ferrous sulfate. In the finishing process, through the stages of surface modification, filtration, washing and drying, we'll get packing  $TiO_2$ .

The growing inability of the world's natural rutile resources, now principally derived from Australia to meet the raw materials of the 'chloride' pigment manufacturers is one of the reasons for studying the upgrading of ilmenite into synthetic rutile [15]. The reactivity of ilmenite towards hydrochloric acid depends on the nature of the mineral. It is commonly recognised in altered igneous rocks as leucoxene and unaltered form as rutile. Generally, the unaltered ilmenite is more readily leached by hydrochloric acid than the altered ilmenite [16].

A common ilmenite alteration mechanism can be explained as follows [17]:

Ilmenite  $\rightarrow$  Pseudorutile  $\rightarrow$  Rutile / Anatase  $\rightarrow$  Hematite

(Fe <sup>2+</sup> TiO <sub>3</sub> )	$({\rm Fe_2}^{3+}{\rm Ti}_3{\rm O}_9)$	(TiO <sub>2</sub> )	$(Fe_2O_3)$
Primitive hexagonal		Tetragonal	Hexagonal

Transfomation phase rate of ilmenite to pseudorutile, then to rutile - anatase and hematite phases is influenced by the processing conditions and the ratio of iron: titania in the ilmenite source.

#### II. EXPERIMENT AND METHOD

A.Materials.

Ilmenite sand (FeO.TiO<sub>2</sub>) was obtained from Laboratory of Metallurgy Research Centre for Metallurgy – Indonesian Institute of Sciences (LIPI), while 2-propanol, iron powder, hydrochloric acid and sulfuric acid using a Merck product. Whereas sodium sulfide is a local product.

#### B.Modified chloride process

Ilmenite was pre-oxidized in air for periods of 6 hours and at temperatures of 500, 600, 700, 800, and 900 <sup>0</sup>C with added sodium sulfide at a certain ratio. The results are dissolved in hydrochloric acid at various concentrations and heated at temperature of 100-105

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<sup>0</sup>C. Amount of metallic iron powder were added also in those mixture. The process produces dissolved ilmenite and sediment. Dissolved ilmenite may contain metal cations such as Fe(III), Fe(II) and Ti(IV). The filtrate of dissolves roasted ilmenite was added 2-propanol for further separation by precipitation. Finally, the resulting solids were TiO<sub>2</sub> (anatase, rutile), while a large of Fe ions still retained in solution phase.

#### C.Techniques and Measurements:

1) X-ray Diffraction Patterns (XRD):

X-ray diffractograms of ilmenite ore, different reaction products and titania were obtained by means of a chart recording Bruker D8 advance x-ray diffractometer using copper (K $\alpha$ ) target

2)X-ray Fluorescence Spectra (XRF):

Quantitative oxide compound was measured with S2 Ranger XRF from Bruker.

3)Electronic Absorption Spectra of Solutions:

The electronic absorption spectra of titanium solutions and iron solutions were measured in the matched 1cm fused silica cells with an automatic Perkin Elmer Lambda 25 UV Vis Spectrophotometer.

#### III. RESULT AND DISCUSSION

Now it is the time to articulate the research work with ideas gathered in above steps by adopting any of below suitable approaches:

#### A. Row Materials Preparation

The Bangka ilmenite contain 35 to 45 %  $TiO_2$  and are regarded as a huge resource to the production of Titania slag and pig iron, while the rutile ( $TiO_2$ ) usually was produced from the commercial grade which cantain more percent of  $TiO_2$ . which can be used directly as pigment or for the manufacture of titanium. However, extraction of the iron from the ilmenite has been, and it's still, an expensive undertaking. Ilmenite (FeO.TiO<sub>2</sub>) and rutile ( $TiO_2$ ) are the two dominant resources minerals of titanium. In the conventional process, a large fraction of ilmenite is being rejected un-dissolved and the co-dissolved other transition metal ions may be co-precipitated with titanium, which may seriously discolor the white pigment color of titanium dioxide. In our laboratory, a few processes have also been tested for the recovery of titanium dioxide.

The previous studies [11] demonstrated important changes that occur on the surface of ilmenite during high temperature oxidation, particularly the formation of hematite. This condition propitiates selective iron extraction because it is concentrated on surface. Thus, in this work it is proposed to leach pre-oxidized ilmenite with HCl solution. In the addition of sodium sulfide affects to pre-oxidation process. The treatment also affects the dissolution of pre-oxidized ilmenite.

Ilmenite used in this work was acquired from Bangka in Indonesia. The initial characterization of original ilmenite involved X-ray diffraction (XRD) of powders and X-ray fluorescence (XRF). XRD patterns revealed that the principal crystalline phase corresponds to FeTiO<sub>3</sub> (Fig. 1).



Figure 1. XRD patterns of ilmenite ore from Bangka

While the XRF data of original ilmenite ore from Bangka shown in Table 1 below

Table 1. Chemical composition of Imenite from Bangka Indonesia by XRF (%)

Content	TiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	$Cr_2O_3$	MnO	MgO	SiO <sub>2</sub>	$Al_2O_3$
Level	34,01	53,36	0,09	1,07	1,73	2,39	1,39

#### B. High Temperature Oxidation

Oxidation products at temperatures of 400, 500 °C, 600 °C, 700 °C, 800 °C, 900 °C calcinated by Na<sub>2</sub>S addition were characterized by X-ray diffraction (XRD) (Fig. 2). Pre-oxidation processes really improve the formation of pseudobrokite phase (Fe<sub>2</sub>TiO<sub>5</sub>), as intermediate product to form TiO<sub>2</sub>. This result is very different from the results of previous studies [13] which indicates the formation of a dominant pseudobrokite. Annealing result at 900°C to 1100°C of raw ilmenite, a matrix of Fe<sub>2</sub>TiO<sub>5</sub> with TiO<sub>2</sub> and Fe<sub>2</sub>O<sub>3</sub> distributed randomly are the only detectable products [13].



Figure 2. XRD pattern of roasting ilmenite with Na<sub>2</sub>S addition annealed at various temperature of (a) 500 °C (b) 600 °C (c) 700 °C (d) 800 °C (e) 900 °C.. I= *ilmenite*, H= *hematite*, R= TiO<sub>2</sub> *rutile*, A= TiO<sub>2</sub> *anatase*, N= Na<sub>2</sub>SO<sub>4</sub>.

Table 2. Chemical co	omposition of	roasting ilmeni	te with Na <sub>2</sub> S	S addition I	ov XRF
	ompoortion or	rousting mineri		, addition (	

Content	SO <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Na <sub>2</sub> O	TiO <sub>2</sub>	SiO <sub>2</sub>	MgO	SnO <sub>2</sub>
Level (%)	39,20	21,06	19,64	11,75	1,44	1,06	0,75

Chemical composition of roasting ilmenite with  $Na_2S$  addition was conducted with XRF shown in Table 2. Increasing the  $Na_2O$  and  $SO_3$  content are influenced on  $Na_2S$  addition in roasting process. Pre-oxidation of ilmenite produce surface modifications as a result of diffusional processes that take place at high temperature on air. In this particular case, iron moves faster than titanium and they tend to migrate towards the high oxygen potential region. Once the iron cations arrive to the surface of the particle, they are oxidized, and a hematite eggshell is formed. The oxidation processes occur during roasting process follow the reaction:

 $2\text{FeTiO}_3 + \frac{1}{2}\text{O}_2 \rightleftharpoons \text{Fe}_2\text{O}_3 + 2\text{TiO}_2$  (1)

It is not clear to be understood that  $Na_2S$  have violently conversion the solid composition after roasting process.  $Na_2S$  definitely act as a reductant of hematite as well as titanium dioxide in the ilmenite structure.

The formation of molten (fused mass) at roasting ilmenite with Na2S addition is likely to reduce the rate of  $O_2$  diffusion to the entire layer (innermost) to resist the pseudobrookite formation. Ilmenite decomposition may occur by salt complexes formation mechanism [18]. The presence of Na<sup>+</sup> ions and S<sub>2</sub><sup>-</sup> of Na<sub>2</sub>S initiated complexation reactions to form salt complexes according to the following reaction:

$$5\text{TiO}_{2(s)} + 2\text{Na}_2\text{S}_{(s)} + 4\text{O}_{2(g)} \rightleftharpoons \text{Na}_4\text{Ti}_5\text{O}_{12(s)} + 2\text{SO}_{3(g)}$$
(2)  
$$2\text{Te}_5\text{O}_{2(s)} + 2\text{Na}_5\text{C}_{2(s)} + 2\text{O}_{2(s)} \Rightarrow 5\text{Na}_5\text{C}_{2(s)} + 12\text{C}_{2(s)} + 2\text{CO}_{2(s)} + 2\text{CO$$

$$5Fe_2O_{3(s)} + 5INa_2S_{(s)} + 2O_{2(g)} = 5INaFeO_{2(s)} + INaFeS_{2(s)} + 5O_{3(g)}$$
 (5)

Salt complexes formation is expected to be more easily dissolved in HCl.

#### C. Leaching

Leaching of roasted ilmenite products were carried out by hydrochloric acid solution at various concentrations. In the case of original ilmenite, the main iron cations are in the ferrous form, which are easier to dissolve, they have to migrate to the surface to be leached. In addition, it has been reported that dissolution of ilmenite follows the reaction specified by [8]:

 $FeTiO_3 + 4 HCl \rightleftharpoons FeCl_2 + TiOCl_2 + 2 H_2O$  (4).

whereas if the reaction was initiated by salt complexes, the reactions had better through following reaction:

 $Na_{4}Ti_{5}O_{12(s)} + NaFeO_{2(s)} + NaFeS_{2(s)} + 18HCl_{(aq)} \rightarrow 6NaCl_{(aq)} + 5TiOCl_{2(aq)} + FeCl_{2(aq)} + 7H_{2}O_{(aq)} + 2H_{2}S_{(aaq)}$ (5)

It's clear that HCl not only promotes iron removal but also could dissolves titanium. Fig. 3 illustrates titanium extraction from the samples. This reveals the high removal of titanium from roasting ilmenite samples (Fig. 3(a)). The addition of  $Fe^0$  to the pre-oxidation ilmenite with ratio of Ilmenite :  $Fe^0 = 5:1$  show progressive separation (Fig. 3(b)).



Figure 3. Influence of dissolution (a) ilmenite to Fe<sup>0</sup> ratio and (b) HCl using in leaching process,

Addition of Fe<sup>0</sup> showed increased dissolution of Fe and Ti, respectively, but addition a large amount of Fe is not necessary to avoid dissociation reaction. Maximum solubility of roasting ilmenite were gained at leaching process under 6-8 M HCl condition, whereas ratio of ilmenite :  $Fe^0 = 5:1$ .

Furthermore the  $TiOCl_2$  production from dissolution roasted ilmenite will further react through complexation reactions, hydrolysis and condensation. Finally we will get anatase $TiO_2$  nanoparticles in last step.

 $4 \operatorname{TiOCl}_{2} + \operatorname{HOiPr} \rightarrow \operatorname{TiO(OiPr)}_{2} + 2\operatorname{HCl} \quad (6)$  $\operatorname{TiO(OiPr)}_{2} + \operatorname{HOiPr} \rightarrow \operatorname{Ti(OiPr)}_{2}(\operatorname{OH})_{2} + 2\operatorname{HCl} \quad (7)$  $\operatorname{Ti(OiPr)}_{2}(\operatorname{OH})_{2} + \operatorname{H}_{2}O \rightarrow \operatorname{Ti(OH)}_{4} + 2\operatorname{HOiPr} \quad (8)$ 

Precipitation of leaching product solution was carry out with 2-propanol – water adition at various volume ratio. Fig. 4 is the XRD pattern of TiO<sub>2</sub> presipitated result. We found that the addition at a ratio of 2-propanol: water = 9: 1 (v/v) was obtained pure anatase TiO<sub>2</sub> nanoparticle products. XRD Pattern TiO<sub>2</sub> obtained (Fig. 4) is in accordance with the JCPDS standard anatase TiO<sub>2</sub>

(No.78-2486). TiO<sub>2</sub> gained after further hydrolysis in 2-propanol-water solvent at certain solvent volume ratio. The addition of 2-propanol is drastically greatly enhance the formation of titanium isopropoxide complexes were subsequently hydrolyzed and condensed to produce TiO<sub>2</sub>. The iron will be further separated by the addition of 2-propanol solvent. Optimum conditions occur in the ratio of 2-propanol: water = 9: 1 (v/v), that is the excellent conditions for separating iron and titanium.





#### IV. CONCLUSION

Roasting ilmenite with Na<sub>2</sub>S addition could improve the TiO<sub>2</sub> separation in solid phases. Na<sub>2</sub>S addition in the preoxidation process decrease pseudobrokite formation. This study indicates that leaching of roasting ilmenite with Na<sub>2</sub>S addition could improve the dissolution both titanium and iron, respectively. The iron, which is successfully removed, is in fact metallic iron, which can precipitate by the disproportionation reaction, which is triggered by slight oxidation. Precipitation leaching product was facilitated the solvent condition of 2-propanol-water mixture gain the high crystalline anatase  $TiO_2$ .

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#### AUTHORS

First Author – Sayekti Wahyuningsih, Inorganic Material research group, Chemistry Department of Sebelas Maret University, sayekti@mipa.uns.ac.id.

**Second Author** – Ari Handono Ramelan, Electronic Materials and Energy research group, Physics Department of Sebelas Maret University. <u>aramelan@mipa.uns.ac.id</u>

**Third Author** – Edi Pramono, Inorganic Material research group, Chemistry Department of Sebelas Maret University, edi.pramono.uns@gmail.com

Fourth Author – Ariantama Djatisulistya, Inorganic Material research group, Chemistry Department of Sebelas Maret University, ariantama@gmail.com

Correspondence Author - Sayekti Wahyunigsih, sayekti@mipa.uns.ac.id, sayektiw@gmail.com, +62-271663375

# Evaluate some biochemical changes associated with chronic renal failure patients undergoing hemodialysis in al najaf al ashraf governorate.

#### A.L Furqan M. Auda, A.L Basim M. Ali, A.L Maha S.R, Hassan Mohammed Marhoon

Department of Chemistry, College of Science, Al-Kufa University, Iraq.

*Abstract*- This study was conducted in AL-Hakeem hospital in al najaf al ashraf city during the period from May 2014 to September 2014. To assess serum lipid profile ,albumin and Hb in renal failure patients on hemodailysis , it included 77 patients , 53were males and 24 were females and their age range from 21 to 65 years.

The patient was diagnosed as having renal failure for both sex based on the history, clinical examination and taking renal function test . The control groups were 50, they were collected from medical staff and relatives who were free from signs and symptoms of renal disease, lipid disorders, diabetes mellitus and hypertension . 30 were males and 20 were females, and their ages range from 22 to 66 years.

Blood samples were taken from the patients (8-12) hours after night fasting, the study shows the following results, a significant change in most variables (TC, LDL, VLDL, TG, Hb, PCV, GOT, GPT, Urea, Uric acid& Albumin) except HDL was not significant, in addition the results appears a significant correlation between duration of CRF disease and the following variations (Uric acid and Urea) while there is no any change in the rest of parameters (TC, LDL, VLDL, TG, Hb, PCV, GOT, GPT, Albumin& HDL) in the other hand the anova analysis of statistical expose the important correspondence between number of dialysis in patients with CRF and the following items (Hb, PCV, TG, VLDL) finally the relationship among the items shows the following (Urea &Uric acid ,, PCV &Uric acid ,, PCV & Albumin " PCV& Hb% " GOT& Uric acid,, VLDL & TG " Hb% & TG " Hb% & VLDL " LDL & HDL), From the present study it can be concluded that Patients with chronic renal failure show abnormal haematological parameters and TG is frequently elevated in patients with CRF.

#### I. INTRODUCTION

**R** enal failure refers to a condition where the kidneys lose their normal functionality, which may be due to various factors including infections, auto immune diseases, diabetes and other endocrine disorders, cancer, and toxic chemicals. It is characterized by the reduction in the excretory and regulatory functions of the kidney<sup>(1)</sup>, research that shows with the improvement in conservative management and dialysis, the life span of patients with chronic renal failure (CRF) has been increased. As the patient's survival has approached in the last century, there is an increasing indication that accelerated atherosclerosis may remain a major unresolved problem threatening the longevity of CRF patients<sup>(2)</sup>, study expose the Chronic renal failure (CRF) is a permanent and major lessening in glomerular filtration rate, or chronic irreversible damage of kidney tissue<sup>(3)</sup>. It is characterised by a wide variety of biochemical disturbances and many clinical symptoms and signs<sup>(4)</sup>, the normal renal function is very important for homeostasis, in addition, that situations in which renal functions are impaired can be life threatening. Diseases of the kidneys are among the most important causes of death and disability in many countries throughout the World<sup>(5)</sup> in the other hand the alteration includes haematologic abnormalities, cardiovascular problems, gastrointestinal disturbances. neurologic disorder. osteodystrophy, skin disorder and altered sexual function<sup>(6)</sup>.the author explain the renal diseases are associated with a variety of haemopoietic changes. Anemia parallels the degree of renal impairment and its most important ause is failure of renal erythropoietin secretion. Other factors include chronic blood loss, hemolysis and bone marrow suppression by retained uremic factors<sup>(7)</sup>, so the RBC survival is decreased in uremic patient's in proportion to the blood urea nitrogen concentration and, it improves significantly after intensive hemodialysis. Uremic plasma increases the expression of phosphatidylserine on the outer cell surface in red blood cells. This enhances the recognition of damaged red blood cells by macrophage, leading to their subsequent destruction and decreased survival<sup>(8)</sup>.

In the other way Lipoprotein metabolism is changed in most patients with renal deficiency. Dyslipidaemia develops early in renal failure. The discrepancy between lipoprotein synthesis and degradation in prolonged renal disease results in a pronounced dyslipidemia<sup>(9)</sup>, team of research were find the dyslipidemias is a very collective complication of Chronic Renal Failure (CRF). Disorders in lipoprotein metabolism are apparent even at the first stages of CRF and usually follow a downhill course that parallels the weakening in renal function. Recently published studies show that dyslipidemias in these patients may actively participate in the pathogenesis of Cardiovascular disease (CVD) as well as in the deterioration of renal function. The characteristic lipid abnormalities seen in CRF patients are elevated triglycerides, normal/reduced total cholesterol (TC), decreased High Density Lipoprotein (HDL), normal Low Density Lipoprotein (LDL). Progressive CRF not only leads to End stage renal disease (ESRD), but it is associated with high cardiovascular infection & mortality. In fact, patients with CRF are much more likely to die because of dyslipidemias than to progress to ESRD<sup>(10)</sup>.

#### II. MATERIALS AND METHODS

This study was conducted in AL-Hakeem hospital in al najaf al ashraf city (Iraq) during the period from May 2014 to September 2014. To assess serum lipid profile ,albumin and Hb in renal failure patients on hemodailysis , it included 77 patients , 53were males and 24 were females and their age range from 21 to 65 years.

The patient was diagnosed as having renal failure for both sex based on the history, clinical examination and taking renal function test . The control groups were 50, they were collected from medical staff and relatives who were free from signs and symptoms of renal disease, lipid disorders, diabetes mellitus and hypertension . 30 were males and 20 were females, and their ages range from 22 to 66 years.

Haematological parameters[(Packed cell volume (PCV) , Haemoglobin concentration (Hb %)] were estimated by using Beckman coulter automatic analyzer.

Exclusion criteria include diabetes mellitus, hypertension & ischemic heart disease, 5 ml of venous blood samples were collected in test tubes after an overnight fast. Subsequently collection, the samples were allowed to clot for half an hour following which the samples were centrifuged and serum was analyzed . Serum total cholesterol (TC), triglycerides (TG<sub>s</sub>), HDL cholesterol (HDL-<sub>C</sub>), LDL cholesterol, albumin, GOT, GPT, urea and uric acid , were measured colorimetrically using commercially available kits on fully auto analyzer of Clinical Biochemistry Laboratory. VLDL<sub>C</sub>, (LDL-<sub>C</sub>) concentration was calculated mathematically by using Friedewald's Formula<sup>(11)</sup>.

#### III. STATISTICAL ANALYSIS

The data collated after biochemical analysis were subjected to statistical calculation using statistical software (Megastat). The mean, standard deviation of mean, F-distribution test were obtained. Critical value or test of probability less than 0.05 (p< 0.05) was regarded significant also we use Microsoft Excel (2010) and Minitab *v. 14*.

#### IV. RESULTS

The evaluation of the data of our patients indicated that the enrolled patients were distributed according to different trends .They were distributed according to the sex (male = table 2) (female = 3) (anova gender table 8), duration of disease (anova table 5) and no. of dialysis(anova table 7).

The results in this study shows a significant increase in cholesterol, GPT,  $LDL_C$  conc. in patients with CRF as compared with their control groups this result shows in <u>table (1)</u> in addition the same table appears highly significant increase in level of TG, Uric acid, Urea, Albumin,  $VLDL_C$  as compared with their control groups respectively, in the other hand the result in table (1) shows a highly significant decrease in level of Hb%& PCV in patients with CRF as compared with their control groups respectively.

The results in table (1,2&3) shows no significant change in level of HDL<sub>C</sub> in patients with CRF as compared with their control groups respectively.

	Patient =77		Control =50		
parameter	mean	sd	mean	sd	P value
cholesterol mg/dl	120.42	42.87	103.12	23.24	0.0039586*
HDL (mg/dl)	39.427	18.434	43.42	11.62	0.1370823
TG(mg/dl)	130.53	57.15	103.24	21.51	0.0002458**
Uric acid	6.3565	1.5851	5.560	0.787	0.0002709**
Urea (mg/dl)	71.08	40.22	33.714	6.848	7.455E-12**
Albumin (g/dl)	4.0123	0.5632	4.326	0.439	0.0006234**
Hb	11.9566	1.5863	12.750	0.401	6.545E-05**
PCV	40.1891	5.9269	44.20	4.66	4.235E-05**
G OT(U/L)	27.75	6.15	24.30	4.51	0.0003942**
GPT (U/L)	28.23	8.03	24.20	6.70	0.0027267*
VLDL	26.106	11.431	20.648	4.302	0.0002458**
LDL	59.733	41.803	41.564	21.522	0.0016824*

Table (1):revealed the biochemical parameters among control and CRF patients undergoing hemodialysis.

The result in **table (2)** which is include 53 **male** patients and 30 **male** control group that shows a significant increase in level of cholesterol, TG, GOT, GPT, VLDL, LDL and Albumin in patients with CRF as compared with their control groups respectively, additionally a highly significant increase in Uric

acid& Urea level as compared with their control groups in CRF patients correspondingly, in the same table appeared a significant decrease in Hb% & a highly significant decrease in level of PCV as compared with the standard group in patients with CRF.

	Patient $= 53$		Control = 30		
parameter	mean	sd	mean	sd	P value
cholesterol mg/dl	115.42	37.38	95.70	24.98	0.005257*
HDL (mg/dl)	39.926	20.606	42.450	13.317	0.500703
TG (mg/dl)	133.68	64.88	112.57	22.31	0.0346*
Uric acid	6.8168	1.5921	5.550	0.914	1.51E-05**
Urea (mg/dl)	75.25	39.08	31.457	4.981	7.5E-11**
Albumin (g/dl)	4.0491	0.5504	4.357	0.427	0.005977*
Hb	12.0700	1.6093	12.530	0.099	0.042974*
PCV	41.4372	5.0420	46.60	3.48	4.82E-07**
G OT(U/L)	28.04	6.58	25.33	3.55	0.017243*
GPT (U/L)	29.11	9.05	24.93	6.43	0.016773*
VLDL	26.736	12.975	22.460	4.223	0.031023*
LDL	55.818	38.749	38.407	24.235	0.013888*

Table (2):revealed the biochemical parameters among control and CRF <u>male</u> patients undergoing hemodialysis.

The result in <u>table (3)</u> which is consist of 24 <u>female</u> patients and 20 <u>female</u> control group that shows a significant increase in level of cholesterol, Urea, GOT, GPT, LDL and Albumin in patients with CRF as compared with their control groups respectively, additionally a highly significant increase in

TG & VLDL level as compared with their control groups in CRF patients correspondingly, in the same table appeared a significant decrease in Hb% & PCV level as compared with the standard group in patients with CRF

Table (3):revealed the biochemical parameters among control and CRF <u>female</u> patients undergoing hemodialysis.

	Patient = 24		Control = 20		
parameter	mean	sd	mean	sd	P value
cholesterol mg/dl	131.46	52.24	108.90	14.22	0.052614*
HDL (mg/dl)	38.32633	12.68975	44.670	8.929	0.059327
TG (mg/dl)	123.58	34.71	89.65	13.74	0.00012**
Uric acid	5.3400	1.0024	5.380	0.675	0.875764
Urea (mg/dl)	61.88	42.00	38.30	5.86	0.011981*
Albumin (g/dl)	3.9313	0.5942	4.330	0.427	0.013429*
Hb	11.7063	1.5378	13.125	0.370	0.000175*
PCV	37.4329	6.8618	40.65	3.22	0.04887*
G OT(U/L)	27.13	5.12	23.25	5.51	0.021346*
GPT (U/L)	26.29	4.73	22.50	6.27	0.032506*
VLDL	24.717	6.941	17.930	2.748	0.00012**
LDL	68.3808	47.6053	46.300	16.086	0.041671*

Table (3) shows patient frequency for every period of duration as shown as male number, female no. & total.

Table (4): Distribution of the studied sample <u>according to duration</u> of CRF disease.

Duration	Period interval	Male no.	Female no.	Total no.
Duration 1	>36 month	15	3	18
Duration 2	24-35 month	11	5	16
Duration 3	13-23 month	14	5	19
Duration 4	1-12 month	13	11	24

The result in <u>table (5)</u> were done by tukey simultaneous comparison (anova one way) which is exposed no significant change in all biochemical variation in patients with CRF except

highly significant increase in Urea level and then significantly increase with Uric acid concentration .

	Duration	1	Duratio	n 2	Duratio	n 3	Duratio	n 4	Anav	a one way
variation	Mean	sd	Mean	sd	Mean	sd	Mean	sd	F	P value
cholesterol									0.22	0.22
mg/dl	113.4	33.5	121.7	41.4	121.4	42	124	52		
HDL (mg/dl)	40.2	14.9	45.1	24	37.3	19.7	36.8	15.8	0.77	0.52
TG (mg/dl)	135.6	70.7	121.7	49.7	126.9	58.2	135.5	52.2	0.25	0.9
Uric acid	7.23	1.6	6.24	1.5	6.45	1.7	5.7	1.3	3.53	0.019*
Urea (mg/dl)	132.4	25.5 4	79.8	10.8	52.5	7.24	33.9	4.6	5.75	1.90E- 7**
Albumin (g/dl)	3.9	0.6	3.96	0.63	4.6	0.54	4.01	0.5	0.62	0.61
Hb	11.9	1.8	12.3	1.66	11.9	1.51	11.8	1.3	0.41	0.75
PCV	41.7	6.27	37.9	6.3	40.5	6.1	40.2	5.9	1.24	0.3
$G \ OT \ (U/L)$	27.7	5.06	28.6	8.62	29.05	6.05	26.2	4.92	0.92	0.44
GPT (U/L)	27.8	4.18	28.75	6.95	30.4	13.19	26.5	5.03	0.88	0.46
VLDL	27.1	14.1 4	24.34	9.93	25.39	11.64	27.1	10.45	0.25	0.86
LDL	51.7	38.1 6	60.7	36.6	63.2	44.16	62.14	47.5	0.28	0.84

Table (5): exposed the biochemical parameters according to duration of CRF patients undergoing hemodialysis.

Table (6) shows patient frequency for all times number of dialysis as shown as male no., female no. & total for any step of dialysis.

Table (6): Distribution of the studied sample <u>according to dialysis no.</u> of CRF disease.

Dialysis	Dialysis no.	Male no.	Female no.	Total no.
Step 1	>6 time	15	5	20
Step 2	4-5 time	14	4	18
Step 3	3 time	15	8	23
Step 4	1-2 time	9	7	16

The result in <u>table (7)</u> were completed by tukey simultaneous comparison (anova one way) which is exposed a significant increase TG& VLDL level in other wise a highly

significant decrease in Hb% additionally a significant decrease PCV level in patients with CRF in the other hand no significant change in the rest of variation in CRF patients.

Table (7): exposed the biochemical parameters <u>according to dialysis no.</u> of CRF patients.

	Step 1	ep 1		Step 2		Step 3		Step 4		Anava one way	
variation	Mean	sd	Mean	sd	Mean	sd	Mean	sd	F	P value	
cholesterol mg/dl	124.6	39.2	109.7	24.81	113.5	42.8	137.4 4	58.63	1.52	0.22	
HDL (mg/dl)	38.3	13.8	36.14	19.2	43.5	24.95	38.6	10.5	0.59	0.62	
TG (mg/dl)	103.4	45.0 3	118.9	44.96	135.5	60.2	170.3	59.2	5.1	0.003*	
Uric acid	6.99	1.4	6.013	1.32	6.2	1.86	6.15	1.6	1.5	0.22	
Urea (mg/dl)	75.35	43.3 5	77	49.15	70.22	34	60.3	34.5	0.58	0.63	
Albumin (g/dl)	4.12	0.4	4.06	0.5	3.9	0.72	3.99	0.53	0.55	0.65	
Hb	9.73	0.87	11.44	0.37	12.47	0.22	13.9	0.8	8.6	9.5E- 13	
PCV	38.003	7.46	37.7	4.96	41.75	3.099	43.4	5.9	5.06	0.003*	
G OT(U/L)	28	4.51	26.7	4.42	28	5.89	28.3	9.53	0.86	0.25	

GPT (U/L)	27.45	5.3	30.8	13.38	26.9	5.82	28.25	5.25	0.87	0.46
VLDL	20.68	9	23.8	8.99	27.1	12.04	34.1	11.8	5.1	0.0029 *
LDL	66.1	42.7	51.5	32.7	56.5	40.9	65.38	52.26	0.52	0.67

<u>**Table 8**</u> in this study exposed the simultaneous comparison between the tow genders its show no significant different in all parameters except a highly significant difference in Uric acid level and a significant difference between male and female patients with  $\mbox{CRF}$  .

	Male =	53	Female	= 24	Anava one way		
variation	Mean	sd	Mean	sd	F	P value	
cholesterol mg/dl	115.4	37.38	131.5	52.24	2.36	0.13	
HDL (mg/dl)	39.93	20.6	38.33	12.69	0.12	0.7	
TG (mg/dl)	133.6 8	64.88	123.5 8	34.7	0.51	0.48	
Uric acid	6.82	1.59	5.34	1.002	17.4	0.000079* *	
Urea (mg/dl)	75.25	39.08	61.87 5	42.00 3	1.85	0.18	
Albumin (g/dl)	4.05	0.55	3.93	0.59	0.72	0.399	
Hb	12.07	1.61	11.71	1.5	0.87	0.355	
PCV	41.44	5.042	37.43	6.86	8.26	0.0053*	
G OT (U/L)	28.04	6.58	27.12 5	5.12	0.36	0.55	
GPT (U/L)	29.1	9.05	26.29	4.73	2.066	0.155	
VLDL	26.74	12.98	24.7	6.9	0.5	0.48	
LDL	55.82	38.75	68.38	47.61	1.5	0.22	

Table (8): exposed the biochemical parameters <u>according to gender</u> of CRF patients undergoing hemodialysis.

The results in <u>table 9</u> appears the relationship among all parameters which is implicate in this study, the statistical analysis shows a positive correlation between the following ((Urea &Uric acid ,, PCV &Uric acid ,, PCV & Albumin ,,

PCV& Hb% ,, GOT& Uric acid ,, VLDL & TG ,, )) in the same way a negative relation between these items(( Hb% & TG ,, Hb% & VLDL ,, LDL & HDL )) in the other hand there is no relationship between the rest parameter .

Table (9) shows the correlation among biochemical parameters in CRF patients undergoing hemodialysis.

r	chole	HDL (mg/dl)	TG (mg/	Uric	Urea	Albumi	нh	PCV	G OT	GPT	וחוע
P-value	sterol	(mg/ui)	dl)	acid	dl)	n (g/dl)	110	100	(U/L)	(U/L)	VLDL
	0.079										
HDL (mg/dl)	-										
	0.493										
TC (max/dl)	0.151	0.191									
i G (mg/ui)	0.19	0.096									
Uric acid	- 0.008	0.145	- 0.030								
	0.944	0.208	0.798								

lirog (mg/dl)	- 0.141	0.127	0.005	0.305							
orea (mg/ai)	0.220	0.270	0.963	0.007 *							
	0.150	0.126	- 0.117	0.181	- 0.094						
Albumin (g/ul)	0.192	0.275	0.310	0.116	0.415						
116	- 0.101	-0.005	- 0.454	0.107	0.159	0.006					
טח	0.384	0.967	0.000 *	0.353	0.166	0.958					
	0.046	0.062	- 0.093	0.303	0.085	0.323	0.396				
PCV	0.688	0.590	0.422	0.007 *	0.463	0.004*	0.000*				
G OT (U/L)	- 0.077	0.025	0.034	0.248	0.082	-0.081	-0.003	0.139			
	0.503	0.831	0.770	0.030 *	0.480	0.484	0.976	0.227			
GPT (U/L)	- 0.055	-0.155	- 0.069	0.007	0.006	0.128	-0.011	0.031	0.064		
( ) )	0.636	0.180	0.550	0.953	0.957	0.269	0.927	0.791	0.581		
VLDL	0.151	0.191	1.000	- 0.030	0.005	-0.117	-0.454	- 0.093	0.034	- 0.069	
	0.190	0.096	*	0.798	0.963	0.310	0.000*	0.422	0.770	0.550	
LDL	0.904	-0.362	- 0.072	- 0.054	- 0.149	0.092	-0.014	- 0.017	-0.103	- 0.001	- 0.072
	0.000	0.001*	0.531	0.640	0.197	0.426	0.901	0.881	0.371	0.993	0.531

#### V. DISCUSSION

The biochemical parameters in 77 chronic renal failure patients compared with 50 age and sex matched controls. In the current study, it has been observed that the PCV & Hb% level are decreased as shown as in *Table 1* in chronic renal failures. This result is agree with (Suresh M. et al) who are described that a most important cause of decrease PCV & Hb% level in chronic renal failure is reduced erythropoietin production and other factors which destroy marrow erythropoiesis and shortened red cell life<sup>(7)</sup>, (Michael & Glader 2004)were explained that RBC survival is decreased in uremic patient's in ratio to the blood urea concentration and, it expands significantly after severe hemodialysis. Uremic plasma increases the appearance of phosphatidylserine on the outer cell surface in red blood cells. This enhances the recognition of smashed red blood cells by macrophage, leading to their subsequent damage and diminished survival. This study is agreed with our current results as in table 1 significant decrease in level of Hb & PCV in addition the current statistical analysis in *table* 7 which is shown highly significant difference in Hb level and than a significant change in percent of PCV so these results are describe whensoever increase hemodialysis the level of Hb & PCV are decrease<sup>(8)</sup>, The hemoglobin concentration and hematocrit generally provide an accurate reflection of the extent to which the circulating red cell

mass is reduced. In chronic renal disease because of impaired erythropoietin secretion, increased destruction of red blood cells, leads to a fall in red blood cell count, which reduces the hemoglobin concentration and hematocrit. A decrease in hematocrit is apparent even among patients with mild to moderate renal insufficiency<sup>(12)</sup>, Aigner et al(2000). were reported that anemia of chronic illness traditionally encompassed any inflammatory, infectious, or malignant disease of a longstanding nature. The modern definition includes chronic renal failure, rheumatoid arthritis, severe trauma, heart disease, and diabetes mellitus. In these conditions, there is primarily a decreased availability of iron, relatively decreased levels of erythropoietin, and a mild decrease in the lifespan of RBCs to 70-80 days (normally 120 days)<sup>(13)</sup>, all these investigates which are written by Aigner et al & Emmanuel et al are approved with our current study.

Chronic renal failure mainly affects the metabolism of (HDL) and (TG)-rich lipoproteins<sup>(14)</sup>, the CRF is associated with premature atherosclerosis and increased incidence of cardiovascular morbidity and mortality. Several factors contribute to atherogenesis and cardiovascular disease in patients with CRF, the notably among all is dyslipidemias The characteristic dyslipidemias observed in CRF patients hemodialysis in this study are shown in *table 1,2,3,7* which were also reported by Dr. Dipika(2013), who is also demonstrates that

in CRF patients treated by intermittent dialysis, long-term hemodialysis fails to correct dyslipidemias generated by CRF. This study is closed agreement with our results<sup>(10)</sup>. Our current study is differs from those of some authors who found that lipid and lipoprotein compositions did not appear to be influenced by dialysis in CRF patients<sup>(15)(16)</sup>, the statistical appears the comparison for the lipid profile levels between male and female patients. Both male and female patients were equally affected by dyslipidemias of CRF as shown as in tables 1,2,3,8. Amin et al (2006) also described identically<sup>(17)</sup>, so Nzere et al (2012) said that reduced catabolism of lipoprotein rich in TG is an early fundamental disturbance of lipoprotein metabolism in renal. In this study it was observed that TG rich lipoprotein (VLDL and LDL-C) and TG itself were significantly higher (p<0.05) in CRF in both males and females. This suggested that renal disease (CRF) affects the metabolism of TG, VLDL-C and LDL-C, and this predisposes the patient to cardiovascular disease<sup>(9)</sup>. The results of our study is the same which is appear in tables 1,2,3,8

#### VI. CONCLUSION

From the present study it can be concluded that Patients with chronic renal failure show abnormal haematological parameters. It has been proposed that in chronic renal failure so hematuria and gastrointestinal blood loss may play a role in decrease red blood cell count, haemoglobin% and hematocrit.

TG is frequently elevated in patients with CRF. This Elevation is accompanied by increased plasma conc. and reduced clearance of VLDL, total cholesterol and LDL-c conc. are frequently elevated because heavy proteinuria alone or in combination with chronic renal insufficiency.

#### VII. RECOMMENDATIONS

- The modifications in routine can have a progressive effect on raising HDL levels, further Prospective study with along follow up is recommended.
- Exercise for the prevention of some dangerous diseases as CRF & CHD
- Diets to suit the need of the body within the age group for each person

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#### AUTHORS

**First Author** – A.L Furqan M. Auda, Department of Chemistry, College of Science, Al-Kufa University, Iraq.

**Second Author** – A.L Basim M. Ali, Department of Chemistry, College of Science, Al-Kufa University, Iraq.

Third Author - A.L Maha S.R, Department of Chemistry,

College of Science, Al-Kufa University, Iraq.

**Fourth Author -** Hassan Mohammed Marhoon, Department of Chemistry, College of Science, Al-Kufa University, Iraq.

**Correspondence Author** – A.L Furqan M. Auda College of Sciences, Al-Kufa University, Iraq. E-mail: furqan.chmala@uokufa.edu.iq

### Effects of Petroleum ether and n-Hexane Extracts of Globemetula braunii on glucose, Lipids and Some Biochemical Parameters of Diabetic Rats

Muhammad H.L.,<sup>1</sup>Kabiru A.Y., <sup>1</sup>Mann A.,<sup>2</sup> Adefolalu F.S <sup>1</sup>, Busari M.B.,<sup>3</sup>Raji R.O., <sup>1</sup>Shekowan S.M and Iwegbulam B<sup>1</sup>

<sup>1</sup>Department of Biochemistry, Federal University of Technology, Minna <sup>2</sup>Department of Natural Product Chemistry, Federal University of Technology, Minna <sup>3</sup>Global Institute for Bioexploration, Federal University of Technology, Minna

Abstract- Globimetula braunii is a parasitic plant (mistletoe) used to treat diabetes and hypertension by Nupe speaking people of Niger Sate, Nigeria.Extracts of petroleum ether and n-hexane showed the presence of steroids, terpenes, and phenols. Rats of both sexes, weighing (135-244)g were randomly allotted to five groups of four rats each. Rats in group one (control) were the normoglycaemic (administered 10 ml distilled water daily), while those in groups two, three, four, and five were rendered diabetic by the administration of 100mg/kg bodyweight of alloxan monohydrate. Group five rats were treated with 500mg/kg bodyweight of standard drug (metformin), groups three and four rats were respectively treated with 500mg/kg bodyweight of petroleum ether and n-hexane extracts for two weeks, while the group two rats were untreated(negative control). Blood glucose was checked after every two days using glucometer. Blood glucose concentration of rats in the extracts (n-hexane and petroleum ether)treated groups decreased significantly  $(217.16\pm4.33 - 84.33\pm2.33)$ , with n-hexane extract having the highest (84.33±2.33). The animals were anaesthesized under chloroform at the end of the treatment andblood samples were collected by jugular puncture and used for the analysis of biochemical parameters. Serum cholesterol of the two extract treated groups reduced significantly((162.43±1.03)and (147.93±3.40) for petroleum ether and n-hexane groups respectively). There was a similar reduction inserum triglyceride levels of extract groups, with petroleum ether group having the highest (152.91±2.15) activity. Total protein decreased  $(5.57\pm0.03)$  in n-hexanetreated group while alkaline phosphatase increased in all the groups with the standard drug treated group having the highest (32.2±0.35) value. Activity of alanine aminotransferase in n-hexane treated group increased  $(47.7\pm12.4)$  while that of aspartate transaminases in groups increased with the petroleum ether group having the highest activity (84.7±2.96).Urea in all groups increased, except in the nhexane treated group. Creatinine levels decreased in petroleum ether and standard drug treated groups. Na<sup>+</sup> levels reduce in all groups except the standard drug treated group, K<sup>+</sup> levels increased in petroleum ether group, Cl<sup>-</sup> values increased in all groups and HCO<sub>3</sub> decreased in petroleum ether and standard drug treated groups. The extracts have hypoglycaemic and hypolipidemic properties, but may be hepatotoxic.

*Index Terms*- Globemetula braunii, hypoglycaemia, hypolipedemia

#### I. INTRODUCTION

Diabetes mellitus is a metabolic disorder characterized by hyperglycaemia, because of defects in insulin secretion, insulin action or both (American Diabetic Association (ADA) (2010). It is one of the most prevalent chronic metabolic disorders affecting nearly 10% of the world population and its incidence is increasing rapidly. The disease may occur as a result of pancreatic  $\beta$ -cells impairment, leading to reduction in insulin secretion. It could also occur when the insulin receptors are resistant to the functions of circulating insulin. Recurrent or persistent hyperglycemia during diabetes causes glycation of body proteins, which in turn leads to secondary complications affecting eyes, kidneys, nerves and arteries. Another major factor, besides hyperglycaemia, which complicates diabetic state and results in death is hyperlipidaemia (Nagappa et al., 2003). Diabetes- induced hyperlipidemia is attributable toexcess mobilization of fat from adipose tissues due to underutilization of glucose and has been implicated in the etiology of atherosclerosis (Abolaji et al., 2007).

There is a significant disturbance in water and electrolyte homeostasis by this disease (ADA, 2010). There exist a complex association between blood glucose and serum electrolytes and can be related to certain factors such as age and associated conditions. Elevated blood glucose mainly results in serum electrolyte imbalance in type 1 diabetes (Bukonla *et al.*, 2012). Water and electrolyte loss are due to increased urination, and as with hyperglycemia, the body's urinary output increases in an attempt to get rid of the excess blood glucose. This balance is especially disturbed between sodium and potassium. In a disease state, the mechanism for maintaining sodium balance may be disturbed causing sodium deficiency or excessive sodium retention with consequent oedema and other adverse clinical conditions (Andrew *et al.*, 2013).

The liver plays a central role in metabolism of drug and xenobiotics, protein synthesis and in maintaining biological equilibrium of organisms. Due to these important roles, liver enzymes are used as markers in assessment of drug or plant extract safety or toxicity (Satyapal *et al.*, 2008). The transaminases are involved in intermediary metabolism and are

thus present in high concentration in the liver. They are rapidly released into the serum in cases of acute destruction of tissues as in myocardiac infarction or hepatocellular necrosis.

Traditional medicine has developed in Nigeria in response to the health needs of the people. A large proportion of the population relies on traditional healers and their medicinal plants for the treatment of many diseases and about 75% of Nigerians solve their health problems consulting traditional practitioners. Even with the existence of modern medicine, herbal medicines are well known for their historical and cultural purpose. Such medicines have become more widely available commercially, especially in the developing countries. Globimetula braunii is a hemi-parasitic plant that grows on deciduous trees preferring those with soft bark, like guava, coffee, cocoa, citrus etc. The Nupe speaking people of Niger state, Nigeria use G. braunii leaves for the folkoric treatment of diabetes, and hypertension.In African, many indigenous cultures used herbs in their healing rituals, due to believe that the allopathic medicines are toxic and have severe side effects.

The leaf extracts of the plantexhibit lipid lowering and antioxidative activities (Okpuzor *et al.*, 2009) and is effective in the management of high blood pressure. The roots attaching to the host plant are used for other therapeutic uses like ulcer and cancer treatment. The chemical components help in the treatment of diabetes by opposing autoimmune response, and helping the beta cells to produce insulin (Schmutterer, 2002). Research on the antidiabetic activity of this plant is very limited.

Other phytoconstituents such as tannins, terpenoids and alkaloids have been shown further in various pharmacological activities including antibacterial and antidiabetic properties of plants (Uzochukwu and Osadebe, 2007).

The research isaimed at investigating the hypoglycemic and hypolipidemic properties of *Globimetula braunii* leafextracts and its effects on activity of liver enzymes, and kidneys of diabetic rats.

#### II. MATERIALS AND METHODS

#### **Plant Materials**

The leaves of *Globimetulla braunii* were collected between in May 2013, from College of Education Minna, Niger State, Nigeria. They were identified and authenticated at the herbarium, Biological Sciences, Ahmadu Bello University, Zaria, Nigeria with voucher specimens v/no: 2829 for future reference. The leaves of *Globimetulla braunii* were properly rinsed and air dried in Departmental laboratory, according to Rocha *et al.*, 2011. The leaves were pulverized under aseptic condition into fine powder with mortar and pestle and thereafter with electric blender.

#### **Preparation of Plant Extracts**

Three hundred and twenty grams (320g)of the dried powdered leaves were weighed into two beakers and 2400ml of n-hexaneand petroleum ether were respectively added and extracted using soxhlet extraction method at temperatures of 68°C and 65°C. The n-hexane extract yielded 16.68g while the petroleum ether extracts yielded 19.35g.

#### **Phytochemical Screening**

Qualitative phytochemical tests were carried out on the extracts according to the standard procedure described by Trease and Evans, (1989) and Sofowora(1993).

#### **Experimental Animals Model**

Swiss albino rats of both sexes weighing between (135-244) g were purchased from the animal house center, College of Health Sciences, Benue State University Markurdi, Nigeria. They were kept under standard environmental conditions in the Department of Biochemistry Laboratory to acclimatize for two weeks. They wereallowed access to gro6rtttwers feed mesh and water (ad libitum) in compliance with internationally accepted principles for human and laboratory animals in the Canadian Council of Animal Care guidelines and Protocol Review (CCAC, 1997).

#### **Experimental Design**

A total of 20 rats divided into five groups of 4 rats each. Group 1 is the normoglycaemic rats, labeled: (NMG), Group 2: Diabetic untreated rats, labeled (DU),Group 3: Diabeticrats treated with 500 mg/kg bodyweight petroleum ether extract labeled (PEETR),Group 4:Diabetic rats treated with 500 mg/kg bodyweight n-hexane extract labeled (NHETR), and Group 5: Diabetic rats treated with 500 mg/kg bodyweight standard drug (metformin), labeled (STD).

### Induction of Animals models with Alloxan for Diabetes Mellitus.

The rats were fasted overnight with but allowedaccess to water. 0.5g of alloxan monohydrate was dissolved in 10ml of normal saline. 100 mg/kg bodyweight of alloxan monohydrate was administered intraperitonially to rats in the respective groups and fasting blood glucose was checked after 72 hours. Rats with blood glucose  $\geq 200$  mg/dl were considered diabetic and used for research.The animals were afterwards allowed free access to water and food and maintained at room temperature in plastic cages.

#### **Animal Treatment**

Oral administration of normal saline (10 ml/kg), extracts (500 mg/kg), and standard drug (500 mg/kg)was carried out twice a day in a 12 h cycle (6 am and 6 pm) for twelve days to monitor any change in blood glucose. During this period the *in vivo*measurement of blood glucose was carried out with blood obtained from tail vein of the mice using One Touch digital ® Glucometer (Accu-chek) and the unit expressed as mg/dl. The treatment was terminated after seven days.

#### **Animal Sacrifice**

Twelve hours after the final treatment, the rats were anaesthetized under chloroform and sacrificed. The blood sample was collected through jugular puncture. Theblood samples were centrifuge at 1000rpm for 10minutes to get the serum for the biochemical assays.

#### **Determination of Biochemical Parameters**

These were determined using assay kits (Randox Laboratories Limited kits, United Kingdom and Teco diagnostic kits) as follows:

#### **Determination of Serum Cholesterol and Triglycerides**

The serum level of total cholesterol was quantified after enzymatic hydrolysis and oxidation of the sample as described by method of Stein (1987), the serum triglyceride level was determined by method of Tietz (1995).

#### **Determination of Liver Enzymes**

Assay of Alanine aminotransaminase(ALT) and Aspartate aminotransaminase(AST) activities were carried out by the procedureoutlined in the diagnostic kit as described by Reitman

and Frankel (1963) and Alkaline phosphatase (ALP) was according to the method outlinedby Gesellschaft, 1972. Total protein was according toTiez, 1995 method.

#### **Determination of Urea and Creatinine**

Urea and creatinine were determined respectively by the methods of Weatherburn 1967, and Bartels *et al.*, 1972.

#### **Determination of Serum Electrolytes**

Sodium was determined based on the modification of those first described by Maruna and Trinder (1951). Potassium was determined using turbidimetric determination method by Terri *et* 

al., (1958). Chlorides were analyzed based on the method of (Tietz, 1976).

#### **Statistical Analysis**

Results were analyzed by t-test using SPSS version 16 software package. All the data are expressed as mean  $\pm$  standard error of mean (SEM), (n=4) and differences between the groups considered significant at (p< 0.05).

#### III. RESULTS

# Table 1: Phytochemical components of n-hexane and petroleum ether extracts of Globimetula braunii leaf<br/>ComponentsPetroleum ether extractComponentsn-hexane extractPetroleum ether extract

Saponins	+++	+
Alkaloids	+	_
Phenols	++	+++
Tannins	+	+++
Cardiac glycosides	+++	_
Terpenes	++	++
Steroids	++	+++
Flavonoids	-	+++
Anthraquinones	_	_
Anthranoides	-	_
Phlobatanins	_	_

- +++: Highly present
- ++: Moderately present
- +: Mildly present
- \_ Not detected

Saponinsand cardiac glycosides are highly present in nhexane extract, while phenols, tannins, steroids, flavonoids are highly present in petroleum ether extract.

The figure shows the mean blood glucose levels of rats in all groups. The fasting blood glucose levels of diabetic untreated

rats significantly increased as opposed to that of the normoglycaemic, standard drug, and extract treated groups. Highest hypoglycaemic activity was recorded at the 12<sup>th</sup> day of the treatment.



Figure 1: Blood Glucose Concentration of Treated and Untreated Rats.



Figure 2: Serum Cholesterol and Triglyceride Concentrations

Group 1: Normoglycaemic rats Group 2: Diabetes untreated rats Group 3: Petroleum ether extract treated rats Group 4: n-Hexane extract treated rats Group 5 Standard drug (metformin) treated rats

Figure 2 shows the levels of total cholesteroland triglyceride. There was an increase in cholesterol concentration of diabetic control group as compared with the normal control group. There was a reduction in the serum total cholesterol of rats treated with petroleum ether and n-hexane leaf extracts of *G. braunii*, and that of the standard drug treated group when compared with the untreated rats. Triglyceride level decreased in n-hexane treated group and shows no significant difference in other groups except the diabetic control group that has elevated values.



#### Figure 3: Serum Alanine aminotransferase (ALP), Aspartate aminotransferase (AST) and Alkaline Phosphatase (ALP) Key

Group 1: Normoglycaemic rats

Group 2: Diabetic untreated rat

Group 3: Petroleum ether extract treated rats

Group 4: n-Hexane extract treated rats

Group 5: Standard drug (metformin) treated rats



#### **Figure 4: Serum Urea and Creatinine**

Values are Mean ± standard error of mean (SEM),not significantly different at (p< 0.05).

Group 1: Normoglycaemic rats

Group 2: Diabetic untreated rats

Group 3: Petroleum ether extract treated rats

Group 4: n-hexane extract treated rats

Group 5: Standard drug (metformin) treated rats

Total protein and creatinine levels were not significantly affected by the extracts.Petroleum ether extract did affect the urea level as much as did the effect of diabetic, with the standard drug showing the most significant effect on urea


**Figure 5: Effect of Extracts on Serum Electrolytes** 

Values are Mean  $\pm$  standard error of mean (SEM),not significantly different at (p<0.05).

- Group 1: Normoglycaemic rats
- Group 2: Diabetic untreated rats
- Group 3: Petroleum ether extract treated rats
- Group 4: n-Hexane extract treated rats
- Group 5: Standard drug (metformin) treated rats

Sodium levels increased in diabetic untreated, n-hexane, and standard drug treated groups, while chloride decreased in diabetic untreated and n-hexane groups. Bicarbonate also increased in diabetic control and n-hexane treated groups.

### IV. DISCUSSION

The study has revealed the presence of important medicinal phytochemicals in both petroleum ether and n-hexane leaf extracts of *Globimetula braunii*.Flavonoids have been reported for their antimutagenic and anticarcinogenic potentials due to their antioxidant and antiinflamatory properties (Parajuli *et al.*, 2012). Saponins are used as adjuvant in the production of vaccines (Asl and Hossein, 2008), while phenols are known for their hypoglycemic properties (Nikrote *et al.*, 2011). Phenols possessantiviral, antibacterial (Akiyma *et al.*, 2007), and antiparasitic effects (Koladziel and Kiderlen, 2005).Alkaloid has

been used as central nervous system stimulant, topical anesthetic in ophthalmology, powerful painkillers and in the production of certain drugs e.g cocaine, caffeine, and quinine. Tannins have also been shown to be potential antiviral, antibacterial and antiparasitic agents. Absence of anthranoid, anthraquinone and phlobatannin in both extracts and the absence of cardiac glycoside in petroleum ether extract (but present in n-hexane extract) (Table 1) is due to the fact that different parts of the plant have different ingredient profile and different extraction procedure. The solvent usedfor extraction may also yield different active components(Shan et al.,2007). The hypoglycemic effect (figure 1) of these extracts may be linked to their phytoconstituents specially the flavonoid and phenol because of their antioxidant properties (acting by potentiating the insulin effect) either by increasing the pancreatic secretion of insulin of the  $\beta$ -cells of islet of langerhanes or it releases the bound insulin (Pari and Armanath 2004).

According to Eleazu *et al.*, 2010, alloxan is known to destroy beta cells of the islets of the pancreas that function in the regulation of insulin secretion which then leads to an increase in the blood concentration of glucose and type 1 diabetes mellitus ensues. Alloxan induces diabetes by damaging the insulin secreting cells of the pancreas leading to hyperglycemia.

The oral administration of 500mg/kg bodyweight of nhexane and petroleum ether leaf oil extracts of *G.braunii* and 0.5g/kg bodyweight standard drug on rats caused a significant (p<0.05) reduction in the blood glucose concentration of diabetic rats. Similar observation has been reported in rats following the administration of *Azadirachta indica* leaf extract and*Rubus ellipticus* fruit extract (Sharma, *etal.*, 2011). This may be due to greater presence of phytochemical in n- hexane extract (Table 1).Metformin was used as a standard drug to compare the efficacy of the extracts. It acts by increasing fatty acid oxidation, decreasing hepatic glucose production and intestinal absorption, increasing peripheral glucose uptake and insulin sensitivity (Kirpichnikov*et al.*, 2002). Administration of petroleum ether and n-hexane leaf extracts of *Globimetula braunii* has led to the reduction in the levels of cholesterol and triglyceride.

Activities of alanine aminotransferase (ALT), and aspartate aminotransferase (AST) increased in extract treated groups (figure 3). Increases in ALT and AST are also seen in drug hepatitis (cholestatic). ALT and AST are good marker enzymes that are found in the liver and kidney. According to Gressner *et al.*, 2007, the cellular rupture of the mitochondrial allows the enzymes to escape into the blood. An increase in the levels of these enzymes (ALT and AST) often means that liver disease such as cirrhosis, liver necrosis, hepatitis or exposure of the liver to toxic substance might have occurred. Elevated level of ALT is usually followed by increase in the level of AST (Shahraki, *et al.*, 2007).

Alkaline phosphatase (ALP) is a protein present in all body tissues with high amount in the liver. The serum levels of ALP significantly increases in both extract treated groups compared to the normoglycemic. This agrees with the result obtained by Brown *et al.*, (2007). Higher than normal values of ALP may be due to biliary obstruction and hepatitis, while lower than normal values are due to malnutrition and protein deficiency, although it is very rare. Increased in the activity of ALP may not be due to hepatic cell disruption, nor to a failure of clearance, but rather to increased synthesis of hepatic ALP. Blood level of ALP is a good indicator of the rate of bone formation.

The total protein is a biochemical parameter for measuring the total amount of protein in blood serum. Total protein consists of albumin and globulin. The liver synthesizes large amount of albumin and some fraction of globulin. Low level of total protein was observed in n-hexane extract treated group. This is in line with the work of Alimat *et al.*, (2012) who reported decreased level of total protein upon administration of neem gold extracts to laboratory animals. This observed low level of total protein may be due to low protein synthesis by the liver or damage to the liversuch as cirrhosis. It might lead to nephritic syndrome, where it is lost through the urine.

Hyperglycemia leads to the over production of free radicals and the non-enzymatic glycation of proteins. These changes are

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### AUTHORS

First Author – Muhammad H.L., Department of Biochemistry, Federal University of Technology, Minna Second Author - Kabiru A.Y, Department of Biochemistry, Federal University of Technology, Minna Third Author - Mann A, Department of Natural Product Chemistry, Federal University of Technology, Minna Fourth Author - Adefolalu F.S, Department of Biochemistry, Federal University of Technology, Minna Fifth Author – Busari M.B, Global Institute for Bioexploration, Federal University of Technology, Minna Sixth Author – Raji R.O, Department of Biochemistry, Federal University of Technology, Minna Seventh Author – Shekowan S.M, Department of Biochemistry, Federal University of Technology, Minna **Eight Author** – Iwegbulam B, Department of Biochemistry, Federal University of Technology, Minna Correspondence Author - khadijahlami@gmail.com Phone

number: 08035960300

# Assessing spatial inequality within Koch Rajbanshi community people of Koch Behar

Kumar chiman sinha<sup>\*</sup> Dr. Rajiva Prasad<sup>\*\*</sup>

<sup>\*</sup>PhD Student, International Institute for Population sciences \*\*Professor (retd), International Institute for Population sciences

### I. INTRODUCTION

Here we are talking about spatial inequality, but before starting to write about it, we need to understand what we mean when we talk about spatial inequality. According to Wikipedia "Spatial inequality is defined as the distribution of qualities/resources and services like welfare in bias or unequal amounts. It occurs as a result of greed, religion, race or culture. Spatial inequality is countered by equal distribution of resources and services". It has been observed that people are living in same socioeconomic conditions in the same cluster.

Historically, people are living in communities and these communities rarely give opportunity to the other community to mingle. Particularly this character makes this group vulnerable to inequality (Khan 1911). If we see the major reasons for spatial inequality we found that religion, culture and ethnicity are in top. Studies on spatial inequality have become important in recent years, as it remains persist in the society and rapidly increasing, the spatial dimensions of inequality have begun to attract considerable policy interest also. In our country as well as other developing countries, there is a sense that spatial and regional inequality, of economic activity, incomes and social indicators, is on the increase (Lall et al, 2005). To some extent this may be a normal feature of economic growth, as new activities develop around coasts or border regions. But are such patterns transient or permanent? What factors are conducive to the spread of activity from booming to backwards regions? Also important in the policy debate is a perceived sense that increasing internal spatial inequality is related to greater openness of economies and to globalization in general.

When market at risk, we expect the fruit of development should reach the peoples. Spatial inequality ruined all the benefits. The growth of mega-cities may be one aspect of this policy, but responses are far from clear. Should infrastructure expenditure be concentrated or dispersed? Should internal migration flows to be restricted or facilitated in order to narrow spatial wage gaps? Spatial inequality is a dimension of overall inequality, but it has added significance when spatial and regional divisions align with political and ethnic tensions to undermine social and political stability. So here, our ultimate objective is to see the socioeconomic condition of Koch Rajbanshi community people and to examine whether they are in an unequal situation.

The onset of the above reasons here we try to select a distinct ethnic group i.e Koch Rajbanshi community to see how of spatial inequality curve the development of this society. Koch Behar was the capital of Koch kingdom. Since a long time Koch Rajbanshi people are living here.

The map is only for representation purpose:



Although Koch Behar is the only place where we get a large number of Koch Rajbanshi people, and on the basis of this we select this place for our study. According to Sir Edward Gait, "True Koches were a Mongoloid race, very closely allied to the Meches and Garos; and we find that in Jalpaiguri, Koch Behar and Goalpara, who, though dark, have a distinctly Mongoloid physiognomy, or else a mixed breed, in which the Mongoloid element usually predominant". Two captures the socioeconomic condition of this community 500 household has been selected using two stage sampling procedures.

To study the socioeconomic characteristics of the community here, we try to focus on the basic economic, social and demographic indicators. For this reason simple frequency tables and cross tabulation has been done of various variables. Lorenz curve will be drawn to see the existence of inequality within the community. A social connection with someone having migrant experience at a particular destination represents an important resource that can be utilized to facilitate movement. We also review the policy which has been implemented by government to remove the inequality and try to see its pros and cons. There are near about eight different groups of people live in Koch Behar. Among them the Koch Rajbanshi community is a most prominent ethnic group of people in the district because they were from the beginning of our known history. Since the attainment of independence, this particular ethnic group of people alienated from the side of the ruling class and rulers of West Bengal who dint of their plans and activities failed to command the support and respect of them. If we see the type of house they live, we found at least 60 percent household living in kuchcha houses followed by 22 percent in pucca and 17 percent in semi-pucca houses.



The sources of drinking water are also shown that the most of the houses depend on hand pump followed by 18 percent of tap water and near about 4 percent depend on public water supply.





The average literacy rate is 88.6 percent. Most of the people have below 8th standard of schooling. This phenomenon has a historical background and persists till date. The King himself liked to give the real power of administration into the hands of educated persons who were outsiders from Southern and Eastern Bengal which further alienate them from the mainstream. Eminent scholars have written that during ancient period general people of Koch province remained engaged with playing and household chores till the age of 17-18 without undertaking any kind of studies. Women were involved in breeding of cocoons and weaving the yarn. If we see the age at marriage of the Koch Rajbanshi people we certainly found that most of the people are married in their lower age. These because they are unable to find any other work and got married in early age. They also have a very low level of education.





In the above picture the vertical axis shows the year of schooling and the horizontal axis shows the age at marriage. Interestingly, it shows that irrespective of educational attainment, age of marriage for girls is low compared to their male counterpart. Average age of marriage is 24 years for Male and 20 years for females. At present most of the Koch Rajbanshi family hold on an average 0.35bigha. For a five member family this

amount of land is very small considered that this land is average in quality and most do not have the irrigation facility. Mass level mall practice of operation 'Barga' decimates the land owners. We found that about 65 percent of households have 4 or more members.

Diagram4: Occupational pattern of Koch Rajbanshi community people (in percent)



Most of the Koch Rajbanshi community people working with the non-agricultural sector. This is because of migration. People migrate to the other places to work industries.

Among the entire household belongs to Koch Rajbanshi community people, only near about 27 percent of them having at least one member residing outside, working and earning money. If we see the reasons for migration, we found that 83 percent people migrate to get a work and only 13 percent are going to outside for settlement purpose. As more people go outside for work more amounts of remittances received the sending place which ultimately helps to develop the region.

Although the average household income is just Rs.5898, the lorenz curve shows that there us very little existence of income inequality. The upper part of the curve is little flat means within community only a few household earn little more money compare to the others.

### **Diagram5: Lorenz curve**



If we compare all the above indicators to the state or national level, we found that all the indicators of Koch Rajbanshi households are below average which strongly suggests that existence of inequality. The existence of inequality within the community is very little. To remove the spatial inequality we must try to improve the condition of Koch Rajbanshi people will may possible by improving socioeconomic factors like education, health and providing more infrastructure such as roads, drinking water, and agro based industries.

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### AUTHORS

**First Author** – Kumar chiman sinha., PhD Student, International Institute for Population sciences **Second Author** – Dr. Rajiva Prasad, Professor (retd), International Institute for Population sciences

# Male involvement and utilization of maternal health services in India

### Kumar Chiman Sinha

PhD Scholar, International Institute for Population Sciences, Mumbai-400088

Abstract- The present paper examines the association between the men's knowledge regarding the maternal health service utilization and maternal health in India using data from National Family Health Survey 2005-06. The indicator of maternal health used in the analysis is safe delivery. Binary and multinomial logistic regression are used established the said association. Males involvement coded into two ways and two categories viz father present at the time of ANC visit or not, and whether at any time during the pregnancy any health provider or health worker told them about the various sign of pregnancy complications or not. The other independent variables used in this analysis are age, children ever born, work status of the women, education of the women, religion and caste. The findings clearly suggest that male involvement and their knowledge about maternal health significantly associated with the maternal health. Those women's husband has knowledge regarding maternal health and those are present at the time of ANC visit more likely to utilize safe delivery service.

*Index Terms*- Maternal health, Male involvement, ANC, Institutional delivery

### I. INTRODUCTION

During the last few decades India has been going through an intensive transformation process related to changes in demographics and in the use of human capital. Among the most significant transformations, we find changes in family structure and fertility, a transition from a relatively young to a relatively older population, an increase in the labor force participation of women, and growth in levels of educational attainment.

There have been important changes in family size related to demographic transition. The total fertility rate fell from 2.9 in 1998-99 to, to 2.7 in 2005-06(NFHS-3). The evolution of family structure has also undergone important although somewhat less dramatic changes. Compared with other South Asian, a large percentage of Indian households are composed of nuclear families. The proportion of female-headed households has also increased.

It is additionally worth mentioning that the majority of these demographic and socioeconomic changes started from the mid-1990s as a consequence of various policies implemented by the government, as well as some institutional changes. While it is true that the decline in India's fertility was already following a secular trend, public policy was additionally trying to accelerate this momentum.

In 1996, safe motherhood and child health services were incorporated into the Reproductive and Child Health Programme

(RCH). To improve the availability of and access to quality health care, especially for those residing in rural areas, the poor, women, and children, the government recently launched the National Rural Health Mission for the 2005-2012 periods.

In spite of the government's effort to reach out to pregnant women in all parts of the country to provide all components of maternal health care free or with nominal charges, utilization of maternal health care remains low in the country. For example, institutional delivery according to NFHS-2 was as low as 34 percent (IIPS, 2000). However, one of the important policy goals of the government is to achieve 80 percent institutional deliveries by the year 2010 (National Population Policy 2000). Though the government is committed to provide extensive free maternal health care under its top priority national health program, its low utilization is intriguing.

Utilization of maternal health care depends not only on the availability of services but also on different other factors such as distance of health care facility; perception of women and husband and their families regarding the need for care; social restrictions on freedom to movement; the opportunity cost of accessing health care; and the interaction between the client and the provider of formal health care system (World Population Monitoring, 1998; IIPS, 2000). Also as a woman's social status and her health are intrinsically related, her low status often is the cause of poor access to essential healthcare (Report on Safe Motherhood Conference, 1987; Royston et al, 1989).

### II. LITERATURE REVIEW

Women's house hold position is one of the important determinants of their health care utilization. It depends on many things, mainly the closeness of the husband-wife bond and the degree of communication between spouses have also been suggested to be an important dimension of women's household position (Jejeebhoy S 1995), because conjugal intimacy is generally discouraged in South Asia and the husband represents a direct avenue to household resources.

It is widely asserted that increased gender equality is a prerequisite for achieving improvements in maternal health. The Programme of Action adopted at the 1994 International Conference on Population and Development claimed that "improving the status of women also enhances their decisionmaking capacity at all levels in all spheres of life, especially in the area of sexuality and reproduction"(ICPD).

Also, women's paid employment could alter the perception of women's value and motivate investment in the girl child's education and health (United Nations, 1999). The investment of power on a woman becomes evident through her participation in household decision making, financial autonomy and freedom of movement (Kishor, 2004). Lack of decision making power by a woman could result into lesser timely health seeking behaviour and leads to greater adverse health consequences (Sundari, 2004).

The input of empowerment also has to enhance her intrinsically by changing her attitude or ideology into egalitarian ideas, otherwise the power or autonomy she has gained, could not channel her to make welfare and developmental decisions. A fundamental shift in perceptions, or "inner transformation," is essential to the formulation of developmental choices (Malhotra A, 2002). Non-egalitarian gender relations deny woman an egalitarian decision making role during health care need, and other family matters (Jeejebhoy, 1998). Positive change in the attitude could alter the current submissive image of an Indian woman as only a reproductive tool, homemaker, caregiver and subordinate.

### III. SOME IMPORTANT ASPECT OF MATERNAL HEALTH CARE

### Maternal Health Care Services

Primary maternal health care is provided by the government through health centers and sub health-centers. At the secondary level, there are district hospitals or community health centers and at the tertiary level, there are, regional and central hospitals. The government currently considers the numbers of facilities offering specialized maternal, newborn and child health care to be adequate, but recognizes a need to strengthen capacity, especially in terms of quality of care and management. It is government policy to provide antenatal care free of charge, except for medicine.

### **Essential maternal care**

All women need of additional care during her pregnancy. All women must be given Tetanus Toxoid immunization and the full course of Iron Folic acid (IFA) tablets. All women need to be advised on the preparations they must take for delivery. It is important that all pregnant women are registered early during pregnancy. The urgency for doing so must be emphasized by the premedical staff. The number of women registered sub-center wise should be monitored monthly. The annual estimated number of pregnant women must be worked out sub-center wise and the total number in the primary health center (PHC) area can be added up. The estimated number of pregnancies and the registered should be monitored to determine how many women are not receiving the essential services.

The purpose of antenatal checkup is to monitor the progress of pregnancy and identify and treat medical complications early. Women who have no antenatal examination are at risk as they may have and underlying complications or high risk factor. Some women can even develop complication without warning. It is essential therefore that all pregnant women receive antenatal care and advise on where they deliver.

### Need of the study

Decision making and the utilization of health care facility are inseparable part of our analysis. Husband and wife as a couple bear all the responsibility of their present and future life. They have needed better understanding to successfully run their family. To live a peaceful life both have needed a good health. As our society's concern husband are always responsible to take all the decision regarding any expenses. To ensure good health husband and wife needs better cooperation. At the time of pregnancy demand for cooperation is more to ensure the safety of mother and child. So we have need to check the husbands presence at the time of wives ANC visit has any influence on better health care utilization as full ANC and a increase or decrease of institutional delivery.

### IV. OBJECTIVE OF THE STUDY

Our specific objective of this study is-

To examine husbands attitude and involvement in maternal health care utilization.

### **Data and Methods**

This study analyzes data from the2005-06 National Family Health Survey (NFHS), which employed a nationally representative sample of 109041households, 124385 women age 15-49, and 74369 men age 15-54. The present analysis is restricted to the 42183 match couples, those are currently married. The Reproductive and Child Health Programme in India envisages the involvement of men in women's reproductive health. Health workers are supposed to provide expectant fathers with information on several aspects of maternal and child care during their contacts with expectant fathers. In NFHS-3, information was collected through the Men's Questionnaire about several aspects of their involvement in antenatal care, including whether the mother of their youngest child had any antenatal check-ups when she was pregnant, whether they were present at any of these antenatal check-ups, and the reason the mother did not have any antenatal checkups if she did not have any. Men were also asked whether at any time during the pregnancy any health provider or health worker told them about the various signs of pregnancy complications and what to do if the mother had any of those complications.

Here according to the benefit of our study we grouped our study variables into four categories: women's social and demographic characteristics, husband's social and demographic characteristics, their perceptions of the household decision making and use of reproductive health care services as ANC visit and place of delivery.

### **Social and Demographic Characteristics**

A number of social and demographic characteristics were considered in the analysis, including husbands' age, number of children ever born, husband wife age gap, education, place of residence, alcohol consumption of the husband, presence of violence, desire for children, religion, caste and justification of wife beating, Because community norms and values influence individual behavior. we also assessed the social and demographic impacts on ANC visit and non institutional delivery for separate states. Education has been consistently related both to use of maternal and child health services and to positive health outcomes. We categorized husbands' education levels as none, primary, secondary and higher. Indicators of the household's socioeconomic circumstances included husband's education and occupation, as well as standard of living index.

### **Use of Maternal Health Care**

We assessed the outcome variables are receipt of skilled antenatal care services with the presence of husband as at least once during the last pregnancy or youngest child, and place of delivery of the youngest child.

### V. STATISTICAL ANALYSIS

Univariate, bivariate and multivariate analyses were used to study the impact of husbands' decision making power and the utilization maternal health care services for their wives. We first examined the bivariate relationships of husbands' social and demographic variables with their use of skilled antenatal and delivery care. Next, multivariate logistic regression models were developed to identify associations between the indicators of women's household position and their use of antenatal care services and skilled maternal health care services. Our models controlled for a series of variables, including age and number of children ever born, desire for children, residence, education, socioeconomic status, household relation, justification of wife beating, husband drink alcohol or not etc.

### VI. RESULTS

Table-4.2.3 presents information on husband's involvement during antenatal care visits. In all age group most of the husbands present at the time of antenatal care visit but those husbands are belongs to 15- 24 years their presence at the time of antenatal visit are very low (65 percent) compared to other age groups. If we see the husband's presence according to the age we found increasing the age the presence is also increasing but after 35-39 years age group husbands presence decreases. Husband's presence at the time of ANC visit also varies according to the number of children. Among those couples have more than 5 children among those husbands' presences at the time of ANC visits are very less (69 percent). Those couples with 1-2 children among them husbands presence is higher (77 percent). Among Hindus 75 percent are present at the time of antenatal visit.

Table-4.2.3 Percentage distribution of husband's presence (non presence) in last ANC of mother by husbands' background

Background		Not		
characteristics		present	Present	Total
Age	15-24	34.68	65.32	1093
	25-29	25.68	74.32	3061
	30-34	22.88	77.12	2968
	35-39	22.39	77.61	1755
	40-44	24.48	75.52	678
	45 and above	29.07	70.93	289
No. of living children	1-2 children	23.24	76.76	6664
	3-4 children	29.13	70.87	2451
	five or more	30.73	69.27	729
Religion	Hindu	24.87	75.13	7865
	Muslim	27.27	72.73	1419
	Others	25.85	74.15	561
Caste	SCs	28.29	71.71	1909
	STs	32.26	67.74	868
	OBCs	24.53	75.47	3640
	Others	22.07	77.93	3050
Place of residence	Urban	19.74	80.26	3632
	Rural	28.49	71.51	6212
Standard of living index	low	34.49	65.51	2018
	medium	27.97	72.03	3182

Husband present during check-ups for youngest child

		high	18.87	81.13	4139
Highes	t educational level	No education	34.82	65.18	1700
		Primary	35.72	64.28	1744
		Secondary	22.43	77.57	5051
		Higher	10.25	89.75	1346
Total			25.26	74.74	9841

It is also highest from all others religions. According to the castes those belonging to others the presence at the time of ANC is highest among them (78 percent), followed by OBCs (75 percent), SCs (72 percent) and STs (68 percent). It is also higher in the urban areas (80 percent). Those who are living in the higher standard among them 81 percent are present at the time of ANC visit. Those husbands with higher education among them presence at the time of ANC visit is higher (90 percent) followed by those are achieve secondary education (77 percent), those with primary education and those have no education (65 percent). So from the above table we find, there is a strong negative relationship between the father's number of children ever born and his presence during any antenatal check-up of the mother, and a positive relationship between both the man's educational level and his wealth status and his presence during antenatal check-ups. Those husbands belongs to 15-24 and 45 or above years age group having more number of children, belongs to STs, living in rural areas with low standard of living and also have no

education among them the presence with their wife at the time of ANC visit is very low.

Table-4.2.4 shows the distribution of men aged 15-49 whose youngest child was less than three years of age at the time of the survey and for whom the mother did not receive any antenatal care by the main reason for not receiving antenatal care. 40 percent of men thought it was not necessary for the mother to receive antenatal care.

Another 15 percent of men said that their family did not think it was necessary or did not allow the mother to receive antenatal care. For 20 percent of men, the main reason for the mother not receiving antenatal care was that it costs too much. The reasons given by men for the mother not receiving antenatal care are similar in rural and urban areas. However, a much higher proportion of rural men (20 percent) than urban men (14 percent) gave cost as the main reason for the mother not receiving antenatal care. A larger proportion of men in urban areas than in rural areas said that their family did not think it necessary or did not allow the mother to receive antenatal care.

### Table-4.2.4 Reasons why child's mother did not receive antenatal care: Men's reports

Percent distribution of men age 15-49 whose youngest living child was age 0-35 months and the child's mother did not receive antenatal care when pregnant with the child by the main reason for not receiving antenatal care, according to residence, India, 2005-06

Reason why mother did not received		<b>.</b>	<b>T</b> ( )
antenatal care	Urban	Rural	Total
Man did not think it was necessary	38.8	40.7	40.4
Family did not think it was necessary	20.3	14	15
Childs mother did not want check-up	10.4	9.1	9.3
Has had children before	1.5	1.6	1.6
Costs too much	14	20.7	19.6
Too far/no transportation	1.2	3.9	3.4
no female health worker available	0.9	1.4	1.3
Other	3	2	2.2
Don't know /missing	9.8	6.5	7
Total	100	100	100
Number of men	756	3944	4699

Source: NFHS-3 report

Table-4.2.5 shows the place of birth of the youngest child according to the background characteristics. More than half of the husband said that their youngest child was not born in the hospitals or in a health facility. If we see it according to the age we found in all age groups of husbands more than 50 percent said that their youngest child did not born in the hospital. Delivery in hospital is very less among 15-24 years age group. It increases up to age 34-39 and then decrease. Institutional delivery is negatively related with the no of living children. It is highest among those have 1-2 children (56 percent) and lowest among those have 5 or more children (15 percent). Institutional delivery is lowest among Muslims (36 percent) and highest among the other religions (53 percent). Institutional delivery is very low among STs (21 percent) followed by SCs (36 percent), followed by OBCs (43 percent) and others (56 percent). In urban areas it is 70 percent and in rural areas it is 31 percent. Those are living in low standard of living near about 80 percent of them are goes for non institutional delivery and its opposite those are in high SLI 68 percent among them goes for institutional delivery.

### Table-4.2.5 Percentage distribution of safe delivery by fathers background characteristics, India, 2005-06

Background characteristics		Place of birth		
		Hospital	Other	Total
Age	15-24	37.65	62.35	1737
	25-29	42.53	57.47	4345
	30-34	46.85	53.15	4305
	35-39	44.85	55.15	2709
	40-44	37.13	62.87	1193
	45 and above	24.74	75.26	578
No. of living children	1-2 children	56.15	43.85	8568
	3-4 children	28.21	71.79	4300
	five or more	14.76	85.24	1998
Religion	Hindu	43.09	56.91	11847
	Muslim	35.98	64.02	2276
	Others	53.23	46.77	744
Caste	SCs	35.90	64.10	3117
	STs	20.87	79.13	1572
	OBCs	43.04	56.96	5706
	Others	56.31	43.69	3969
Place of residence	Urban	69.79	30.21	4340
	Rural	31.26	68.74	10527
Standard of living index	Low	20.66	79.34	4231
	Medium	35.83	64.17	4909
	High	68.48	31.52	4937
Educational level	No education	18.81	81.19	3834
	Primary	34.69	65.31	2744
	Secondary	51.51	48.49	6734
	Higher	75.92	24.08	1549
Decision about health care	Husband alone	43.87	56.13	3205
	H-F jointly	44.31	55.69	5441
	Others	40.23	59.77	6220
Husband present during check-ups	Not present	12 72	57 28	2486
for youngest ennu	Present	42.72 62.05	37.20	7357
Total	i iestin	42.51	57 49	14861

If we see it according to the educational attainment we found those have no education among them only 19 percent goes to hospital for delivery. It increases according to the increase of educational attainment of the husband. More than 75 percent husband from higher educated group said that their youngest child born in health facility. If husband not present at the time of ANC visit then only 42 percent goes for hospital to delivery but if husband present at the time of ANC then more than 62 percent wife goes to hospital for delivery. If the husband present at the

time of ANC visit then wife is more likely goes to hospital for delivery.

Now we are trying to understand the reasons which lead institutional delivery and simultaneously increase non institutional delivery also.

Table-4.2.6 shows that, those who are living in rural and urban areas among them 15 percent of urban and 85 percent of

Table -4.2.6 Institutional delivery of youngest child

rural husbands think that there is some reason which leads to non institutional delivery. If we compare urban and rural we found that 13 percent of urban and 87 percent of rural husbands said that cost is the main reason for not going to hospital for delivery. At least 92 percent of husband from rural area said hospital is too far and there is no transportation which prevents to go to hospital for delivery.

Percent distribution of husband aged 15-49 who has not experienced safe by whether the child delivery by reasons, according to the place of residence.

Reason for not delivering youngest child in health facility

Place of residence					
	India	Urban	Rural	Total	
Cost too much	5.01	13.16	86.84	2113	
Facility closed	0.37	20.51	79.49	156	
Too far/no transportation Don't trust facility/poor quality	1.52	7.79	92.21	642	
service	0.28	21.37	78.63	117	
No female provider	0.13	15.09	84.91	53	

Cont.....4.2.6

		Place of residence		
	India	Urban	Rural	Total
Mother did not think necessary	2.19	21.67	78.33	923
Husband did not think necessary	5.49	14.20	85.80	2317
Family did not think necessary	3.60	16.39	83.61	1519
Other	0.72	22.70	77.30	304
DK	0.13	16.67	83.33	54
Total	20.26(42183)	15.33	84.67	8547

The major cause for not delivering youngest child in health facility is cost that is too much (5.01 percent), husband did not think it is necessary (5.49 percent), family did not think it is

necessary (3.60 percent) followed by mother did not think it is necessary and other causes related health facilities.

### 4.2.7 Multivariate findings

**Table-4.2.8** Odds ratios from logistic regression analysis assessing associations between the husband's presence at the time of ANC and couples background characteristics.

Odds ratios (	of ANC care					
		Exp b/significance				
	Characteristics	India	UP	WB	MH	
	15-24	1	1	1	1	
age	25-29	1.26*			1.95*	
	30-34	1.33*		4.55*		

35-39	1.35*	3.44* 2.26*

Odds ratios of ANC care

	40-44	1.46*		5.75*	
	45 and above	1.42*	4.31*		
Age gap	wife is older or same husband is 1-5 years	1			
	older	1.31*			
	h 6-10 years older more than 10 years	1.33*			
	older	1.34*			

Cont.....

	Exp 0/significance					
	Characteristics	India	UP	WB	MH	
No. of living children						
	No children	1	1			
	1-2 children	.77***	.69*			
	3-4 children	.79*				
Education	No education	1	1		1	
	Primary					
	Secondary	1.31***	2.26***			
	Higher	2.44***	4.27***		4.09*	
occupation	service sector	1				
	Agriculture	.69***			.48*	
	industrial workers	.83*			.60*	
	not working	.50*				
Religion	Hindu	1	1	1	1	
	Muslim		1.47*	.29*	.42*	
	others	.76*				
caste	SCs	1		1		
	STs			.12*		
	OBCs	1.22*				
	Others					
SLI	low	1				
	medium					
	high	1.38***				
Desire for children						
	want no chil			1		
violoneo	want chil			.35*		
violence	No vio	1				
	Physical vio	.79***				
	Emotional & sexual vio	.73***				
N		7668	896	249	894	

Evn b/significance

0=Husband not present at ANC 1= Husband Present

Only significant values are given

In this multivariate model our dependent variable is husband's presence or absence during any of the ANC visit of wife. We coded it as '0' means husband not present and '1' means husband present. First we did regression in all India level and then the same model we used for state level to see the determinants of husbands presence at the time of ANC visit of the mother. The multivariate model shows that in all India level age, age gap, number of living children, religion, caste, education, occupation and SLI are the main determinants of husband's presence at the time of ANC visit. Age and husbands presence at the time of ANC with wife is significantly related. With the increase of age odds ratio also increases. Compared to the 15-24 years age group 40-44 years age group husbands are 46 percent more present at the time of ANC. Age gap is one of the important predictor of husband's presence at ANC with his wife. Those husbands who are ten years or more older than their wives their presence is 34 percent more present at the time of ANC compare to those husbands with same age or with older wives. But the chance of husband's presence at the time of ANC visit decreases with the increase of no of children. Compared to those who have no children, those have 3-4 children are 21 percent less likely present at the time of ANC. Those who have the higher education are two and half time more likely present at the time of ANC of their wife compared to those husbands' have no education. According to the occupation, those husbands are working at service sector, are more likely to present compared to

those are working in agriculture sector (.69), industrial sector (.83) and those are not working at the time of ANC visit with wife. Among all religions those are not belongs to Hindu and Muslim are less likely to present at the time of ANC. OBCs are 22 percent more likely to present at the time of ANC visits with their wife. Compared to those are living in low standard, those are living with higher standard are more (38 percent) likely to present at the time of ANC. Presence of violence is also one of the important determinants of husbands presence at the time of ANC visit. Compared to no violence the presence of physical violence reduces the chance (21 percent) of husband's presence at the time of ANC visit. Those couples are experienced by emotional and sexual violence, the husband is 27 percent less likely to present at the time of ANC.If we apply the same model to see the determinants in UP we found compare to 15-24 years age group, those are belongs to 45 or more years age group are near about 4.3 times less likely present at the time of ANC. Positive association also found with education and religion. Those have secondary education, compare to those have no education they are more than two times more likely to present with their wife at the time of ANC, it also increase among higher age groups. Those husbands have the higher education; they are four times more likely to present at the time of ANC visit, with wife. In UP among Muslims husbands presence at the time of ANC are higher compare to Hindus.

In West Bengal the main significant determinants of husband's presence at the time of ANCs are husband's age, religion, and caste and desire for children but in Maharashtra the main determinants are husband's age, occupation, education and religion. Surprisingly we didn't find any significant relationship between place of residence and husband's presence at the time of ANC visit.

Table-4.2.9 shows the association between the non institutional deliveries with the couple's background characteristics. In all India level non institutional delivery is with associated all important couple's background characteristics. From here we can understand the negative and positive associations and compare it. The result shows with increasing age non institutional delivery decreases.

Compared to 15-24 years age group those women with more than 35 years of age are at least 50 percent less likely goes for non institutional delivery i.e. institutional delivery increases. According to the age gap if wife and husband's age is same or wife is older than they are more likely to goes for institutional delivery. Results clearly show that age gap leads institutional delivery. Number of living children is positively related with non institutional delivery. Those have 1-2 children compare to those have no children goes 2.5 times more to non institutional delivery and those have 3-4 children goes four and half times more to non institutional delivery. It clearly shows that increasing the number of children decrease the probability to go for institutional delivery. Non institutional delivery is negatively associated with educational attainment. Compare to uneducated husband those have primary education 20 percent less likely goes for non institutional delivery.

It farther increases 23 percent among those have secondary level education and farther increases near about 50 percent among those have higher education compared to those have no education

<b>Odds ratios of non-ins</b>	titutional delivery				
	-	Exp b/significance			
	Characteristics	India	UP	WB	MH
	15-24	1	1		
Age	25-29	0.94			
	30-34	0.76*			
	35-39	.57***	.47*		
	40-44	.55***			
	45 and above	.57**			
Age gap	Wife is older or same	1			
	Husband is 1-5 years older	.79*			
	H 6-10 years older	.71**			
No. of living children	More than 10 years older	0.8			
	No children	1	1	1	1
	1-2 children	2.49***	1.56*	6.57***	1.87**
	3-4 children	4.47***	2.29*	26.27**	

# Table-4.2.9 Odds ratios from logistic regression analysis assessing associations between the place of delivery of youngest child and couples background characteristics.

### Odds ratios of non-institutional delivery

Exp b/significance

304

### Education

	No education	1	1	1	1
	Primary	0.81*			.34*
	Secondary	.77**		3.67*	.20***
	Higher	.54***	.40*		.10***
occupation					
	Service sector	1			1
	Agriculture	1.43***			1.95*
	Industrial workers	0.99			
	Not working	1.02			
Religion	Hindu	1		1	
	Muslim	1.24*		3.32*	
	Others	1.25*			

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	Characteristics	India	UP	WB	MH	Co
Caste	SCs	1	1	1	1	
	STs	1.64***			2.21*	
	OBCs Others	.76*** .79**	.64* .38***	.07*		
SLI	low	1	1	1	1	
	Medium High	0.89 .49***	 .41*	.07***	.41** .17***	
Desire for children	Want no chil	1				
	Want chil	.77**				
Place of residence	Urban	1	1	1		
violence	Rural No vio	2.16*** 1	1.92** 1	5.02**	 1	
	Physical vio Emotional & sexual vio	1.1 1.36***	1.55* 1.56*		3.05***	
Justification of wife beating	No Yes	1 0.94				
Wife's health care decision	Wife alone	1			1	
	Jointly	1.27***			1.55*	
Alcohol use	Others	1.20** 1				
	Yes	0.93				
Husband's presence in ANC	No	1		1		
	Yes	.57***		.29**		
N		7659	893	245	894	

### 0= institutional

### 1= non institutional delivery

Only significant values are given.

This shows that non institutional delivery decreases according to the increase of education. Those husbands who are in agricultural sector compare to those are in service sector are 43 percent more likely to go for non institutional delivery but those husbands are working in industrial sector are less likely to go for institutional delivery although the difference is very low among those who are working in service sector, those are working in industrial sector and those are not working. Religion and institutional delivery are also associated with each other. Compared to Hindus among Muslims non institutional delivery is 24 percent more and in other religions it is 25 percent more. Compared to STs non institutional delivery is 64 percent more but it is 21-24 percent less among OBCs and other caste groups. Those with higher standard of living are 50 percent less likely chose to go for non institutional delivery. That indicates those are living higher standard are more likely to go for institutional delivery. Desire for children also negatively associated with non institutional delivery. Place of residence is also very strongly associated with non institutional delivery. Compared to urban those living in rural areas are at least two times more likely to go for non institutional delivery. Emotional and sexual violence is significantly associated with non institutional delivery. Compared to those couple experiencing no violence, those are

experiencing emotional and sexual violence is 36 percent more likely to goes for non institutional delivery. Wife health acre decision and non institutional delivery also significantly related. If wife jointly or others take decision about health care compare to wives alone decision about health care are more likely leads non institutional delivery and it is 27 percent more when health care decision taken jointly with husband and 20 percent more when others take health care decision compare to wife alone. It also negatively associated with the husband's presence at the time of wives ANC visit. Compared to husbands not present at ANC those husband are present at the time of ANC are 43 percent less likely go for non institutional delivery. This clearly shows that husband's presence at the time of wives ANC visit increases the probability to for an institutional delivery. We did not found any significant relation between wives justification of wife beating and husbands alcohol consumption and non institutional delivery.

In UP, age, number of living children, caste, SLI, place of residence and presence of violence are significantly associated with non institutional delivery. In West Bengal number of living children, education, religion, caste, place of residence and husbands' presence at the time of ANC visit with wife is significantly associated with the non institutional delivery but in Maharashtra number of living children, occupation, education, caste, SLI, presence of physical violence and couples joint decision about health care are significantly associated with non institutional delivery.

In UP husbands aged 35-39 are more than 50 percent less likely to go for non institutional delivery. Those have 1-2 children compared to those have no children goes one and half times more to non institutional delivery and those have 3-4 children goes near about two and half times more for non institutional delivery but non institutional delivery is 60 percent less among those have higher education. Compared to SCs among OBCs non institutional delivery is 36 percent less and among others it is 62 percent less. Those who live in higher SLI among them also non institutional delivery is less but it is very high in rural areas. Presence of violence also reduces the probability to go for institutional delivery.

In West Bengal those who have more number of children is less likely to go for institutional delivery. Surprisingly those have secondary education are three and half times more likely to go for non institutional delivery. It is also higher among Muslims. Those are living in rural areas are five times more likely goes for non institutional delivery. Those husbands are present at the time of wives ANC visit are also more likely to go for institutional delivery. In Maharashtra violence and wives decision about health care are also positively associated with non institutional delivery. Compared to no violence presence of physical violence increase the probability to go for non institutional delivery three times more like wise husband and wives joint decision about health care also increases non institutional delivery at least one and half times as compared to wife take decision about health care alone.

### VII. CONCLUSIONS

From the above analysis we can conclude that husband can significantly influence the women's health care utilization. In all India level and in state label some factors which determine the women's ANC visit and decide the place of delivery are same. Education, age, place of residence, number of living children, caste, religion are some of the major factors which reduce husbands presence at the time of ANC visit and also restrict women into the house hold and leads non institutional delivery. Presence of violence decreases the husbands' presence at the time of wives ANC visit but increase the institutional delivery. Which also indicate that husbands' presence at the time of ANC does not improve institutional delivery. If wife jointly with her husband or someone else take decision about health care then also institutional delivery does not increase. This result also shows that until or unless the women are able takes decision alone the institutional delivery does not increase. In Maharashtra occupation is coming one of the important factors which determine the husbands presence at the time of wives ANC visit and place of delivery. In both the cases those are working in agriculture sector are far behind from those are in service sector. Results from Maharashtra also support that joint decision making does not improve institutional delivery.

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### AUTHORS

**First Author** – Kumar Chiman Sinha, PhD Scholar, International Institute for Population Sciences, Mumbai-400088

# Probiotic properties of bacterium isolated from shrimp cultured ponds

### G. Mary Sandeepa\* and Ammani \*\*

<sup>\*</sup>Department of Biotechnology, Vikrama Simhapuri University, Nellore-524003 <sup>\*\*</sup>Department of Botany and Microbiology, Acharya Nagarjuna University, Guntur-522510

Abstract- Use of probiotic bacteria in aquaculture has tremendous scope and the studies of the application of probiotics in aquaculture have a glorious future. The present study was aimed at the studies on the probiotic characters of bacteria which were isolated from shrimp cultured ponds. Initially 26 soil samples were collected from dried shrimp cultured ponds; bacteria were isolated by serial dilution. 10 samples were able to produce prominent colonies which were further subjected for repeated sub culturing for pure cultures on nutrient agar medium. Among 10 isolates six were Gram positive, and four of them were Gram negative. All isolates fermented glucose, three of them (HL1, HL2, HL6) fermented lactose, four (HL6, HL4, HL5andHL6) fermented xylose, six (HL1, HL2, HL4, HL8, HL9, HL10) gave positive result for catalase, four (HL1, HL2, HL4, HL6) showed positive result for urease test and four (HL1, HL2, HL3and HL4) gave positive result for nitrate reductase test. Probiotic bacteria such as lactic acid bacteria are mostly gram positive so only six gram positive strains were made pure culture on MRS agar which were further characterized for their probiotic nature. All the isolates survived under low pH (2and3) for 1hr and 6hrs. All isolated colonies survived under 0.3%, 0.5% and 0.1% oxgall treatments, HL1 (98±1.6cfu/ml) and HL5 (92±4.2cfu/ml) showed high survival rate under 0.3% concentration. All isolates survived in gastro intestinal juices for 4hrs, HL1 showed high survival rate 72±1.2cfu/ml. High cholesterol assimilated by HL5 (27±1.2cfu/ml). DNA was isolated from five strains except HL2 and DNA amplification of V2-V3 variable region for identification of Lactobacillus species.

Key words: Probiotic, urease, oxgal and cholesterol

### I. INTRODUCTION

A quaculture has become the world's fastest growing food production sector during last few decades. But according to World Bank report global losses from shrimp diseases were around 36 billion USD. Because of negative consequences of using antibiotic in aquaculture such as indiscriminate use has led to the appearance of antibiotic resistant strains (Skjermo and Vadstein,1999) and also the contamination of shrimp meat and environment (Holmstrom et al., 2003). These have led to suggestions that the use of non pathogenic bacteria as probiotics (Vaseeharan and Ramaswamy, 2003). Now adays in aquaculture industry dietary supplementation of probiotic bacteria has been widely employed (Gatesoup, 1999 and Vine et al., 2006).

Probiotics are a live microbial feed supplement that beneficially affects the host animal by improving its intestinal balance (Fuller, 1989). Another definition given by Coeuret et al. (2004) that probiotics are live micro organisms that upon digestion certain numbers exert health benefit beyond inherent nutrition.

Many types of probiotics are economical force in aquaculture, they are gram negative, gram positive, bacterio phages, yeasts and unicellular algae, (Irianto and Austin, 2002). Probiotic bacteria can prevent the damage or disease by pathogenic bacterium in host by producing antimicrobial substances that inhibits the growth or attachment by harmful bacteria by out competing the pathogen for nutrients or by modulating immune response (Moriarty, 1998). The use of terrestrial bacterial species as probiotics for aquaculture have had limited success, because bacterial strain characters are dependent up on environment in which they thrive. So the better approach is isolating potential probiotic bacteria from the marine or pond environment in which they grow. The present research was aimed at isolation of bacteria from dried shrimp cultured ponds and their characterization under various physical and physiological conditions.

### II. MATERIAL AND METHODS

Collection of soil samples

Twenty six (26) soil samples were collected from the brakish water shrimp ponds from Mypadu, Ramudu palem and Kudithipalem of Nellore district, Andhra Pradesh, India. All these areas are very nearer (20 km away from Bay of Bengal) where extensive *P. monodon* culture being practiced for the last 20 years and *P. vannamei* culture being practiced for the last five years.

### Isolation and enumeration of bacteria

All the samples were transferred to laboratory under sterilized conditions. All soil samples were subjected for serial dilution under extreme sterile conditions using nutrient agar supplemented with 15% sodium chloride. All the prominent bacterial colonies obtained were subjected for pure culture isolation. An inoculum (0.1 ml) of each decimal dilution of samples was plated onto the surface of De Man, Rogosa and Sharpe (MRS) agar (Difco, Detroit, MI, USA) which were incubated anaerobically in anaerobic jar (BBL, Gas Pak Plus). The samples were cultivated under sterile condition in MRS agar plates and they were incubated at 37<sup>0</sup>Cfor 48hrs. Each isolates

were cultured in MRS agar again and preserved in refrigerator in order to conserve them.

### Identification of the bacterial isolates

Representatives of bacterial colony types from MRS agar were isolated and identified using conventional morphological and biochemical tests according to Bergey's manual of determinative bacteriology (Holt et al., 1994).

### Biochemical characterization

The bacteria isolated were biochemically characterized by grams staining, carbohydrate fermentation, catalase production, nitrate reduction and urea production.

### Probiotic properties of Isolates

For determination of probiotic properties all the isolates were subjected for the analysis to look for the probiotic characters such as resistance to low pH, tolerance against bile salt tolerance to gastro intestinal juices and cholesterol assimilation

### Acid tolerance

Acid tolerance was determined according to the method described by Hyrominus et al. (2000). Cells of *Lactobacillus sps* strains were grown in MRS broth at 37°C overnight, and sub cultured in fresh MRS (3%, v/v) broth adjusted to pH 2.0 and 3.0 with hydrochloric acid (3.0 mol/L). Survival rate was calculated as the percentage of the cfu/ml after incubation at 37°C for 60 and 180 min compared to the cfu/ml at time 0 min.

### *Bile tolerance (Oxgall treatment)*

Bile tolerance test was conducted using a modified method of Gilliland et al. (1984). Overnight cultures of *Lactobacillus* strains were inoculated (3%, v/v) into MRS broth and MRS broth containing 0.3, 0.5 and 1.0% (w/v) oxgall. Survival rate was calculated as the percentage of the cfu/ml after incubation at  $37^{\circ}$ C for 240 min compared to the cfu/ml at time 0 min.

### Tolerance to simulated human gastrointestinal tract

In vitro determination of viability under conditions similar to those prevailing in the GIT was performed according to the method of Charteris et al. (1997). Briefly, simulated gastric and pancreatic juices were prepared by suspending pepsin (3 mg/ml; Sigma) and pancreatin USP (1 mg/ml; Sigma) in sterile sodium chloride solution (0.5%, w/v), and adjusting the pH to 3.0 and 8.0 with hydrochloric acid (3.0 mol/L) and NaOH (1 mol/L) , respectively. Portions (0.2 ml) of washed cell suspensions of the isolated bacterial strains in phosphate buffered saline (PBS, pH 7.0) were inoculated in 1.0 ml of simulated gastric or pancreatic juice and 0.3 ml NaCl (0.5%, w/v), mixed and incubated at 37°C. Total viable counts (cfu/ml) were evaluated after incubation for 180 min in cultures tested for gastric transit tolerance, and for 240 min in cultures tested for small intestinal transit tolerance.

### Assay of cholesterol assimilation

Freshly prepared sterile MRS broth was supplemented with 0.3% (w/v) oxgall and 0.2% (w/v) sodium thioglycolate. Water–soluble cholesterol (polyoxyethanyl-cholesterylsebacate, Sigma)

(Pereira and Gibson, 2002a) was filter sterilized and added to the broth at a final concentration of 100  $\mu$ g/ml. Bacterial strains isolated from probiotic samples were inoculated (3%, v/v) into 5 ml of the Ch-MRS-Thio broth, and incubated anaerobically at 37°C for 20 h. Uninoculated sterile broth was used as the control. After incubation, cells were removed by centrifugation (10000 g, 4°C, and 10 min) and the remaining cholesterol concentration in the broth was determined using a modified  $\sigma$ -phthaladehyde method of Ruddel and Morris (1973).

### Isolation of lactic acid bacteria from selected probiotic samples and DNA extraction

Out of the 6 samples five samples were subjected for molecular characterization leaving HL2, as it was a poor performer in tolerance tests performed for probiotic characterization. The 5 selected probiotic samples (HL1, HL3, HL4, HL5, HL6) selected were made in sterile physiological saline, plated onto MRS agar (Biolab Diagnostics, Midrand, South Africa) supplemented with natamycin, and incubated at 30 °C for 24–48 h. Colonies were harvested from plates representing 10<sup>3</sup> CFU/ml and suspended in10 ml of sterile physiological saline. DNA was isolated from 2 ml of cell suspension Dellaglio et al., 1973.

### DNA amplification for lactobacillus identification

The V2–V3 variable region (approx. 200 base pairs) of the 16S rRNA gene in lactic acid bacteria was amplified by using primers ATTACCGCGGCTGCTGG 3') and 341FGC 534 (5' ACGGGGGGCCTACGGGAGGCA 3'). The PCR reaction was performed in 50 µL of PCR mixture containing 0.5 mM of primers, 200 mM dNTP (Takara Bio Inc., Shiga, Japan), 0.5 U Taq DNA polymerase (Takara Bio Inc., Shiga, Japan), 1'PCR buffer (TakaraBio Inc., Shiga, Japan) and 10 µL of DNA. The following conditions were used: initial denaturation at 94 °C for 4 min, followed by 35 cycles of denaturation at 94 °C for 30 s, annealing at 56 °C for 30 s and elongation at 72 °C for 8 min. PCR reactions were performed in a Master Cycler TM Thermal Cycler (Eppendroff, Germany). Amplicons were analyzed on 2% (by mass per volume) agarose gels with ethidium bromide and 0.5TB buffer. DNA fragments were visualized under UV light. The two positive samples for 16s rRNA gene were used in the entire study for the health management and water quality maintenance during the hatchery practices and in farming.

### III. RESULTS

Among the 26 samples serially diluted only 10 samples were able to produce prominent colonies which were further subjected for repeated sub culturing for the isolation of pure colonies. A total of 10 pure colonies obtained further streaked on MRS agar slants for further studies.

### Biochemical characterization

All isolates were subjected to gram staining the gram reaction of isolates were observed under light microscope HL1, HL2, HL3, HL4, HL5 and HL6 were shown to be gram positive and the remaining isolates were gram negative. All isolates produced gas from glucose. HL1, HL2, HL 6 fermented the lactose. HL1, HL 4, HL5, HL6 fermented the xylose. HL1, HL2, HL4, HL8, HL9, HL10 gave positive result for catalase test. HL1, HL2, HL4, HL6 showed positive result in urease test and in nitrate reductase test HL1, HL2, HL3, HL4 gave positive result. The positive and negative results for these biochemical characterizations were given in the **Table-1** 

### Acid tolerance test

All the isolates were subjected for acid tolerance test under different incubation periods. The results (Table-2) have shown that all the isolates tolerated low pH of 2 and 3 for 1hr and 6hrs. All the isolates were resistant to low pH, the survival rates of isolates at pH 2 and pH 3 for 1hr and six hrs were given in. HL 2 showed highest survival rate at both pH 2 and pH 3 that is  $91\pm1.2$ cfu/ml and  $90\pm2.2$ cfu/ml, HL 4 showed least survival rate  $64\pm3.7$ cfu/ml and  $54\pm3.5$ cfu/ml.

### Tolerance against Bile

The strains were further screened for their ability to tolerate the bile salt. Under 0.3% concentration HL1 and HL5 showed highest survival rate  $98\pm1.6$ cfu/ml and  $92\pm4.2$ cfu/ml respectively, and at 0.5% concentration also HL1 and HL5 showed highest survival rate  $94\pm1.7$ cfu/ml and  $90\pm3.2$ cfu/ml respectively. Under 0.1% concentration HL1, HL4 and HL5 showed highest survival rate  $93\pm1.4$ cfu/ml,  $87\pm2.2$ cfu/ml and  $84\pm/-1$ cfu/ml. All the isolates were able to grow in 0.3%, 0.5% and 0.1% for 4hrs (240 min) (Table-3).

### Survival rate in gastric and intestinal juices

All isolates were survived in gastric and intestinal juices at both pH 3 and pH 8 for 4hrs. And all isolates were efficiently survived at pH 8 than pH 3. The results were shown in Table-4. Among the six isolates at pH 3, HL 1 has high survival rate  $72 \pm$ 4.2cfu/ml and the least  $52 \pm 2.1$ cfu/ml shown by HL 6. At pH 8 HL 1 has highest survival rate  $92 \pm 2.7$ cfu/ml followed by HL 3 that is  $91 \pm 1.9$  cfu/ml and the least was recorded by HL 5 that is  $69 \pm 3.7$ cfu/ml.

### Cholesterol assimilation

All six isolated strains were tested for cholesterol assimilation. These results were showed in Table-5. The highest assimilation activity 27.0±1.2µg/ml was recorded in HL 5, followed by HL 3 (22±1.7µg/ml), and HL 1 (20±1.6µg/ml). The least 13±1µg/ml was recorded in HL 2.

### Molecular identification of lactobacillus species

After biochemical characterization, *Lactobacillus* bacteria were subjected for the molecular identification of the 16s rRNA gene using the specified primers and conditions mentioned in the materials and methods section. Bacterial DNA samples isolated were found to have the V2-V3 sequence of *lactobacillus* which is of approximately 200 bp fragment (Fig.1). All the screened samples were shown to be amplified for V2-V3 region.

### IV. Discussion

Resistance to low pH is one of the major selection criteria for probiotic strains (Cakir, 2003), because in the stomach the high concentration of bile components in small intestine of host can influence the probiotic strains selection (Hyronimus et al., 2000). In the present study all the six isolates were resistant to low pH for 1hr and 6hrs time duration. Jatindra et al., 2010 selected 55 acid tolerant strains of LAB in PBS buffer  $P^{H}$ -2.5 for 3hrs. Succi et al. (2005) also reported the *Lactobacillus rhamnous* strain survival at pH-3.0 after 2hrs period. The results of present study also are in agreement with the above reports.

Resistance against bile salt and survival in gastric juices at pH 3 and pH 8 is next important criteria for colonization and metabolic activity (Strompfova and Laukova, 2007). The mean bile salt concentration of human or animal gastrointestinal tract is about 0.3% so it is considered as high enough and critical to screen for resistant bacterial strain (G.R.Goldin et al., 1992). According to Maragkoudakis et al. (2005) all isolated strains tolerated 0.3% bile salts concentration in 4hrs. The results of present study showed that all six isolates were resistant to low pH also showed high survival rate at 0.3% concentration as well as at 0.5% and 0.1% bile concentration for 4hrs. Among all isolates HL1 and HL5 showed high survival rate at all concentration. These two strains also showed high survival rate at pH 8 in the simulated gastric and intestinal juice. Lactobacillus strain MG2-1 showed highest tolerance at pH 8 for longer time among all isolates to the artificial gastrointestinal juice and bile salts (M.Bilige et al., 2009).

A good probiotic bacterium should have cholesterol reduction efficiency. M.Bilige et al. (2009) isolated 30 lactobacillus strains, MG2-1 have high cholesterol removal rate (51.74±0.04%). According to Nagpal et al. (2012) probiotic have many health biological properties, one of them was anti cholesterol assimilation because elevated levels of certain blood lipids are a greater risk for cardiovascular disease. Lavanya et al. (2011) found two isolates 16, 43 and L.brevis has ability to reduce the cholesterol level up to 80% in 24hrs. Another report showed lactic acid bacteria can reduce the serum cholesterol level up to 50% in the presence of bile salt in 48 hrs (Gulsandi et al., 2003). In the present study the highest assimilatory activity was  $23\pm1.2\mu$ g/ml which was recorded in HL 5. This is because ability of organism to reduce cholesterol level was due to assimilation of cholesterol with in bacterial cell and increased excretion of bile salts due to deconjuction by the bile salt hydrolase (Salminen et al., 2002).

All the selected samples for amplification were able to produce amplificons of 200 base pairs except HL6 which was failed in V2-V3 region amplification. Similar results were obtained by *L. plantarum L. fermentum, L. sakei by* Svetoslav et al. (2009) during the evaluation of *Enterococcus mundtii* ST4V (a potential probiotic and bacteriocin-producing strain), during its survival in commercial boza.

### V.CONCLUSION

From the results obtained it can be concluded that among the 10 samples only six samples HL1, HL2, HL3, HL4, HL5 and HL6 are suitable bacteria in order to be used as probiotic bacteria terms of resistance to physical factors, their potential to grow in bile salts, gastric and intestinal juices and the ability to assimilate cholesterol. When tested for V2-V3 variable region of *lactobacillus* HL6 failed to amplify the specified 200 base pairs

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amplicon. Hence from the results it can be concluded that HL5 can be considered as best probiotic as it was found to have high tolerance capacity and high cholesterol assimilation.

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### AUTHORS

First Author –G. Mary Sandeepa, Assistant Professor,

Department of Biotechnology, Vikrama Simhapuri University, Nellore – 524001, Andhra Pradesh, INDIA.

Email: deepa btg@rediffmail.com

sandeepa.g@simhapuriuniv.ac.in.

Mobile: 91-9848867220

Second Author- Dr. K. Ammani, Assistant Professor,

Department of Microbiology & Botany, Acharya Nagarjuna

University, Guntur, Andhra Pradesh, INDIA.

Email: ammani1969@gmail.com.

Test	HL1	HL2	HL3	HL4	HL5	HL6	HL7	HL8	HL9	HL10
Grams staining	+	+	+	+	+	+	-	-	-	-
Catalase	+	+	-	+	-	-	-	+	+	+
Urease	+	+	-	+	-	+	-	-	-	-
Nitrate reductase	+	+	+	+	-	-	-	-	-	-
Glucose fermentatio	+	+	+	+	+	+	+	+	+	+
Lactose fermentation	+	+	-	-	-	+	-	-	-	-
Xylose	+	-	-	+	+	+	-	-	-	-

Table 1: Characterization of bacteria

Table2: Survival rate of the *Lactobacillus* species under acidic conditions

Strain	Survival at pH 2 (1hr)	Survival at pH 3 (1hr)	Survival at pH 3 (6hr)
HL 1	77+/-3.2	75+/-3.1	71+/-2.1
HL 2	91+/-1.2	90+/-2.2	88+/-1.7
HL 3	84+/-3.2	81+/-2.1	61+/-4.1
HL 4	64+/-3.7	54+/-3.5	40+/-6.5
HL 5	75+/-3.2	70+/-2.2	55+/-2.2
HL 6	76+/-3.2	72+/-3.0	70+/-2.0

Table3. Survival rate under different concentrations of oxgall treatment (Bile tolerance test)

<b>Isolated Strain</b>	0.3% (240 min)	0.5% (240 min)	1% (240 min)
HL 1	98+/-1.6	94+/-1.7	93+/-1.4
HL 2	86+/-2.7	80+/-2.9	76+/-2.2
HL 3	89+/-4.4	88+/-4.4	81+/-2.7
HL 4	89+/-4.6	87+/-4.2	87+/-2.2
HL 5	92+/-4.2	90+/-3.2	84+/-1.0
HL 6	89+/-3.9	82+/-3.9	80+/-3.9

Table 4. Survival rate in gastric and intestinal juices

Isolated Strain	Survival rate in gastric juice (pH 3) (240 min)	Survival rate in intestinal juice (pH 8) (240 min)
HL 1	72+/-4.2	92+/-2.7
HL 2	53+/-3.1	73+/-2.1
HL 3	71+/-2.1	91+/-1.9
HL 4	66+/-4.2	76+/-4.2
HL 5	64+/-3.2	69+/-3.7
HL 6	52+/-2.1	82+/-4.0

n
)

Isolated Strain	Cholesterol assimilation (µg/ml)
HL 1	20.0+/-1.6
HL 2	13.0+/-1.0
HL 3	22.0+/-1.7
HL 4	20.0+/-1.9
HL 5	27.0+/-1.2
HL 6	16.0+/-2.2



Figure-1 Molecular characterization of probiotic bacteria selected, Lane1-HL1, Lane 2- HL3, Lane 3-HL4, Lane 4-HL5, Lane 5-HL6 and M- Molecular marker

### Design and Computational Analysis of 1 kW Tesla Turbine

Raunak Jung Pandey<sup>\*1</sup>, Sanam Pudasaini<sup>1</sup>, Saurav Dhakal<sup>1</sup>, Rangeet Ballav Uprety<sup>1</sup>, Dr. Hari Prasad Neopane<sup>1</sup>

<sup>1</sup> Department of Mechanical Engineering, Kathmandu University, Nepal

*Abstract*- Conventional turbines are mostly reaction and impulse type or both. Often technical challenge faced by conventional turbines in Himalaya is erosion by sediment. Financial feasibility of power plants is depended upon innovations to prevent erosion of mechanical equipments or alternatives which better handle these conditions.

Tesla turbine is an unconventional turbine that uses fluid properties such as boundary layer and adhesion of fluid on series of smooth disks keyed to a shaft. It has been garnering interest as Pico turbine where local communities could manage such stations in low capital. It provides a simple design which can be produced locally and maintained at low cost. It can be useful in plants for pumping of water and other viscous fluids. Tesla Turbine pump has been used as a blood pump. Due to its uniqueness it has its own cliché uses giving importance to identify the scope of use of Tesla Turbine in Nepal.

This paper is presented in context of research project at Kathmandu University to understand working of Tesla Turbine. For this design and computational fluid dynamics (CFD) analysis of 1 kW tesla turbine was carried out. The models thus created were used for computational analysis. The proposed uses of Tesla Turbine in Nepal have been suggested.

Index Terms- Tesla Turbine, Boundary layer, Tesla pump, CFD

### I. INTRODUCTION

T esla Turbine is a bladeless turbine consists of a series of

discs with nozzle through which gas or liquid enters towards the edge of the disc. Momentum transfer between fluid and disc takes place due to fluid properties of viscosity and adhesion. Discs and washers, that separate discs, are fitted on a sleeve, threaded at the end and nuts are used to hold thick end-plates together. The sleeve has a hole that fits tightly on the shaft. Openings are cut out around center of the discs to communicate with exhaust ports formed in the side of the casing.

Hence tesla turbine is described as a multi disc; shear force or boundary layer turbo machinery that works with compressible and incompressible fluid. Fluid enters radially and exits axially through the ports.

Tesla turbine has advantages of ease of production, versatility and low maintenance. Fluid used can be steam or water. It is unaffected by sediment erosion due to lack of vanes. A challenge related to Tesla turbine is low efficiency. Tesla turbine claims high rotor efficiency for optimum design, but experimentally many difficulties has been found to achieve high efficiencies in nozzles and rotors.

The design of a 1 kW Tesla turbine was carried using iterative process for head and discharge for main dimensions of the turbine.

### II. PREVIOUS WORK

Tesla Turbine was patented by Nikola Tesla in 1903.His turbine used 22.5 cm disc and the entire rotor was 5 cm thick producing 110 Horsepower and used steam as propulsive fluid. Tesla pump was patented in 1909 which uses smooth rotating disc on volute casing. Tesla conducted experiments of his turbine between 1906 and 1914, and then there was little activity on this field until a revival of interest began in the 50's [1].

Rice [2] developed a simple initial analysis using pipe flow theory with bulk coefficients for friction that gives some qualitative understanding through graphs as it is shown in Figure 1 and Figure 2. With this graphs it is possible to obtain approximate values of efficiencies for different flow rates, but for the specified geometry  $\frac{r_0}{h} = 50$ 

 $r_0 =$  outer radius of disc

**b**= disc spacing between two discs

 $\Omega$  = angular velocity of fluid

Q = volumetric flow rate for single disc spacing

Figure 2 shows that high efficiencies is only obtain for very low flow rates at values of  $\frac{Q}{\Omega r_0^2} = 0.0001$  and the second turbine tested by Rice has a value of  $\frac{Q}{\Omega r_0^2} = 01256.03$  then, the efficiencies are expected to be under 40% as it is shown in Figure 1. Figure 2 depicts the change of pressure, for higher tangential velocities, the change of pressure is higher, and for higher flow rates the change of pressure is lower, this is because the change of pressure occurs only in the boundary layer due to the effects of viscosity and with the increase of flow rate, the velocity increase and the thickness or region of the boundary layer diminishes [3].

Allen came with an analytical model for fluid flow between parallel, co-rotating annular disks from conservation of mass and conversation of momentum principles. Through the assumption of fully developed boundary layer flow a closed form solution is found for the components of velocity and the pressure. The model can be used to analyze the fluid disk system in either a turbine or pump configuration. The accuracy of result improves in both cases as the dimensionless parameter  $R^*$  increases. A  $R^*$  on the order of 1 or greater than indicates that the viscous effects are important and the model is accurate [4].



Figure 10 Original sketch of Tesla turbine [1] Conservation of Mass:  $\dot{a} + \vec{\nabla} (a\vec{v}) = 0$  (1)

$$p + v \cdot (\phi u) = 0$$
Conservation of Momentum:

$$\dot{\vec{u}} + (\vec{u}.\vec{\nabla})\vec{u} = \frac{-1}{\rho}\vec{\nabla}P + \vec{g} + \nu\nabla^2\vec{u} = 0$$
<sup>(2)</sup>

u = Radial velocity

- P = Pressure
- v = Tangential Velocity
- ▼=Gradient Function



Figure 11 Typical results for maximum efficiency as a function of flow rate and parameter. Plotted for f=0.05 ro/b= 50[3]



Figure 12 Typical results for pressure-change parameter as a function of flow rate and speed parameters. Plotted for f= 0.05, ro/b= 50[3]

### III. CALCULATIONS

### A. Design parameters

Flow rate  $\frac{Q}{\Omega r_0^2}$  was selected as 0.0001. Iteration of  $r_0$  and  $\Omega$  was carried out to find volumetric flow rate Q for single disc spacing. Q was multiplied by total number of disc n to find total volumetric flow rate Q' the disc configuration can handle giving acceptable values of efficiency and torque.

Head and flow rates were iterated. Fluid enters turbine through the nozzle and is directed in between the disks. The fluid strikes the disk almost tangentially at an angle to the rotor periphery. This was used to find absolute and radial velocity of jet. Torque and power produced was calculated. Finally efficiency of rotor assembly was calculated.

Absolute velocity: 
$$V = \sqrt{2gH}$$
 (3)

Radial Velocity: 
$$U = \frac{\pi DN}{60}$$
 (4)

$$\text{Torque:} \left( u_0 v_0 - u_i v_i \right) Q' \rho \tag{5}$$

Efficiency: 
$$=\frac{T\omega}{QgH}$$
 (6)

Table 1 defines the rotor configuration of the turbine. Values of power output and efficiency are provided. Figure 5 and 6 represent Tesla disc and rotor assembly respectively.

### Table 4 Design parameters

Parameters	Values
Angle of	$10^{\circ}$
nozzle <i>a</i>	
Outer	127 mm
radius <b>r</b> o	
Inner radius	35 mm
$r_{i}$	
Disk spacing	2.54 mm
δ	
No of discs <i>n</i>	9
No of spacers	10
Revolution	800 rpm
Total length	43.688
	mm
Torque <b>T</b>	9.18 Nm
Power P	777.16 W
Efficiency	777%

### B. Analytical Model

The fluid model described by Allen uses the differential forms of the conservation of mass and the conservation of momentum principles only.

$$R = \frac{-\lambda_2}{2\lambda_1} \frac{\nu}{\delta^2 r U} \tag{7}$$

v= kinematic viscosity

*r*= radius of disc

 $R^*$  is dimensionless system constant which is ratio of rotor configuration to the viscous/momentum force balance. A  $R^*$  on the order of 1 or greater than indicates that the viscous effects are important and the model was accurate.

$$R^* = Rr^2 \tag{8}$$

Reynolds number based on disk spacing

$$Re_{\delta} = \frac{Ur}{v} \tag{9}$$

Radial Reynolds number  

$$Re_r = \frac{U\delta}{v}$$
(10)

*a* is radial constant dependent on boundary conditions.  $U = \frac{a}{r}$ (11)

In a turbine configuration the flow is radially inward, the radial velocity is negative hence a is negative. Table 5 Fluid parameters

Table 5 Fiuld paramet	CI 5
Parameters	Values
Laminar Flow coefficient	8
value $\lambda_1$	15
Laminar Flow coefficient	2
value $\lambda_2$	3
Re <sub>S</sub>	1.31e04
Rer	4.39e05
Mass flow rate <i>m</i>	7.28
	kg/s
a	-0.456
R*	-0.042
Specific speed	26.23

### C. CFD Analysis

Two domains were created in Solidworks2013. Rotating domain consisted of rotor assembly and the stationary domain consisted of outer casing with a simplified nozzle [5]. Table 3 shows the meshing data for the domain created. Table 4 presents parameters selected for CFD analysis. Figure 6 shows the setup of two domains.



Figure 13 Tesla disc



Figure 14 Tesla turbine rotor assembly



Figure 15 Inlet and outlet conditions Table 6 Meshing data for domains

Meshing data		
Rotating domain		
Nodes	483462	
Elements	2011811	
Stationary domain		
Nodes	244141	
Elements	1282278	

Table '	7 CFX	Pre	parameters
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Flow State	Transient		
Boundary Conditions	Mass flow rate as inlet		
	Atmospheric pressure at		
	outlet		
Turbulence model	K-epsilon		
Mass flow rate	7.2 kg/s		
Static atmospheric	1 atm (Outlet condition)		
pressure			
Phase	Single(water)		
RPM	800		

### Table 8 Solver criteria

Coefficient loop	
Min iteration	1
Max iteration	10
Residual Type	RMS
Residual Target	1e-4





### Figure 17 Pressure gradient in rotating domain

### IV. RESULTS

Fluid parameters describing the interaction of disc with water were given. Value of dimensionless system constant  $R^*$  was found to be -0.042 which shows acceptable accuracy of model and that viscous effects are significant. Efficiency considering simplified nozzle was 77.7%. Figure 7 and 8 shows the velocity streamlines and pressure gradient respectively.

### V. CONCLUSION

Tesla turbine is a versatile turbine. It can be used in Pico hydropower which can be locally produced and managed by village communities. It can be used as pumped storage systems. It can be used as radial ventricular devices which are 'gentle' on blood pumps and doesn't causes loss of platelets because of its energy transfer mechanism. Tesla pump has been reported to handle different kinds of industrial and agricultural and waste fluids [6]. It can also be alternative to Improved Water Mill (IWM). It can be concluded that the study on Tesla turbine has yielded important understanding of the turbine. There are still many rooms for improvement which makes it interesting topic for further research.

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### AUTHORS

First Author – Raunak Jung Pandey, Final Year Undergraduate Student, Kathmandu University, email: rj.mech17@gmail.com Second Author – Sanam Pudasaini, Final Year Undergraduate Kathmandu University, email: <u>sanam.pudasainee@gmail.com</u> Third Author- Saurav Dhakal, Final Year Undergraduate, Kathmandu University, email: <u>dhakal.saurae@gmail.com</u> Fourth Author – Rangeet Ballav Uprety, Final Year Undergraduate Kathmandu University, email: <u>rangeet.uprety@gmail.com</u> Fifth Author- Dr.Hari Prasad Neopane, Head of Department,

Kathmandu University, email: <u>hari@ku.edu.np</u>

**Correspondence Author** – Raunak Jung Pandey, email address: <u>rj.mech17@gmail.com</u>, contact number: +977-9849607588.

# The 1950 Treaty of Peace & Friendship: An Issue of Contention between India and Nepal

### Natasha Manhas and Mamta Sharma

Post Graduate Department of Political Science, University of Jammu, Jammu.

Abstract- The need for treaties has increased as the world's interdependence has intensified. Continuing, technological innovation, economic globalization and the growth of transnationalism has resulted in an enormous increase in the frequency and rapidity of global interaction. Such challenges require both national and international responses. Where a problem cannot be adequately addressed by a country acting alone acting cooperatively at the international level becomes essential for a country to protect its own interests. The purpose of treaties is to address the interests and concerns of the signatories in a given time and context and if they fall short to address the dynamic international policies then the obvious choice is to upgrade or amend them. The interests and concerns of a particular country is defined and determined by its political elite in a particular time, space and context. This is true in the context of the Treaty of Peace and Friendship signed in 1950 between India and Nepal to take care of their mutual interests within a particular regional context. The article examines the relevance of the treaty and prospects of Indo- Nepal relations in the changing enternational scenario. It argues that Nepal has benefitted much more than India from the treaty. However, considering changes in the strategic equations in the region, India- Nepal bilateral relations must be remodeled into a strategic partnerrship that seeks to provide security, modernization and prosperity.

*Index Terms*- Treaty, India, Nepal, Peace, Friendship, Relations, Perspective.

### I. INTRODUCTION

Ties between India and Nepal have consistently been close and reflect the historical, geographical, cultural and linguistic links between the two nations. The signing of the India-Nepal Treaty of Peace and Friendship in 1950 established the framework for the unique ties between the two countries. The treaty was signed with an objective to strengthen the relationship between the two countries by recognizing historical values and perpetuating peace in the region. It provided the foundation for India and Nepal relations. The treaty contains ten articles and a letter of exchange. In Article 1, the two countries acknowledged each other's territorial integrity and sovereignty. Article 2 says that they have to inform each other in case of friction with neighbouring countries. Article 5,6 and 7 deals with arms imports of Nepal, national treatment of each other's citizens in economic matters, and reciprocal treatment to nationals in matters concerning residence, protection and trade.Article 8 cancels all the past treaties between Nepal and British government. Article 9 and 10 deals with renewal and cancellation of the treaty. The objective of the treaty signed by mutual consent of the contracting parties was to establish permanent peace and friendship between the two countries by identifying their mutual politico- economic and socio-cultural linkages and security requirements. The land- locked Nepal conducts trade with the outside world through India. As K.V.Rajan observed, the treaty basically offered economic opportunities in India for Nepalese nationals against Nepalese assurances that security concerns would be respected. The international and regional situation during the 1950s, when the treaty was signed, was wholly different from what it is today. The world was then reeling under the cold war. The international community was divided into three blocks of capitalist, communist and nonaligned nations. India as a newly independent country with a weak military and troubled by internal disturbances was suspicious of the Chinese adventurism in Tibet. It was also apprehensive of the Communist influence in Nepal. India was also perturbed by the Chinese claim that Tibet is China's palm and Nepal, Bhutan, Sikkim, Ladakh and NEFA are five fingers. With the palm already under Chinese grip the security of other Himalayan countries was endangered. The Chinese annexation of Tibet changed the strategic significance of Nepal. India decided to strengthen its northern frontier by taking Nepal into confidence. Expressing India's concern, Prime Minister Jawahar Lal Nehru said, we cannot allow anything to go wrong in Nepal or permit that barrier to be crossed or weakened because that would also be a risk to over security." Nepal, which was striving for recognition in the community of nations and was facing domestic upheaval due to protests against Rana rulers, was surprised by the Chinese claim on Tibet. The then external environment, particularly the developments in China and Tibet and the Chinese attitude of acquiescence towards the Indo-Nepalese ties also contributed a great deal in the evolution and perpetuation of special relations between the two countries. The Ranas also were looking for an opportunity to enter into some kind of understanding with India to pacify the democratic movements in Nepal which had its base in India. During 1947-1950, Rana's policy towards India was guided by winning over India's sympathy or to prevent it from supporting the democratic movements in Nepal which had its base in India. The commonality of interests and requirements resulted in the signing of the treaty. The treaty, thus addressed the socio-economic variables in the relationship. Such as, the citizens of one country could participate in the industrial and economic developments in another country without any discrimation in trade and commerce and movement in each other's country (Clause 7). The provisions were favourable to both the countries particularly to Nepal considering its dearth of economic development and opportunities for people. The letters exchanged along with the

treaty explicitly states: it may be necessary for some time to come to offer the Nepalese nationals in India protection from unrestricted competition (Clause 3). This was done to protect the interests of the Nepalese. At the same time, Nepal also agreed to give first preference to the Government of India or Indian nationals in development projects related to natural resources When the countries erected barriers to strengthen their security, India and Nepal through the treaty agreed for an open border and tried to bring their countries socially, culturally and economically closer. The treaty could have become a model for bilateral cooperation where the signatories played on each other's strengths but with the passage of time, the mutual interests and concerns have changed in tone and tenor. For example, the open border, which is a historical reality and took into consideration the socio-cultural-economic and security interests of the signatories was infringed by the forces inimical to the interests of the two countries. The mutuality in the security interests was questioned. The treaty which provides for 'national' treatment for each other's citizens in matter of entry, movement and business in their respective territories, is a reflection of the unique relationship.

The 1950 Treaty of Peace and Friendship has been a matter of acute controversy between India and Nepal more or less since the late 1950s when a 'secret' letter exchanged with the Treaty was made public. This letter, together with the Treaty was signed by the head of an oligarchical government i.e. the Rana regime that was about to be overthrown by a democratic movement. The Ranas in its last days in power were desperate for foreign assistance for its survival and were prepared to act in tune with New Delhi. Pt.Jawahar Lal Nehru, a shrewd politician, quickly grasped the situation and opportunity which it offered. The Ranas in Nepal fully accommodated India's security and commercial interests. Soon that oligarchical regime fell in Nepal but the treaty concluded by that regime survived and survives till today, much to the discomfort of Nepal.

The issue of revision of Indo-Nepal Treaty of Peace and Friendship considered unequal by most Nepalis, was first raised publicly by Prime Minister Kirti Nidhi Bista in the year 1969 terming it as obsolete and outdated. The argument put forward for its revision had to do with India not abiding by the related clauses of that treaty (Article II requires that both governments inform each other of any serious friction or misunderstanding with any neighbouring state likely to cause any breach in the friendly relations subsisting between the two countries). Letter exchanged with the treaty stipulates clearly that the two governments shall consult each other and devise effective counter - measures to deal with the threat from a foreign aggressor. India had taken two unilateral actions during its war with China in 1962 (along Ladakh region) and the Pakistan in 1965 (disputed region of Kashmir) without informing Nepal on both occasions despite the treaty obliging both parties to do so. Even later in 1971, India's direct involvement against Pakistan for Bangladesh independence without Nepal's knowledge breached the important article of that treaty. Holding India responsible for violating certain provisions of the treaty, Prime Minister Kirti Nidhi Bista said, developments have taken place in India's relations with the Soviet Union and the United States on the one hand and with Pakistan and China on the other. Nepal was not informed about these developments and India therefore

assumed and has led Nepal to assume that exchange of information on such cases is not necessary". These views were expressed in print media and were not forwarded to the Government of India officially to amend or abrogate the Treaty. Hence, there was no response from the Indian government on this.

With the introduction of multi-party democracy in Nepal in 1990, the treaty became an important electoral issue for some political parties in Nepal. It was by the Communist government of Nepal during 1994-95 that a demand was raised officially for the revision of this treaty for the first time. But it was the with the launch of Maoist Insurgency in Nepal in 1996, the demand for the revision of the treaty gained momentum. The 40 - point demands of the Communist Party of Nepal (Maoist) also focused on this issue and generated intense anti-India feelings during the people's war in Nepal. Nepalese Foreign Minister Kamal Thapa visited India in September 1997, with a 'non-paper', which, for the first time, introduced some ideas for a revision of the treaty. Most recently, the CPN-Maoist, in its manifesto for the 2008 Constituent Assembly elections, promised to abrogate the treaty and maintain equal distance between India and China. However, the Nepali Congress (NC) manifesto was silent on the matter. The Communist Party of Nepal(Unified Marxist- Leninist (CPN-UML) promised to review 'all unequal treaties', a reference to the 1950 Treaty between India and Nepal.

Almost forty years down the line in 2008, the Prime Minister, Pushpa Kamal Dahal, terming Indo-Nepal 1950 treaty as unequal from a security relation point of view called for scrapping it off. He also called for a revisit and review of several other treaties such as the Mahakali Treaty of 1996. Even today the core grievance of Maoists in Nepal is the 1950 Treaty of Peace and Friendship signed with India.

### II. NEPALESE PERCEPTIONS

Nepalese reservations to the treaty are based on several issues, ranging from security to free movement of people across the border:

**First,** Nepalese scholars argue that the treaty was signed with a Rana Prime Minister who was not elected by the people and therefore does not represent the Nepali political consensus. They also refer to the unequal status of the signatories as an example of the build-in-inequality in the treaty

Second, the treaty is considered as a legacy of British imperialism. After 1947, the relations between India and Nepal had to start on a new scale of heightened ideological passions of democracy. Even though the two countries were ready to write their political destiny, the relevant treaties and practices that started during the British rule were not done away with. The Standstill Agreement signed in 1949 accepted all the previous treaties signed as valid till new treaties and agreements could be signed. The Treaty of Peace and Friendship of 1950 was a reflection of the Treaty of Peace and Friendship signed in 1923 but with changes made to suit the political context of the time. Six decades have gone by but reference to the continuation of the British policies still find reference in the general perception on India – Nepal relations and continues to haunt the Nepalese elite. It has become a yard stick to critically measure the policies with India even though Nepal had good working relations with the British. The Left parties in Nepal such as Communist Party of Nepal (Unified Marxist- Leninist), Unified Communist Party of Nepal (Maoist), Nepal Workers and Peasant Party have often declared India's relations with Nepal as imperialistic and hegemonistic and responsible for signing unequal treaties with Nepal. This view was further consolidated after the merger of Sikkim in 1975 and became an easy prey for the domestic consumption in Nepal. The words hegemonistic and imperialistic reflect a continuation of British India's legacy that gets exacerbated by the big size of India vis-à-vis its small, landlocked neighbour.

Third, it is argued that this treaty of Peace and Friendship is an outmoted treaty and derogations from it are common place. Since both countries have led many of its provisions fall into disuse in the last 50 years, the time has come to review the treaty and replace it by a new one. One of the arguments advanced by Maoists to make its case against this treaty is that the government in New Delhi remained silent when Nepalese were forced to leave certain North-eastern states e.g., Assam and Meghalaya in the late 1980s. It is argued that India should not expect Nepal to conform to a treaty to which India itself is unable to conform.

**Fourth,** many Nepalese complain about the influx of Indian labourers into Nepal. The government of Nepal states that it is difficult for a small country with a population of 27 million to accord national treatment to the Indians which is more than 1 billion in population. Hence, Nepal has enacted laws barring foreign nationals, including Indians from owning land in Nepal. As Nepal borders on some of the poorer parts of India, there is a continuous flow into Nepal of Indian immigrants and labourers in search of work. This places an unfair burden on Nepal and gives unreasonable say to India in the conduct of domestic affairs of Nepal. It is argued that this treaty has never acquired validity.

**Fifth,** this treaty is described not only unequal but as an attack on Nepal's sovereignty on the ground that the circumstances in which the treaty was signed have changed and therefore, there is no relevance of this treaty anymore.

Sixth, most of the criticism of this treaty is surrounded around the politico-strategic aspects of the same. It is alleged that India has been more concerned about its strategic and security interests in the Himalayas and has ignored Nepal's sovereignty. Article 5 of the Treaty states : The government of Nepal shall be free to import, from or through the territory of India, arms, ammunition or war like material and equipment necessary for the security of Nepal. The procedure giving effect to this arrangement shall be worked out by the two governments acting in consultation. At the same time, the letter of exchange which was kept secret till 1959 says : 'Any arms, ammunition or war like material and equipment necessary for the security of Nepal that the government of Nepal may import through the territory of India shall be so imported with the assistance and agreement of the Government of India'. This article clearly brings Nepal under the security umbrella of India.

**Seventh,** Nepal has reservations on clause 6 that allows the citizens to participate in the industrial and national development in each other's country and clause 7, which grants the citizens the right to reside, own property participate in trade and commerce and enjoy other privileges in one another's country. The demand of India of reciprocal 'national treatment' for its citizens in Nepalese territory and access to all the Nepal's natural resources,

while Nepalese citizens are being discriminated against while acquiring property in India is inconsistent with Nepal's exercise of full sovereignty. Over the years, there have been many instances when India has ignored the provisions of the treaty. Article 2 of the treaty requires the two governments to inform each other of any serious friction with any neighbouring state likely to cause any breach in their friendly relations. Nepalese argue that India did not inform or consult Nepal during war with China in 1962 and with Pakistan more than once. However, India argues that Koirala government was kept in close touch by its Indian counterpart on the developments in Sino-Indian relations.

### III. INDIAN PERSPECTIVE

The reaction of Government of India on the 1950 Treaty of Peace and Friendship is defensive and has stemmed from its larger policy of denying the extra-regional powers a foothold in the region and keeping it away from cold war politics. India regards the 1950 Treaty of Peace and Friendship as valid and insists upon full compliance of its provisions by Nepal. Nevertheless, it emerged from the debate during the 1989 stalemate between India and Nepal that India too was prepared to enter into negotiations with Nepal on the whole gamut of mutual relations, including the 1950 Treaty of Peace and Friendship. But what India was saying was that because of its 'special relationship' with Nepal it had been very generous to its neighbor in many matters and now, since the latter was intended on changing this 'special relationship', in view of New Delhi, Nepal was merely like Bangladesh and Pakistan thus not worthy of generous treatment by India. After the emergence of Maoist Insurgency in Nepal, the demand for the revision of the treaty gained momentum as their first demand in the 40-point declaration was that 'all the unequal treaties and arguments including the 1950 Treaty of Peace and Friendship with India ought to be abolished. The demand for the revision of treaty is seen by India as Nepal's changed relations with China. Nepal has been in favour of equitable relations with India and China and in this regard, the treaty has been viewed as an obstacle. It is true that Nepal has friendly relations with China and the circumstances of the early 1950s do not prevail anymore. But the point is that the treaty puts no hurdles on closer Nepal-China relations. The fact remains that Nepal concluded border treaty with China despite the 1950 Treaty of Peace and Friendship with India. Nepal also accepted aid and imported arms from China and even sought Chinese assistance for the construction of roads and other infrastructure development. It opened relations with several other countries as well. The treaty never obstructed Nepal's diplomatic postures. So, it is mainly for the political reasons that the treaty has been viewed as an obstacle and an issue.

When the Unified Communist Party of Nepal- Maoist (UCPN- Maoist) emerged as the largest party in the Constituent Assembly elections and formed the government in 2008 in Nepal, the issue of revision of treaty was further highlighted. Also on his visit to India as Nepal's Prime Minister Pushap Kamal Dahal( Prachanda) proposed revision of the treaty. However, his government fell in May 2009 and the issue could not move further. This proposal for revision pertained to renegotiating cooperation on water resource development, halting

the recruitment of Gurkhas in the Indian Army, solving issues like land encroachment by the Indian side and border management and regulation. These defined the political agenda of the UCPN-Maoist before and after the Constituent Assembly elections. Nepal's other left-wing party the Communist Party of Nepal - Unified Marxist- Leninist (CPN-UML) equally rallied for a revised treaty with India, although it was not the main tenet of its election agenda. Unlike the UCPN- Maoist and CPN-UML, the Nepali Congress (NC) has been silent on this issue. The Madheshi parties believe that border management as an inevitable corollary to revision will devastate the special relations between the people of the southern plains (Terai) and the people of the Indian states of Bihar and Uttar Pradesh. The traditional ties of the roti-beti (bread and butter) in the region cannot be ignored by those proposing revision. Moreover, they argue that this will greatly impact the Nepali Pahadi (hill ) people who earn their livelihood in different cities of India.

India has expressed its readiness to 'review' the treaty. But the Nepali side has not been able to emerge with a concrete model for a revised treaty. A revision of the 1950 Treaty of Peace and Friendship has to be realistic and practical taking note of the citizens of both countries who enjoy various privileges reciprocally. Any revision of the treaty may directly or indirectly affect the life of citizens on both sides of the border, an aspect that needs to be carefully considered. The long standing India-Nepal relationship based on the inseparable bonds of culture and history cannot be ignored in the name of treaty revision. Nepali experts believe in the short term, a reconsideration of the treaty and claims for the sealing of borders can make political elites sufficiently happy; however, in the long run, it cannot work in favour of India-Nepal relations.

Therefore the continued rhetoric calling for a revision of the 1950 Treaty of Peace and Friendship leaves many questions unanswered as whether a revised treaty duly transforms India-Nepal relations for the better and solve existing disputes or would the Indians and Nepalese arrive at consensus if the treaty is to be revised. In practice, the treaty is more breached than respected by both the countries. Since some of the provisions in the treaty became irrelevant with the changing international scenario, both countries have violated its provisions as the situation demanded. As a result, the treaty remained virtually defunct on several fronts. The disrespect to the treaty first appeared while the Prime Minister of Nepal Tanka Prasad argued in favour of equidistance between India and China in 1956. Subsequently, the monarchy identified India as its main enemy because of its support to the democratic forces and looked towards China as a savior. The vital elements of the strategic as well as socio-economic components of the treaty and the inherent inter-dependence between these components have become nearly eroded. The initiatives for most of the moves made to erode the 1950 treaty and other bilateral arrangements came from Nepal.There were several factors responsible for this erosion of the treaty: (i) prior to the 1962 Sino-Indian war, India was regarded as a security guarantor to Nepal. India's poor performance in the 1962 war reduced its power relevance in the region. The Chinese adventurism also forced India to encourage other big powers to counter the Chinese presence in Nepal.(ii) during that time, India failed to fulfill the economic and technical needs of Nepal for development and modernization. This gave

an opportunity to diversify Nepal's relationship with other countries. Dependence on India decreased due to alternative employment opportunities for Nepalese youth in other countries. Moreover, the concept of security has undergone transformation due to the emergence of nuclear powers in Asia. This has affected the relevance of Nepal as a buffer state between China and India. Unlike the 1950s, Nepal has got new trade routes with China. The Constitutional Monarchy has been replaced by Parliamentary Democracy. On the other hand, the present power equation in Asia is changing both in military and economic terms with the emergence of India as a major player. In this scenario, the new dispensation in Nepal would like to continue the treaty with some changes. The leadership in Nepal is expected to adopt a balanced policy towards India.

### IV. CONCLUSION

India - Nepal Treaty of Peace and Friendship of 1950 is a bed rock of the special relations that exist between India and Nepal. Although Nepal has some reservations on the treaty and resorted to political posturing, it has not withdrawn from the treaty. Nepal has, in the past, taken measures to neutralise India's overbearing influence on many occasions. It has used the China card to balance India. It has introduced a work permit system for the Indian workers in 1988 and many discriminatory measures vis-à-vis the Indians in violation of the spirit of the treaty. On this part, India has tried to ensure Nepalese compliance in various ways, which have been termed by the Nepalese as coercive and high - handed. It is surprising that the treaty has survived to this date despite reservations from both countries on certain issues. Moreover, there is a consensus at the moment that the treaty requires revision taking into account the changing international and regional scenario. The fact remains that Nepal will continue to be dependent on India given the geographical realities. India will also have to acknowledge the historical linkages with Nepal and the strategic importance of developing a multi-faceted partnership within future. India has to adopt a liberal approach towards providing trade and transit facilities for Nepal and closely coordinate its security policies to counter emerging threats from non-state actors. Giving the close sociocultural linkages and the propensity of the people in the bordering regions to connect with each other, the borders should ideally be kept open with joint regulatory mechanisms. The new treaty needs to factor in all these perspectives and usher in a new partnership between the two countries.

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### AUTHORS

**First Author:** Natasha Manhas, P.hD Research Scholar, Department of Political Science, University of Jammu,Jammu.natashamanhas85@gmail.com **Second Author:** Mamta Sharma, P.hD Research Scholar, Department of Political Science, University of Jammu,Jammu.mamtasharma2021987@gmail.com

**Correspondence Address:** Priyadarshni Girls Hostel, University of Jammu, Jammu, Contact no.s 9797513967, 9797324156.
# **Fuzzy Modeling of Perceived Stress, And Cortisol Responses to Awakening Using Distance for Fuzzy Sets**

P. Senthil Kumar<sup>\*</sup> & B. Mohamed Harif<sup>\*\*</sup>

\*Assistant professor of Mathematics, Rajah Serofji Government College. Thanjavur.(T.N) \*\*Assistant professor of Mathematics, Rajah Serofji Government College. Thanjavur.(T.N)

*Abstract*- In this paper, fuzzy modeling of distance between Intuitionistic fuzzy sets (four inputs-one output and two inputs-one output) were developed to test the hypothesis that high job demands and low job control (job strain) are associated with elevated free cortisol levels early in the working day and with reduced variability across the day and to evaluate the contribution of anger expression to this pattern. The models were derived from multiple data sources including One hundred five school teachers (41 men and 64 women) classified 12 months earlier as high (N = 48) or low (N = 57) in job strain according to the demand/control model sampled saliva at 2-hour intervals from 8:00 to 8:30 hours to 22:00 to 22:30 hours on a working day. Comparison of the models show that the four input model exhibited less entropy than the two input model using distance between Intuitionistic fuzzy sets.

*Index Terms*- Cortisol, Euclidean distance, Intuitionistic fuzzy set, Job strain, Hamming distance, Normalized Euclidean distance, Normalized Hamming distance, Work stress

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### I. INTRODUCTION

Fuzzy set was proposed by Zadeh in 1965 as a frame work to encounter uncertainly, vagueness and partial truth, represents a degree of membership for each member of the universe of discourse to a subset of it. Intuitionistic fuzzy set was proposed by Attanassov, [1], [2] in 1986 which looks more accurate to uncertainty quantification and provided the opportunity to precisely model the problem based on the existing knowledge and observations. The Intuitionistic fuzzy set theory has been studied and applied in different areas.

Using the concept of an intuitionistic fuzzy set that makes it possible to express many new aspects of imperfect information. For instance, in many cases information obtained cannot be classified due to lack of knowledge, discriminating power of measuring tools, etc. In such a case the use of a degree of membership and non-membership can be an adequate knowledge representation solution. Work stress has emerged as a major psychosocial influence on physical and mental health over recent decades. Fuzzy model has proved valuable in understanding the work characteristics associated with coronary heart disease risk, hypertension, mental health, quality of life, and other outcomes. This model proposes that people working in highly demanding jobs who also have low control and limited opportunities to use skills will experience high job strain. The HPA axis is one of the principal pathways activated as part of the physiological stress response. It is puzzling, therefore, that clear links between cortisol and work stress has not been established. This study used serial sampling over the working day to determine whether salivary cortisol was predicted by measures of job strain taken 1 year earlier in men and women working in a single occupation.

The purpose of this study was to develop generalized rule based fuzzy models from multiple knowledge sources to test the hypothesis that high job demands and low job control (job strain) are associated with elevated free cortisol levels early in the working day and with reduced variability across the day and to evaluate the contribution of anger expression to this pattern and subsequently test its performance by comparing defuzzified outputs to actual values from test data and comparing predicted and actual fuzzy classifications.

A popular area-based defuzzification procedure is the centroid method. As the term implies, the point of the output membership function that splits the area in half is selected as the crisp value (Figure 1C). This method however does not work when the output membership function has non-convex properties. Depending on the shape of the membership function of the output, defuzzification routines may not produce effective values for the predicted output. However, the defuzzified value using the mean-max membership principle that does not convey the ambiguity. The centroid method has drawbacks when the output membership function is non-convex (Figure 1B). The defuzzified value is at a point that has low membership. In an effort to compensate for these drawbacks, an alternative approach to model validation is proposed that uses a distance measure to compare actual and predicted fuzzy classifications consisting of three point ordinal sets.



Figure 1. Different defuzzification methods: (A) maxmembership principle; (B) mean-max membership principle; (C) centroid principle. Note: x\* is the defuzzified value.

#### II. DISTANCE MEASURES BETWEEN FUZZY SETS

For two fuzzy sets A and B in the same universe, the Hamming distance [3] is an ordinal measure of dissimilarity. The Hamming distance (HD) is defined as:

HD(A,B) = 
$$\sum_{i=1}^{n} |\mu_A(x_i) - \mu_B(x_i)|$$

where n is the number of points that define the fuzzy sets A and B,  $\mu_A(x_i)$  the membership of point  $x_i$  in A and  $\mu_B(x_i)$  is the membership of point  $x_i$  in B. The Hamming distance is smaller for fuzzy sets that are more alike than those that are less similar.

#### 2.1 ENTROPY OF A FUZZY SET

Entropy is a measure of fuzziness associated with a fuzzy set. The degree of fuzziness can be described in terms of a lack of distinction between a fuzzy set and its complement. For a fuzzy set A, entropy [4] is calculated as:

where n is the number of points that define A, and  $\mu_A(x_i)$  is the membership of point  $x_i$  in A. In this study, the concept of entropy was used to quantify the ambiguity associated with the predicted fuzzy outputs. In the absence of actual values, entropy values are essentially a measure of confidence in outputs predicted by a fuzzy model.

### 2.2 PROPOSED DISTANCE MEASURE

As indicated in the theory section, a modified form of the Hamming distance is proposed which enables better distinction between different levels of classification (see Table1 and 2). The proposed distance measure D(A, P) is defined as:

$$D(A,B) = \frac{1}{4} \left( \sum_{i=1}^{n} \left| \mu_A(x_i) - \mu_B(x_i) \right| + \sum_{i,k=1 \\ (i \neq k)}^{n} (2(2|i-k|-1)\mu_A(x_i)\mu_P(x_k)) \right) \dots \dots (2)$$

where A is the actual fuzzy classification, P the predicted fuzzy classification, n the number of classes that define A and P,  $\mu_A(x_i)$  is the membership of point  $x_i$  in A and  $\mu_P(x_k)$  is the membership of point  $x_k$  in P.

#### 2.3 COMPARING FUZZY CLASSIFICATIONS

The two output membership functions created in both models are categorized as low and high. The actual value from the test data was evaluated using the parameters of these membership functions to produce a fuzzy set represented by two points (high and low). This fuzzy set represents the degree of belongingness ( $\mu$ ) to each of the two categories (low and high). The predicted output from the Mamdani model is a fuzzy set represented by the given points. Based on the relative contributions from each output membership function, the predicted fuzzy set of given points was reduced to a fuzzy set of three points. The relative contributions from each output membership function were estimated by integrating the predicted fuzzy set over the range of the membership function. Equations (3) were used to develop the predicted fuzzy classification:

For each test case, an actual fuzzy classification and a predicted fuzzy classification were obtained. The modified Hamming distance measure (3) was used to determine the similarity between the two fuzzy sets. Apart from a comparison to actual values, the ambiguity associated with each predicted value was quantified using an entropy measure (1) as defined in the theory section.

#### 2.4 DEFUZZIFYING THE PREDICTED OUTPUT

The centroid method was used to defuzzify the output of the Mamdani models. The crisp predictions were compared to the actual values from the test data and entropy value was calculated. This is a common form of comparison utilized for most modeling strategies. However, defuzzifying the output results in a loss of information regarding the ambiguity of the prediction. In the absence of actual values, the confidence in the prediction can be determined based on the degree of ambiguity.

### 2.5 INTUITIONISTIC FUZZY SETS

Intuitionistic fuzzy set was introduced first time by Atanassov, which is a generalization of an ordinary Zadeh fuzzy set. Let X be a fixed set. An intuitionistic fuzzy set A in X is an object having the form

$$A = \{(x, \mu_A(x), v_A(x)) | x \in X\}$$

where the functions  $\mu_A(x), \nu_A(x) : X \to [0,1]$  are the degree of membership and the degree of non-membership of the

Obviously, each fuzzy set may be represented by the following intuitionistic fuzzy set

$$A = \{ (x, \mu_A(x), 1 - \mu_A(x) | x \in X \}$$

## 2.6 DISTANCE BETWEEN INTUITIONISTIC FUZZY SET

In Szmidt and Kacprzyk [5], [6], it is shown why in the calculation of distances between the intuitionistic fuzzy sets one should use all three terms describing them. Let A and B be two intuitionistic fuzzy set in  $= \{x_1, x_2, \dots, x_n\}$ . Then the distance between A and B while using the three term representation (Szmidt and Kacprzyk) may be as follows.

The Hamming distance:

$$\begin{split} &d_{IFS}(A,B) = \frac{1}{2} \sum_{i=1}^{n} (\left| \mu_{A}(\mathbf{x}_{i}) \cdot \mu_{B}(\mathbf{x}_{i}) \right| + \left| \mathbf{v}_{A}(\mathbf{x}_{i}) \cdot \mathbf{v}_{B}(\mathbf{x}_{i}) \right| \end{split}$$

The Euclidean distance:

$$e_{IFS}(A, B) = \sqrt{\frac{1}{2}\sum_{i=1}^{n}((\mu_{A}(x_{i})-\mu_{B}(x_{i}))^{2} + (v_{A}(x_{i})-v_{B}(x_{i}))^{2})}$$

The normalized Hamming distance:

$$l'_{IFS}(A, B) = \frac{1}{2n} \sum_{i=1}^{n} (|\mu_A(x_i) - \mu_B(x_i)| + |v_A(x_i) - v_B(x_i)|)$$

The normalized Euclidean distance:

$$q'_{IFS}(A, B) = \sqrt{\frac{1}{2n}\sum_{i=1}^{n}((\mu_{A}(x_{i}) - \mu_{B}(x_{i}))^{2} + (v_{A}(x_{i}) - v_{B}(x_{i}))^{2}}$$

The Hamming distance is smaller for fuzzy sets that are more alike than those that are less similar. In our study, the model-testing phase involved comparison of low and high actual fuzzy classifications[7]. From the results in Table 1, the normalized Euclidean distance measure is better than the Hamming distance at distinguishing between different levels of classification. In cases e and f, the Hamming distance(HD) gave the same value for different the normalized hamming distance fuzzy classifications.

#### III. EXAMPLE

Data were collected at the 12-month follow-up phase of a study of job strain and cardiovascular risk, details of which have been published previously [13]. Participants in the original sample were 162 junior and high school teachers, selected on the

basis of scores on a work stress measure (37) as having high (28 men and 52 women) or low (32 men and 50 women) job strain scores. Eighty-five (52.5%) were classroom teachers, and 77 (47.5%) had additional administrative roles. One hundred thirtyseven teachers took part in the 12-month phase (84.6%), which consisted of ambulatory blood pressure monitoring and a psychiatric interview (to be reported elsewhere) in addition to cortisol measurements. Of the 25 who did not participate at 12 months, 10 had left teaching or retired, 7 were seriously ill or pregnant, 1 experienced equipment failure, and 7 did not respond to our invitation. Comparisons between the 137 participants and 25 who dropped out of the study revealed no significant differences in gender, job strain scores, age, grade of employment, or scores on negative affect or anger expression. An additional 15 of the 137 individuals refused to sample saliva during the working day, mainly because they envisaged that data collection might be embarrassing or inconvenient at school. Statistical comparisons of these individuals with the remainder again identified no differences on demographic or psychological variables.



Figure 2. Mean concentration of saliva free cortisol in high and low job strain groups across the day and evening.



Figure 3. Mean concentration of saliva free cortisol in men and women across the day and evening.

Saliva sampling was conducted on a working day at schools. Participants were asked to take eight saliva samples at 2-hour intervals, and a 30-minute time window was allowed for each sample. Participants were asked to not consume any caffeine, citrus drinks, or food for at least 60 minutes before the saliva sample was taken. The schedule sampling sequence was therefore 8:00 to 8:30, 10:00 to 10:30, 12:00 to 12:30, 14:00 to 14:30, 16:00 to 16:30, 18:00 to 18:30, 20:00 to 20:30, and 22:00 to 22:30 hours. The first sample of the day was always obtained at schools after explanation of the procedure by the investigators. Saliva samples were collected in Salivettes, which were stored at  $-30^{\circ}$ C until analysis. After defrosting, samples were spun at

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3000 rpm for 5 minutes, and  $100 \ \mu l$  of supernatant was used for duplicate analysis involving a time-resolved immunoassay with fluorescence detection.

Fuzzy function of the given figure 2 and 3 is defined as

$$f(x) = \begin{cases} -5x + 1.5, x \in [0, 0.2] \\ 0.5, x \in [0.2, 0.4] \\ -x + 0.9, x \in [0.4, 0.7] \end{cases}$$

$$A_{1}(x) = \begin{cases} 5x, x \in [0, 0.2] \\ 2 - 5x, x \in [0.2, 0.4] \\ 0, otherwise \end{cases}$$
$$A_{2}(x) = \begin{cases} 5x - 1, x \in [0.2, 0.4] \\ -3.33x + 0.33, x \in [0.4, 0.7] \\ 0, otherwise \end{cases}$$

Corresponding Fuzzy diagram of given figure 3 and figure 5



Figure 4. Fuzzy Mean concentration of saliva free cortisol in high and low job strain groups across the day and evening and Fuzzy Mean concentration of saliva free cortisol in men and women across the day and evening.

Case		Actual fuzzy classification			Predicted	l fuzz	y classification	HD	Predicted
	Time	High	Low		High		Low		Distance
		$\mu_A(x_i)$	$\mu_A(x_i)$		$\mu_{B}(x_{i})$		$\mu_{B}(x_{i})$		
a	8-8.30	(1, 0)	(0.83, 0.17)		(0.9, 0.1)		(0.8, 0.2)	0.13	0.43
b	10 - 10.30	(0.45, 0.55)	(0.45, 0.55)		(0.8, 0.2)		(0.8, 0.2)	0.4	0.34
с	12 - 12.30	(0.39, 0.61)	(0.39, 0.61)		(0.5, 0.5)		(0.5, 0.5)	0.16	0.13
d	14 - 14.30	(0.44, 0.54)	(0.44, 0.54)		(0.4, 0.6)		(0.4, 0.6)	0.16	0.11
e	16 - 16.30	(0.31, 0.69)	(0.31, 0.69)		(0.5, 0.5)		(0.5, 0.5)	0.4	0.18
f	18 - 18.30	(0.24, 0.76)	(0.27, 0.73)		(0.4, 0.6)		(0.5, 0.5)	0.4	0.16
g	20-22.30	(0.17, 0.83)	(0.21, 0.79)		(0.4, 0.6)		(0.5, 0.5)	0.51	0.18
Entropy Value (0.57, 0.43) (0.64, 0.36)				(0.64, 0.36)		(0.8, 0.2)			
Various Distance Between Intuitionistic fuzzy set				W	Women Me		n		
Hamming Distance				0.54		0.55			
Euclidean Distance				0.39		0.49			
Normalized Hamming Distance				0.15		0.16			
Normalized Euclidean Distance				0.	15 0.19				

 

 Table 1: Comparison of the various distances of Fuzzy Mean concentration of saliva free cortisol in high and low job strain groups across the day and evening

Case		Actual fuzzy classification			Predicted fuzz		y classification	HD	Predicted
	Time	Women	Men		Women		Men		Distance
		$\mu_A(x_i)$	$\mu_A(x_i)$		$\mu_B(x_i)$		$\mu_B(x_i)$		
a	8 - 8.30	(1, 0)	(0.83, 0.17)		(0.9, 0.1)		(0.8, 0.2)	0.13	0.43
b	10 - 10.30	(0.6, 0.4)	(0.6, 0.4)		(0.8, 0.2)		(0.8, 0.2)	0.7	0.35
c	12 - 12.30	(0.34, 0.66)	(0.5, 0.5)		(0.5, 0.5)		(0.5, 0.5)	0.22	0.15
d	14 - 14.30	(0.37, 0.63)	(0.53, 0.47)		(0.4, 0.6)		(0.4, 0.6)	0.08	0.11
e	16 - 16.30	(0.27, 0.73)	(0.33, 0.67)		(0.5, 0.5)		(0.5, 0.5)	0.38	0.17
f	18 - 18.30	(0.25, 0.75)	(0.25, 0.75)		(0.4, 0.6)		(0.5, 0.5)	0.39	0.16
g	20-22.30	(0.2, 0.8)	(0.19, 0.81)		(0.4, 0.6)		(0.5, 0.5)	0.52	0.17
Entropy Value (0.52, 0.48) (0.66, 0.36)				(0.71, 0.29)		(0.8, 0.2)			
Various Distance Between Intuitionistic fuzzy set				W	Women		n		
Hamming Distance				0.59		0.62			
Euclidean Distance				0.51		0.56			
Normalized Hamming Distance				0.17		0.18		]	
Normalized Euclidean Distance				0	0.19		1	]	

 Table 2: Comparison of the Hamming various distances of Fuzzy Mean concentration of saliva free cortisol in men and women across the day and evening

### IV. CONCLUSIONS

Job strain is associated with elevated free cortisol concentrations early in the working day but not with reduced cortisol variability. The interaction with outward anger expression suggests that individual characteristics modulate the impact of chronic work stress on the hypothalamic-pituitaryadrenocortical system. fuzzy modeling of distance between Intuitionistic fuzzy sets were developed to predict characteristics of the sample are summarized in table 1 and 2. The high and low job strain groups did not differ in gender distribution, age, occupational grade, or proportion of cigarette smokers. There were significant differences between groups in job strain and in its components job demands, job control, and skill utilization. The high job strain group reported greater demands, lower control, and less skill utilization than the low job strain group as inputs.

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#### AUTHORS

**First Author** – P. Senthil Kumar, Assistant professor of Mathematics, Rajah Serofji Government College. Thanjavur.(T.N), E-mail: senthilscas@yahoo.com **Second Author** – B. Mohamed Harif, Assistant professor of Mathematics, Rajah Serofji Government College. Thanjavur.(T.N), E-mail: harif1984@gmail.com

# **Global Recession: Indian Scenario**

## Dr. Vinayak Erpate, M.A. (Sociology), M. Phil., Ph. D., Registrar

Gondwana University, Gadchiroli, MIDC Road Complex, Gadchiroli-442 605, Maharashtra(India).

Abstract- The word 'Recession' denotes a temporary period of economic decline during which trade and Individual activities are reduced. Till date, the world has witnessed a number of economic recessions that brought the trade market to a standstill and left the economists and analysts with valuable lessons to be learnt for future. Globalization and liberalization have contributed a lot in making the entire world a close knit economic unit. In an interconnected global economy recession and economic turbulence in one part of the world has the potential to disrupt the economies of other countries in a major way. The economic slowdown in US economy in 2008 caused by the burst of housing bubble engulfed the entire world in its grip. This research paper attempts objectives, US crisis in 2008 and its impact on Indian economy, facts of global recession in 2013, RBI's initiative, India and Global recession in 2013, benefits of recession and some conclusions.

*Index Terms*- global recession, causes, US crisis, Impact, Benefits and Conclusion

#### I. INTRODUCTION

A merica is the most effected country due to global recession, which comes as a bad news for India. India have most outsourcing deals from the US. Even our exports to US have increased over the years. Exports for January declined by 22 per cent.

RECESSIONS ARE the result of reduction in the demand of products in the global market. Recession can also be associated with falling prices known as deflation due to lack of demand of products. Again, it could be the result of inflation or a combination of increasing prices and stagnant economic growth in the west. Recession in the West, specially the United States, is a very bad news for our country. Our companies in India have most outsourcing deals from the US. Even our exports to US have increased over the years. Exports for January have declined by 22 per cent. There is a decline in the employment market due to the recession in the West. There has been a significant drop in the new hiring which is a cause of great concern for us. Some companies have laid off their employees and there have been cut in promotions, compensation and perks of the employees. Companies in the private sector and government sector are hesitant to take up new projects. And they are working on existing projects only. Projections indicate that up to one crore persons could lose their jobs in the correct fiscal ending March. The one crore figure has been compiled by Federation of Indian Export Organisations (FIEO), which says that it has carried out an intensive survey. The textile, garment and handicraft industry are worse effected. Together, they are going to lose four million jobs by April 2009, according to the FIEO survey. There has also

been a decline in the tourist inflow lately. The real estate has also a problem of tight liquidity situations, where the developers are finding it hard to raise finances.

### WHAT IS A RECESSION?

A recession is a decline in a country's gross domestic product (GDP) growth for two or more consecutive quarters of a year. A recession is also preceded by several quarters of slowing down. Recession is a slowdown or a massive contraction in economic activities. A significant fall in spending generally leads to a recession. Description: Such a slowdown in economic activities may last for some quarters thereby completely hampering the growth of an economy. In such a situation, economic indicators such as GDP, corporate profits, employments, etc., fall. This creates a mess in the entire economy.

#### HOW DOES THIS HAPPEN?

Normally, when consumers lose confidence in the growth of the economy and start to spend less, there is a decrease in demand for goods and services. This, in turn, leads to a decrease in production. On the other hand, the profit margin of companies is due to a rise in costs and they try cost cutting measures. The equity / stock markets react negatively to this. A lay-off (asking people to leave) leads to a rise in the unemployment rate and a decline in real income.

## WHAT CAUSES IT?

An economy which grows over a period of time tends to slow down the growth as a part of the normal economic cycle. An economy typically expands for 6-10 years and tends to go into a recession for about six months to 2 years. A recession normally takes place when consumers lose confidence in the growth of the economy and spend less. This leads to a decreased demand for goods and services, which in turn leads to a decrease in production, lay-offs and a sharp rise in unemployment. Investors spend less as they fear stocks values will fall and thus stock markets fall on negative sentiment.

#### II. OBJECTIVES OF THE STUDY

The researcher has made the following for the study purpose

- a) To know the causes of recession.
- b) To analyze the emerging economic trend due to global recession.
- c) To understand the recession in the global perspective.
- d) To provide suggestions and comments on the study.

#### III. IMPACT ON INDIAN ECONOMY

The impact of the crisis is deeper than estimated by our policy makers although it is less severe than in other emerging market economies. Further, the Indian banking system is one of the least affected in the whole world and has been praised by many of the economists and financial experts. The banks were saved from this downturn because of the financial policies which were very well formulated that acted as an insulator for the Indian banks. The extent of impact has been restricted due to several reasons such as-

- Indian financial sector particularly our banks have no direct exposure to tainted assets and its off-balance sheet activities have been limited. The credit derivatives market is in nascent stage and there are restrictions on investments by residents in such products issued abroad.
- India's growth process has been largely Domestic Demand Driven and its reliance on foreign savings has remained around 1.5 per cent in recent period.
- India's comfortable Foreign Exchange Reserves provide confidence in our ability to manage our balance of payments notwithstanding lower export demand and dampened capital flows.
- Rural demand continues to be robust due to mandated agricultural lending and social safety & Rural Employment Generated programs.
- India's Merchandise Exports are around 15 per cent of GDP, which is relatively modest.

Despite these mitigating factors, India too has to weather the negative impact of the crisis due to rising two-way trade in goods and services and financial integration with the rest of the world. Indian economy is experiencing the following incidental effects of the Global Crisis.

### IV. GLOBAL RECESSION DAMPEN INDIAN EXPORT PROSPECTS IN 2013: (HTTP://WWW.FIRSTBIZ.COM/ECONOMY/GLOBAL-RECESSION-MAY-DAMPEN-INDIAN-EXPORT-PROSPECTS-IN-2013-35388.HTML)

Indian exports, which was hit by global slowdown last year, are likely to remain sluggish during 2013 as well due to challenging economic conditions in western economies, though policymakers have drawn a strategy to diversify exports. The year started on a double-digit growth for exports, but gradually declined and finally entered the negative territory in May. In January 2012, outbound shipments grew by 10 percent before contracting by about 5 percent in May, with no major turnaround since then.

The government's effort to diversify from the traditional markets of the US and Europe yielded positive results but dependence on the western economies have led to decline in the country's overall merchandise shipments. These two market accounts for about one-third of India's exports. Although India's exports surpassed the \$300-billion mark and reached \$307 billion during 2011-12, the country's trade deficit also touched an all-time high of \$185 billion in the period. During January-November 2012, the trade gap has widened to \$175.5 billion

compared to \$146.9 in the comparable period last year. For government, it is a major cause of concern, as widening trade gap directly impacts current account deficit (CAD) and domestic currency. CAD stood at 3.9 percent of GDP in the April-June quarter.

Due to the global demand slowdown, India's exports during the current fiscal are likely to barely cross \$300 billion against the ambitious target of \$360 billion for the current fiscal. According to the Commerce Secretary S R Rao, any ripple worldwide will impact India's commerce as the country's integration with the global trade has reached a high level. Slowing global output growth has led to World Trade Organisation (WTO) cut its 2012 forecast for world trade expansion to 2.5 percent from 3.7 percent and to scale back the 2013 growth estimate to 4.5 percent from 5.6 percent.

"In an increasingly interdependent world, economic shocks in one region can quickly spread to others," WTO Director General Pascal Lamy has said. Federation of Indian Export Organisations (FIEO) has said the year 2012 had been difficult for exporters. "Domestic issues like poor infrastructure, increasing transactions cost and some procedural hurdles are huge challenges for exporters," FIEO President Rafeeq Ahmed said. Sharing similar views, Rakesh Mohan Joshi, internal trade expert and Professor with India's prestigious Indian Institute of Foreign Trade (IIFT) said the ballooning trade deficit poses serious challenges to the government. "2012 was not a good year for India's exports.

Trade deficit touched an all-time high. It is matter of serious concern for the government and I do not even see 2013 as a better for them (exports). Situation may improve, but marginally," Joshi said. He said the condition in Europe is not satisfactory and there are no signs of improvement.

"Along with global issues, domestic conditions are also not good. There is a strong need to boost investments in the manufacturing sector," he added. Apparel Export Promotion Council (AEPC) Chairman A Sakthivel too said 2012 was one of the most challenging years. "We witnessed lower buyer sentiments due to sluggish market condition," he said. Sectors which contribute maximum in the country's exports have been registering negative growth since April-November period of this fiscal. While exports of engineering and gems and jewellery items contracted by 5.3 percent and 10 percent, respectively, that of cotton yarn, jute, readymade garments and handicrafts shrunk by 11 percent, 14 percent, 8 percent and 65 percent, respectively, during April-November period of the current fiscal.

"This is a matter of serious concern to us. They are directly linked to job creation and job sustenance," Commerce and Industry Minister Anand Sharma has said. However, the government is making every effort to support exporters. Sharma has recently announced several measures including extension of cheap loan facility for one more year till March 2014.

The minister said those incentives will help in bridging the trade deficit. The two per cent interest subsidy scheme, which was to end on March 2013 has been extended for one more year. Besides, more sectors have been covered under it with the engineering exporters being the major beneficiaries. Merchandise shipments to the US, European Union and the Asian markets will now qualify for additional sops. Exporters are facing a demand slowdown in these markets. "With these measures, we should be

able to give a push to our exports in the last quarter of this financial year. The objective is to stabilise the situation and try and move from the negative territory to positive," Sharma has said. Rising trade deficit has been cited by several global rating agencies like S&P as a key area of concern for the Indian economy.

#### V. GLOBAL RECESSION 2013

Is a global recession a real possibility in 2013? Absolutely, with some even calling a 2013 global recession a 100% certainty. Even the International Monetary Fund (IMF) is bearish, noting the global economic slowdown is a serious threat and warning U.S. and European policymakers that a failure to fix their economic malaise would prolong the slump. The IMF said the world economy in 2012 would grow just 3.3%, down from the previous estimate of 3.5%; making 2012 the slowest year of growth since the Great Recession began in 2009. In 2013, the IMF predicts only a modest pickup to 3.6%, below its July 2012 estimate of 3.9%.1

Why pay attention to any IMF forecasts? The IMF accurately projected U.S. growth would be little more than two percent in 2012 and predicts the same for 2013. It also expects modest euro growth in 2013 of just 0.2%. While Germany has been the economic engine for the eurozone (the 17-nation currency union), its slowing economy could join the rest of the region in recession—or at least, that's according to the Deutsche Bundesbank, Germany's central bank. Thanks to the deep recessions in the other eurozone countries and austerity programs, Germany's ability to carry the region is in serious jeopardy

The Bundesbank is predicting growth of just 0.4% in 2013; down from a June 2012 forecast of 1.6%. Not surprisingly, unemployment is running in step. The Bundesbank also expects the jobless rate to hit 7.2% in 2013, up from 6.8% in 2012.2. The rest of the eurozone is faring much worse. The jobless rate in the eurozone as a whole is at 12%, the highest level since the euro was created in 1999. Europe's debt crisis has also had a serious impact on North America. For American companies with operations in Europe, a weaker euro translates into weaker European sales. At the same time, American banks have lent money to Greece as well as other eurozone countries and would lose billions if the country went bankrupt. The American economy would face even greater threats if other eurozone countries followed suit.

### VI. VARIOUS STEPS TAKEN BY RBI TO CURB THE PRESENT RECESSION IN THE ECONOMY AND COUNTER ACT THE PREVAILING SITUATION

The sudden drying-up of capital inflows from the FDI which were invested in Indian stock markets for greater returns visualizing the Potential Higher Returns flying back is continuing to challenge liquidity management. At the heart of the current liquidity tightening is the balance of payments deficit, and this NRI deposit move should help in some small way.

To curb the liquidity crises the RBI will continue to initiate liquidity measures as long as the current unusually tight domestic

liquidity environment prevails. The current step to curb these being lowering of interest rates and reduction of PLR.However, the big-picture story remains unchanged – all countries in the world with current account deficits and strong credit cycles are finding it difficult to bring cost of capital down in the current environment. India is no different. New measures do not change our view on the growth outlook. Indeed, we remain concerned about the banking sector and financial sector. The BOP- Balance of Payment deficit – at a time when domestic credit demand is very high – is resulting in a vicious loop of reduced access to liquidity, slowing growth, and increased risk-aversion in the financial system.

In total the recession have turned down the growth process and have set the minds of economists and others for finding out the real solution to sustain the economic growth and stability of the market which is desired for the smooth running of the economy.

Complete businesss/ industry is in dolledrum situation and this situation persist for a longer duration will create the small business to vanish as they have lower stability and to run smoothly require continous flow of liquidity which is drived from the market.

In present situation down fall in one sector one day leads to a negative impact on the other sector thus alltogether everyone feel the impact of the Financial crises with the result of the current recession which started in US and slowly and gradually due to linked global world have impacted everyone.

## VII. RECESSION – BUSINESS OPPORTUNITIES

a) Realty Sector: The worst hit industry in India and abroad is Realty Sector. It is a time to introspect for everybody. There have been things to learn, relearn and unlearn for all the concerned viz., End Users, Investors and Developers. Recession brings the much needed discipline to people's way of life, while for corporate across various sectors, there are many positive ripple effects - for instance it allows people to analyze and identify their core competencies. End Users are more cautious and looking for value for their investment and Lenders are exercising prudence while selecting the borrowers. Developers have started focusing attention on affordable and mass housing with attracting plans. More cautious spending and greater saving by consumers, more prudence by lenders, shift in focus from premium to lower and mid-end segment of housing by developers, is exactly what our economy needed for its long-term health and recession is having the desired impact. The End User is going to be benefited as the supply chain started addressing the real demand in market - affordable housing.

**b) Innovation:** The consumption of basic requirements such as Food, Shelter, Clothing, Water, Electricity and Health etc., is always going to stay the same even in the recession, which forces the consumers to look for cost effective alternatives. Hence the providers of the basic needs are required to focus their attention to offer them at affordable cost. Recession is an opportunity to produce cost effective / innovative products and services to the consumers.

c) Mobile & Internet Users: India has over 550 million cell phone subscribers, which is next to China. It provides ample opportunity to the entrepreneurs / technocrats to build viable

business models on present and prospective Mobile/Internet Users. India's Internet infrastructure is a revolution. India has over 70 million internet users and expected to increase to 200 million in the next 5 years. This means that even the individuals from India's remotest regions can now showcase and offer their businesses to customers based anywhere globally.

d) Financial Discipline: The crisis has opened the eyes of the Individuals, Corporate and Governments and made them to focus their attention on need of Savings & Investments, which was completely ignored in the past. Now they realized the importance of savings and financial discipline, which definitely paves the way for better future. The concept of "Spend – Earn – Save – Repay", which is prevalent in the present consumerism era, need to under go a change into "Earn – Save – Spend".

IT industries, financial sectors, real estate owners, car industry, investment banking and other industries as well are confronting heavy loss due to the fall down of global economy. Federation of Indian chambers of Commerce and Industry (FICCI) found that faced with the global recession, inventories industries like garment, gems, textiles, chemicals and jewellery had cut production by 10 per cent to 50 per cent.

## VIII. HOW TO TACKLE THE GLOBAL SLUMP?

"Our economy is shrinking, unemployment rolls are growing, businesses and families can't get credit and small businesses can't secure the loans they need to create jobs and get their products to market," Obama said. "With the stakes this high, we cannot afford to get trapped in the same old partisan gridlock."

The following measures can be adopted to tackle the recession:

- Tax cuts are generally the first step any government takes during slump.
- Government should hike its spending to create more jobs and boost the manufacturing sectors in the country.
- Government should try to increase the export against the initial export.
- The way out for builders is to reduce the unrealistic prices of property to bring back the buyers into the market. And thus raise finances for the incomplete projects that they are developing.
- The falling rupees against the dollar will bring a boost in the export industry. Though the buyers in the west might become scarce.

The oil prices decline will also have a positive impact on the importers.

### IX. OBSERVATIONS

1. Recession will have its plus point and minus points. The minus points are that, there will be job scarcity, retrenchment will be all time high, liquidity in the market will be low, export market will be severely hit etc etc. The plus point is that cost of living will come down. Things we were exporting will be forced to be sold locally, bringing the price of products down. Real

estate which was out of reach for the common man, will be within his reach.

- 2. During time of recession, hold on the what ever job we have. Those who have lost their jobs, please do not be choosy. Take up any job that comes by. Remember every day has a night and every night has a day. This is all temporary and will pass soon.
- 3. All industries which depend heavily on exports, are likely to suffer for at least 2-3 years. Consider Software companies, jewellery, textiles, brass ware, auto Component manufacturers etc. Orders will dry up, factories will have to be shut down, albeit temporarily, jobs will be lost and so on. It is already happening on a large scale. You must have heard latest. Foreign governments (US and Saudi Arabia are latest) are advising employers in their countries to fire expatriates (Indians are in large numbers) first, if they are to downsize.
- 4. Indian industries shall also slow down, especially the IT, call centres, transportation like airlines, service industry like hotels, the banking industry etc. The share market and real estate also have dropped many staff have been retrenched
- 5. Impacts of global recession on India are multifold.
- 6. The first and the foremost effect was felt on the stock exchanges when Foreign Institutional Investors, most of whom are based in US and Europe started pulling back money from Indian Markets as they needed to add liquidity. The sudden sale of lot of stocks caused stock markets to crash and Industries in general are having a hard time raising cash for several ongoing projects. As a result many have shelved several projects for the lack of funds.
- 7. Export oriented Industries have suffered the most. The financial meltdown has caused reduced demand in US and western European Countries. So these Industries are experiencing a reduced cashflow than they had anticipated and they have been forced to look to other markets.
- 8. The negative sentiments had created a situation where even banks would not trust each other in lending money. Government had to take several steps like cutting CRR rate in order to infuse more money into the economy. Increased interest rates have made it difficult to borrow money in order to start new ventures, even though government has tried to bring the interest rate down.
- 9. Industries with significant cash flow problems had to layoff several employees. Existing employees are being forced to work longer hours with lesser pay. Many companies have deferred the yearly increments in an effort to cut costs.
- 10. In the age of globalization, no country can remains isolated from the fluctuations of world economy. Heavy losses suffered by major International Banks is going to affect all countries of the world as these financial institutes have their investment interest in almost all countries.
- 11. As of now India is facing heat on three grounds: (1) Our Share Markets are falling everyday, (2) Rupee is

weakening against dollars and (3) Our banks are facing severe crash crunch resulting in shortage of liquidity in the market.

- 12. Actually all the above three problems are interconnected and have their roots in the above-mentioned global crisis.
- 13. India will become more strong as exporter will try to find out the way in Indian Market. This is the time when we should see our own strengths and move a step ahead in making INDIA "a self dependent country". Another point which falsh in my mind is NON IT units will improve their quality @ low price to make their product available across the globe as our labour cost is much more less than others.
- 14. The HR & MKTing ppl are having a tough time finding EXCUSES to fire employees .Employees are informed about their pink slips on as short a notice period as 15days.
- 15. The major impact of global economic recession in India or economic slowdown is with the small exporters and importers in the country as most of them are facing the problem of heavy duties
- 16. A lethal cocktail of the falling sales, rising inflation, increasing input costs and drying cash flow topped with US economy slowdown is hurting India industry hard.
- 17. The weaking of rupee has helped comapnies to show a PROFIT in terms of the dollar to rupee revenue but the operating ratio has come out for most organisation.
- 18. The global recession will have the least impact on the Indian economy. It is generated by artificial development activity. Nothing can have much impact on these indians than their own economy. It is strong. There will be little impacts on it could be felt but not for long. Because, this is India. Nothing is permanent here. Indians are immune to these recession and can make living in any desert. This bloody recession has little impact, except for those who live in high style abroad.
- 19. The impact will be mediocre. It depends a lot on our politician. If they make right economical decisions, we can say either there will not be any impact or even this recession can be used to become more powerful nation. Government claims there will not be any impact, but at least people working for software companies especially MNCs are definitely vulnerable to this recession.
- 20. Its because of the Lehman brothers it has lead to bankruptcy of many companies and hence leading to a downfall of global economy resulting in recession. Thats how it happened. Lot of companies are dependent on outsourcing. When there economy goes down, it shows the impact on us. The sol. for this is we have to create more projects within India.

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#### AUTHORS

First Author – Dr. Vinayak Erpate, M.A. (Sociology), M. Phil., Ph. D., Registrar, Gondwana University, Gadchiroli, MIDC Road Complex, Gadchiroli-442 605, Maharashtra(India)., M. No: 08275046101/09404529930,

registrar.gondwanauniversity@gmail.com,

v.irpate@rediffmail.com

# Legitimacy Crisis in Investor – State International Arbitration System: A Critique on the Suggested Solutions & the Proposal on the Way Forward.

## **Julius Cosmas**

Lecturer in Law, Mzumbe University - Morogoro Tanzania

Abstract- In recent years, investor – state arbitration system (ISA) has received a lot of attention and criticism in academic writings. A section of stakeholders have labelled this system as machinery for advancing foreign investors interests at the expense of the host state interests. It is contended that the system is overshadowed with flaws and lacks the necessary values of a legitimate adjudicative system. The often cited flaws in the system includes: lack of mechanism to avoid inconsistent decisions, lack of rules to ensure impartial and independent adjudication process, confidentiality of proceedings despite the fact that the disputes are public in nature and expensive adjudication process. Furthermore the system is condemned for encroaching on governments' regulatory powers.

In the efforts to remedy the situation, a number of solutions have been suggested by different stakeholders. The most cited solutions include; consolidation of related disputes; invoking res judicata and lis pendens principles; use of mediation / conciliation technique; adopting the margin of appreciation standard in interpretation of BITs and creating an appellate structure at ICSID. Another suggestion has been creating a standing international investment court.

The purpose of this article therefore is to make a critical analysis of the solutions suggested. The main objective is to find out whether the suggested solutions are strong enough and capable of addressing all flaws in the ISA system. To get a satisfying answer to this question the article proceeds by looking at the strengths of each suggested solution and identify the possible weaknesses which befalls them.

In the last part the article proposes its own recommendations. It is concluded that in order to serve the system from collapsing, establishing a single permanent court with permanent members stands out to be the panacea to all legitimacy issues haunting investor – state arbitration system.

*Index Terms*- Investor – State arbitration, legitimacy crisis, international investment court, international investment appellate court.

#### I. INTRODUCTION

Foreign investor – state arbitration (ISA) is not carried out by a single omnipotent body or court; rather, it is carried out by a number of different bodies; permanent and ad hoc. Most of the times these dispute are settled under the International Centre for Settlement of Investment Disputes (ICSID) arbitration,<sup>1</sup> or under the Additional Facility arbitration<sup>2</sup> or the ad hoc arbitration under UNCITRAL rules.<sup>3</sup> The dispute is settled at ICSID where it involves a member state to the convention and a national from another member state.<sup>4</sup> Where one of the parties to the dispute is not a member to the Convention, the dispute can then be settled under the ICSID Additional Facility rules.<sup>5</sup> Where neither the host state nor the foreign investor home state is a member to the convention, the dispute is normally settled on ad hoc basis under the UNCITRAL Arbitration rules.<sup>6</sup>

The UNCTAD 2013 World Investment Report indicates that ICSID constitute 61% of all investor – state disputes while UNCITRAL constitutes 26% and the remaining 13% is left for the International Chamber of Commerce (ICC) established in  $1923^7$ , the Permanent Court of Arbitration (PCA)<sup>8</sup> and the Stockholm Chamber of Commerce.<sup>9</sup>

<u>http://icsid.worldbank.org/ICSID/StaticFiles/facility/A</u> FR\_English-final.pdf accessed on 21/02/2013.

<sup>3</sup> The UNCITRAL Arbitration Rules, 2010, available at

<u>www.uncitral.org/pdf/arbitration/rules/arb-rules-revised-2010</u> accessed on 15/02/2013.

<sup>4</sup> See the ICSID Convention, note 1 above, Art.25.

<sup>5</sup> See the Additional Facility Rules , note 2 above, Art 2(*a*).

<sup>7</sup> See ICC Rules of Conciliation and Arbitration, 1998 available at <u>http://www.jus.uio.no/lm/icc.conciliation.arbitration.rules.1988</u>

<u>cpa.org/showpage.asp?pag\_id=1027</u> accessed on 18/07/2013. <sup>9</sup> See UNCTAD Latest Developments in Investor-State Dispute Settlement, [2013] IIA Monitor, No. 1, at 1–2, U.N.Doc UNCTAD/WEB/ITE/IIA/2013/3 available at <u>http://unctad.org/en/PublicationsLibrary/webdiaepcb2013d3\_en.pdf</u> accessed on 23/07/2013.

<sup>&</sup>lt;sup>1</sup> Governed by the Washington Convention on Settlement of Investment Disputes between States and the Nationals of Other Contracting States, 1965 hereinafter referred as "the ICSID Convention" read together with the Rules of Procedure for the Institution of Conciliation and Arbitration Proceedings (hereinafter ICSID Rules) available at <u>http://www.worldbank.org/icsid.htm</u> accessed on 21/05/2013.

<sup>&</sup>lt;sup>2</sup> The Rules Governing the Additional Facility for the Administration of Proceedings by the Secretariat of the

International Centre for Settlement of Investment Disputes ICSID/11April 2006 available at

<sup>&</sup>lt;sup>6</sup> UNCITRAL Rules 2010, note 3 above, Art. 1 (1).

accessed on 20/07/2014 (hereinafter ICC Arbitration Rules).

<sup>&</sup>lt;sup>8</sup> Established by the Hague Convention for the Pacific Settlement of Disputes of 1899 available at <u>http://www/pca-</u>

#### II. ISA LEGITIMACY ISSUES

As pointed out in the introduction, the lack of a single omnipotent body which is responsible for supervising investment disputes, has led to the cropping up of a number of issues. Under the current ISA there is no mechanism in place to avoid inconsistent decisions,<sup>10</sup> there are no adequate rules to ensure an impartial and independent adjudication process, there are no rules to ensure transparency despite the fact that the disputes are public in nature, expensive adjudication process and there is no appellate system to rectify errors.<sup>11</sup>

In addition, the tribunals at times encroach on governments' regulatory powers by rendering awards which challenges or illegalize legitimate laws passed by states. This can be substantiated by a number of decided cases challenging the host states basic regulatory functions and sometimes states duty to provide public services to its citizens.<sup>12</sup> In some cases the main function of the state; security and peace is put at jeopardy but still the standard of review applied by the tribunals does not take these factors under consideration.<sup>13</sup> Furthermore, state regulatory measures on environmental issues, health and other service delivery to the citizens have been declared illegal in favour of foreign investors' interests.<sup>14</sup>

Europe AG, Vattenfall Europe Generation AG v. Federal

<u>Republic of Germany</u>, (Award) ICSID Case No ARB/09/6. The case is commenced by <u>Vattenfall against Germany</u> as a result of Germany's nuclear opt-out decision to protect the environment and health.

### III. SYSTEMIC FLAWS CONSEQUENCES

In reaction to the above mentioned flaws in the system, some stakeholders have started running away from the investor – state arbitration system. Latin America countries; Bolivia, Ecuador, and Venezuela have led the way by withdrawing from the ICSID convention.<sup>15</sup> In April 2011, in an effort to seek more policy space, Australia issued a trade policy statement announcing that it would stop including investor – state dispute settlement clauses in its future International Investment Agreements (IIAs).<sup>16</sup> In March 2014, Indonesia after facing a number of treaty-based claims in recent years, has decided to terminate the BIT with Netherlands.<sup>17</sup> It has further indicated that it intends to terminate all 67 BITs entered with other countries.<sup>18</sup>

The United States, has also revised its Model Bilateral Investment Treaty (BIT) in order to constrain the expansive interpretations by tribunals. The revised model BIT empowers the US government more to regulate on different issues; health, safety, environment, and the promotion of internationally recognized labour rights without interference from the investor – state tribunals.<sup>19</sup> In addition to that, the US 2012 Model BIT mandate the Parties to "consider" whether arbitral awards under the BIT should be subject to any new appellate mechanism to be introduced in the future.<sup>20</sup>

South Africa has also shown its dissatisfaction with the current dispute settlement system.<sup>21</sup> The government in 2009 issued a policy statement with regards to BITS. In the effort to balance interests between host state and foreign investors, the government has denounced a number of BITs with European countries and is pushing for utilization of host state courts in the event of any disputes between South Africa and foreign investors.<sup>22</sup> In another move, the South African government in

<u>http://www.iisd.org/sites/default/files/publications/iisd\_itn\_may</u> 2014 en.pdf

http://www.ustr.gov/assets/Trade\_Sectors/Investment/Model\_BIT /asset\_upload\_file847\_6897.pdf\_accessed on 23/02/2013.

<sup>&</sup>lt;sup>10</sup> See SGS Société Générale de Surveillance S A v Islamic Republic of Pakistan ICSID ARB/01/13 (Decision on objection to jurisdiction) (hereinafter SGS v Pakistan) and SGS Société Générale de Surveillance S A v Republic of the Philippines, ICSID ARB/02/6 (Decision on objection to jurisdiction and separate declaration) (hereinafter SGS v Philippines); See also Lauder v The Czech Republic, 9 ICSID Reports 66 and CME Czech Republic BV v The Czech Republic 9 ICSID Reports 121.

<sup>&</sup>lt;sup>11</sup> See Van Harten et al 'Public Statement on the International Investment Regime' Aug. 31, 2010 available at *http://tinyurl.com/3qhnjwr* (hereinafter Public statement) accessed 23rd January 2013; See also Brower C N et al 'The Coming Crisis in the Global Adjudication System' (2003) 19 Arbitration International 415 at 417; Mann H 'Civil Society Perspective: what Do Key Stakeholders Expect from the International Investment Regime?' in Alvarez JE and Sauvant KP (eds.) The Evolving International Investment Regime: Expectations Realities, Options (2011) 22-29; Gaiger R 'Multilateral Approach to Investment' in Alvarez J and Sauvant K P (eds.) The Evolving International Investment Regime (2011) 153-173; Reinisch A 'The Future of Investment Arbitration' in Binder C et al (eds.) International Investment Law for the 21st Century: Essays in Honour of Christoph Schreuer (2009) 894 - 916; Van Harten G 'Investment Treaty Arbitration, Procedural Fairness and the Rule of Law' in Schill S (ed.) International Investment Law and Comparative Public Law (2010) 627-658; Peterson L 'Out of Order' in Waibel et al (eds.) The Backlash Against Investment Arbitration: Perception and Reality (2010) 483 - 488; Reinisch A 'The Issues Raised by Parallel Proceedings and Possible Solutions' in Waibel M et al (eds.) The Backlash Against Investment Arbitration: Perception and Reality (2010) 113-126.

<sup>&</sup>lt;sup>12</sup> See Aguas del Tunari S A v Bolivia ICSID ARB/02/3 2005 (decision on jurisdiction) and Azurix Corp v Argentina ICSID ARB/1/12 2006 (final award) (all cases concerned governed measures to protect water services).

<sup>&</sup>lt;sup>13</sup> See CMS Gas Transmission Company v The Argentine Republic ICSID ARB/01/8 (final award), Sempra Energy International v The Argentine Republic

ICSID ARB/02/16 (final award), Sempra Energy International V The Argentine Republic ICSID ARB/02/16 (final award) and Enron Corporation and Ponderosa Assets L P v Argentine Republic ICSID ARB/01/3 (final award).

<sup>&</sup>lt;sup>14</sup> See *Philip Morris Asia Limited v. The Commonwealth of Australia*, UNCITRAL, PCA Case No. 2012-12 in which the claimant is suing the government of Australia for enacting a legislation which require plain cigarette packaging on public health reasons; See also <u>Vattenfall AB</u>, <u>Vattenfall</u>

<sup>&</sup>lt;sup>15</sup> UNCTAD World Investment Report 2012 at 84.

<sup>&</sup>lt;sup>16</sup>Department of Foreign Affairs and Trade of Australia Trading our way to more jobs and prosperity, April 2011 available at www.dfat.gov.au/publications/trade/trading-our-way-to-more-

<sup>&</sup>lt;u>www.ajat.gov.au/publications/traae/traaing-our-way-to-more-jobs-and-prosperity.html</u> accessed on 25/01/ 2013.

<sup>&</sup>lt;sup>17</sup> See Indonesia Statement on *Investment Treaty News*, May 2014 Issue at 16 available at

<sup>&</sup>lt;sup>18</sup> See the Dutch Ministry Statement on Indonesia Termination of BIT at <u>http://indonesia.nlembassy.org/news/2014/03/bilateral-</u> investment-treaty%5B2%5D.html accessed on 16/05/2014

<sup>&</sup>lt;sup>19</sup> The Office of the U.S. Trade Representative, *Model Bilateral Investment Treaty (2012)*, Art.12 available at

<sup>&</sup>lt;sup>20</sup> 2012 U S Model BIT, as above, Article 28(10).

<sup>&</sup>lt;sup>21</sup> The Department of Trade and Industry *Republic of South Africa's Government Position Paper on Bilateral Investment Treaty Policy Framework Review*, June 2009, available at <u>http://www.thedti.gov.za/ads/bi-lateral\_policy.pdf</u> accessed on 7/02/2013.

<sup>&</sup>lt;sup>22</sup> See the Speech delivered by the Minister of Trade and Industry of South Africa Dr Rob Davies at the South African launch of the United Nations Conference on Trade and Development (UNCTAD) Investment Policy Framework for sustainable development at the University of The Witwatersrand on 26<sup>th</sup> July 2012 available at

http://www.info.gov.za/speech/DynamicAction?pageid=461&sid =29391&tid=77861 accessed on 07/03/ 2013).

November 2013 published its draft Promotion and Protection of Investment Bill 2013 in the Government Gazette for public comment.<sup>23</sup> The bill discourages ISA and provides for domestic litigation, domestic arbitration and mediation of investment disputes.<sup>24</sup>

In addition, Zimbabwe,<sup>25</sup> Liberia,<sup>26</sup> Russia,<sup>27</sup> Thailand,<sup>28</sup> Senegal,<sup>29</sup> Kyrgyzstan<sup>30</sup> and Venezuela<sup>31</sup> have shown dissatisfaction with the ICSID system and refused to pay the awards issued against them.<sup>32</sup>

Not only developing countries are reacting, in March 2014 Germany has also announced its dissatisfaction with the investor - state arbitration system and is opposing the inclusion of the system in the EU - US trade pact which is currently under negotiations.<sup>33</sup> Germany is advancing the idea of adjudicating investor - state dispute in the host state courts. According to the Financial Times, the Junior Minister of Economy, Brigitte Zypries, believes that foreign investors "have sufficient legal

<sup>25</sup> Funnekotter v Republic of Zimbabwe ICSID Case No ARB/05/6, Award (2009) http://italaw.com/documents/ZimbabweAward.pdf accessed on 20/10/2013.

<sup>26</sup> Liberian Eastern Timber Corp v Republic of Liberia ICSID Case No ARB/83/2, Award 2 ICSID Rep. 346 (1994) accessed on 20/10/2013.

Sedelmayer v Russian Federation, Arbitration Award (ad hoc arbitration under

the Stockholm Chamber of Commerce arbitration rules July 7, 1998), http://italaw.com/documents/investment\_sedelmayer\_

*v ru.pdf*. accessed on 20/10/2013.

http://italaw.com/sites/default/files/case-

documents/ita0067.pdf accessed on 20/10/2013.

<sup>29</sup> Socie 'te' Ouest Africaine des Be'tons Industriels v Senegal, ICSID Case No ARB/82/1, Award, 2 ICSID Rep 190 (1994) accessed on 20/10/2013. <sup>30</sup> Petrobart Ltd. v Kyrgyz Republic, Arbitration No 126/2003, Award II

(Arbitration Institute of the Stockholm Chamber of Commerce Mar. 29, 2005), 13 ICSID Rep. 387 (2008) accessed on 20/10/2013.

<sup>31</sup> Mobil Corp v Bolivarian Republic of Venezuela, ICSID Case No ARB/07/27, Decision on Jurisdiction (June 10, 2010),

https://icsid.worldbank.org accessed on 20/10/2013; see also CNN (Jan. 9, 2012) Chavez Says He Won't Respect World Bank Panel's Decision, available at

## http://edition.cnn.com/2012/01/09/business/venezuela-

exxon/index.html accessed on 20/10/2013

<sup>32</sup> For more on this see Peterson LE & Hepburn J ' Payment Round Up New Reporting on ICSID Award Debts of Kazakhstan, Kyrgyzstan and Bangladesh'(2011) Investment Arbitration Reporter available at

http://www.iareporter.com/articles/20111231\_7; see also Baldwin E 'Limits to Enforcement of ICSID Awards' (2006) 23 Journal of

International Arbitration 1at 7; see also Peterson LE 'Zimbabwe Not Paying ICSID Award' (2010) Investment Arbitration Reporter

#### http://www.iareporter.com/articles/20100507\_5 accessed on 21/10/2013.

http://www.iisd.org/sites/default/files/publications/iisd\_itn\_may\_ 2014\_en.pdf accessed on 15th February 2013.

protection in the national courts."<sup>34</sup> It is submitted here that this new Germany stance, which was the first country to pioneer for BITs and signed the first BIT with Pakistan in 1959, shows that the dispute settlement provision in the BITs indeed has problems.

Apart from countries, other stakeholders have also shown concern about the current dispute settlement mechanism. The Committee on International Trade of the European Parliament, on 22<sup>nd</sup> March 2011 issued a report on the future of International Investment Policy of the European Union.<sup>35</sup> The report put to light the problem relating to: different interpretation of investment principles by different tribunals which lead to conflict between private interests versus regulatory tasks of public authorities,<sup>36</sup> existence of BITs which focus on the interests of investors alone and disregard the host state interests in regulating for other development goals,37 the lack of the model BIT for member states which can enhance certainty and consistency of interpretation.<sup>38</sup> In addition, the report raises concerns on the wide discretionary powers granted to arbitrators on interpretation of the investment principles.<sup>39</sup> The report raises more concerns on lack of transparency on the current system, lack of an appellate option and the absence of the requirement for exhaustion of local remedies before resorting to international arbitration.40

Further still, the Law professors from different parts of the world in 2010 issued a public statement condemning the current investment arbitration system.<sup>41</sup> Among the concerns raised in the public statement are: the need to have an independent judicial system responsible for investment disputes; recognition of the state's fundamental right to regulate on behalf of public welfare; the need for arbitrators to consider public interest in their interpretation of investment principles and that the current adjudication system is not a fair, independent and balanced system for settlement of investment disputes.<sup>42</sup>

## IV. THE SUGGESTED SOLUTIONS

As stated in the introduction above, in the efforts to address the above discussed ISA systemic problems, stakeholders have put forward a number of solutions to curb the shortcomings in the ISA system. The most cited solutions include; consolidation of related disputes, invoking res judicata and lis pendens principles; use of mediation/ conciliation technique; adopting the

http://www.iisd.org/sites/default/files/publications/iisd itn may 2014 en.pdf accessed on 15<sup>th</sup> February 2013.

<sup>35</sup> European Union Parliament Report on the Future European International Investment Policy, A7-0070/2011 of 22 March 2011 available at

http://www.europarl.europa.eu/sides/getDoc.do?pubRef=//EP//T EXT+REPORT+A7-2011-0070+0+DOC+XML+V0//EN accessed on 15th February 2013.

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<sup>&</sup>lt;sup>23</sup> See the Draft Bill on Promotion and Protection of Investment, 2013 available at http://www.tralac.org/files/2013/11/Promotion-and-protectionof-investment-bill-2013-Invitation-for-public-comment.pdf accessed on 07/03/2014.

<sup>&</sup>lt;sup>24</sup> See the Draft Bill, as above, Article 11.

<sup>&</sup>lt;sup>28</sup> Walter Bau AG (in liquidation) v Kingdom of Thailand, Award (UNCITRAL Arbitration July 1, 2009),

<sup>&</sup>lt;sup>33</sup> See the Germany Ministry Announcement in Investment Treaty News, May 2014 Issue at 16 available at

<sup>&</sup>lt;sup>34</sup> Financial Times quoted in Investment Treaty News, May 2014 Issue at 16 available at

<sup>&</sup>lt;sup>36</sup> European Parliament Report on Investment 2011, note 35 above, para G.

<sup>&</sup>lt;sup>37</sup> European Parliament Report on Investment 2011, note 35 above, para J (1) and

para 25. <sup>38</sup> European Parliament *Report on Investment* 2011, note 35 above, para J (4) and (10).

<sup>&</sup>lt;sup>39</sup> The European Parliament *Report on Investment* 2011, note 35 above, para 17.

<sup>&</sup>lt;sup>40</sup> The European Parliament *Report on Investment* 2011, note 35 above, para 31.

<sup>&</sup>lt;sup>41</sup> Van Harten, note 11 above.

<sup>&</sup>lt;sup>42</sup> Van Harten, note 11 above.

margin of appreciation standard in interpretation of BITs and creating an appellate structure at ICSID.<sup>43</sup> Another suggestion is to create a standing international investment court.<sup>44</sup>

In the section that follows, the strengths and weaknesses of each solutions are discussed.

## 1.1 Consolidation of related disputes

Christina Knahr proposes consolidation of related proceedings as a means of curbing inconsistent decisions in ISA.<sup>45</sup> She argues that in order to avoid duplication of proceedings and conflicting outcomes, parties should consolidate related proceedings which have a common question of fact or law for the purposes of minimizing costs but also avoiding inconsistent decisions. August Reinisch and Crivellaro also support this suggestion.<sup>46</sup> They submit that big nations including the US Model BITs provides for consolidation of related proceedings.<sup>47</sup> The US Model BIT spirit has been reflected in the recent US - Rwanda BIT.48 They further submit that Canadian Model BIT also provides for consolidation.<sup>49</sup> The Canadian Model BIT spirit on consolidation is reflected in the Canada -Tanzania BIT which came into force on 09 December 2013.50 Article 27 of Canada - Tanzania BIT empowers the tribunal to consolidate related disputes where it is of the view that there are similar questions of law or fact involved.<sup>51</sup> Consolidation is also provided for and has been applied under NAFTA Chapter 11.52

## 1.1.1 Strength

http://www.international.gc.ca/trade-agreements-accordscommerciaux/agr-acc/fipa-apie/tanzania-text-

<sup>52</sup> Knahr C, note 45 above at 4.

Reinisch argues that if consolidation is done properly, it can provide very effective remedies against inconsistent decisions.<sup>53</sup> For example, it is submitted that had the *Lauder* and *CME* cases been consolidated, the problem of inconsistency would have been allayed.<sup>54</sup>

## 1.1.2 Weaknesses

It should be borne in mind that while consolidation addresses the problem of inconsistency properly, there are currently very few BITs which provides for consolidation of proceedings. Most of the existing BITs do not have a provision for consolidation of related proceedings.<sup>55</sup> Therefore even where the Tribunal desires to consolidate, it may not succeed where the BIT and the rules concerned do not mandate it to do so.

In addition, it may also happen that consolidation becomes more expensive than dealing with separate claim especially when the cases were in different stages before the formation of the consolidation Tribunal. In *Canfor Corp. v. United States*<sup>56</sup> it was held that consolidation should not be ordered where the cost of consolidation becomes 'excessive'.<sup>57</sup> Therefore, while consolidating the disputes can be beneficial to one party; it might as well be disadvantageous to the other party hence inefficient and unfair.<sup>58</sup>

It is further submitted here that consolidation cannot be a panacea to all problems relating to inconsistency in international investment dispute settlement system as it only applies to same treaty disputes. Under the current system with 2850 BITs and 350 IIAs,<sup>59</sup> consolidation will only cure a small portion of the problems.

http://unctad.org/sections/dite/iia/docs/bits/south

<u>africa\_zimbabwe.pdf</u>. see also An Agreement between the Government of the Kingdom of Sweden and the Government of the United Republic of Tanzania for the Promotion and Protection of Investment 01/09/1999 available at

<u>http://unctad.org/sections/dite/iia/docs/bits/tanzania\_sweden.pdf;</u> (hereinafter Tanzania –Sweden BIT); see also the Agreement between the Government of United Republic of Tanzania and the Government of Italian Republic on the Promotion and Protection of Investment of 21/08/2001 (hereinafter Tanzania – Italy BIT) available at

<u>http://unctad.org/sections/dite/iia/docs/bits/tanzania\_italy.pdf</u> and the Agreement between the Government of United Republic of Tanzania and the Government of Republic of Finland on the Promotion and Protection of Investment of 19/06/2001 (hereinafter Tanzania - Finland BIT) available at

http://unctad.org/sections/dite/iia/docs/bits/tanzania\_finland.pdf.

All these BITs have no provision for consolidation of proceedings. <sup>56</sup> Canfor Corp v United States, Tembec et al v United States, and Terminal Forest Products Ltd. v United States, Order of the Consolidation Tribunal, 7 September 2005, available at

http://naftaclaims.com/Disputes/USA/Softwood/Softw

ood-ConOrder.pdf.

<sup>58</sup> Knahr C, note 45 above at 11.

<sup>&</sup>lt;sup>43</sup> See note 11 above.

<sup>&</sup>lt;sup>44</sup> UNCTAD 'Reform of Investor-State Dispute Settlement: In Search of a Roadmap' IIA Issue Note No. 2, June

<sup>2013</sup> at 1.

<sup>&</sup>lt;sup>45</sup> Knahr C 'Consolidation of Proceedings in International Investment Arbitration' in Knahr C et al (eds.) *Investment and Commercial Arbitration – Similarities and Divergences* (2010) 1-19 at 2.

<sup>&</sup>lt;sup>46</sup> Reinisch A 'The proliferation of international Dispute Settlement Mechanisms: The threat of fragmentation vs. The promise of more effective system? Some reflections from the perspective of investment arbitration' in Buffard J et al (eds.) *International Law Between Universalism and Fragmentation* (2008)107 – 126; See also Crivellaro A 'Consolidation of Arbitral and Court Proceedings in Investment Disputes' (2005) *4 Law & Practice of International Courts & Tribunals 371 at 371.* 

<sup>&</sup>lt;sup>47</sup>The Office of the U.S. Trade Representative, note 19 above.

 $<sup>^{48}</sup>$  See for example Article 33 of the US – Rwanda BIT, 2008 which came in force 2012 available at

<sup>&</sup>lt;u>http://tcc.export.gov/Trade\_Agreements/All\_Trade\_Agreements/</u> <u>pdf-agreements/RwandaBIT.pdf</u> accessed on 19/05/2014.

<sup>&</sup>lt;sup>49</sup>The Department of Foreign Affairs and International Trade *Canada's Model Foreign Investment Protection Agreement*, 2004 Art. 32(2) (hereinafter Canada Model BIT) available at

http://www.italaw.com/documents/Canadian2004-FIPA-model-en.pdf accessed on 20/01/2014.

<sup>&</sup>lt;sup>50</sup> See the Agreement between the Government of Canada and the Government of the United Republic of Tanzania for the Promotion and Reciprocal Protection of Investments available at *http://www.international.gc.ca/trade-*

agreements-accords-commerciaux/agr-acc/fipa-apie/tanzania-

text-tanzanie.aspx?lang=eng accessed on 19/05/2014.

<sup>&</sup>lt;sup>51</sup> See Article 27 of the Agreement between the Government of Canada and the Government of the United Republic of Tanzania for the Promotion and Reciprocal Protection of Investments available at

tanzanie.aspx?lang=eng accessed on 19/05/2014.

<sup>&</sup>lt;sup>53</sup> Reinisch A, note 46 above at 912.

<sup>&</sup>lt;sup>54</sup> Lauder v The Czech Republic, 9 ICSID Reports 66 award of 03/09/ 2001 and CME Czech Republic BV v The Czech Republic 9 ICSID Reports Partial Award of 13/09/ 2001 respectively.

<sup>&</sup>lt;sup>55</sup> See for example the Agreement between the Government of the Republic of South Africa and the Government of the Republic of Zimbabwe for the Promotion and Reciprocal Protection of Investments of 27/11/2009 (hereinafter South Africa – Zimbabwe BIT) available at

<sup>&</sup>lt;sup>7</sup> Canfor Corp v United States.

<sup>&</sup>lt;sup>59</sup> See the UNCTAD World Investment Report 2013 'Towards a New Generation of Investment Policies' at 4 available at

Another notable weakness is that consolidation can only be a useful tool where all disputes are settled under one institution hence the possibility of relating the disputes in question. Under the current system, consolidation of proceedings at ICSID will not help to bring consistency if there is a similar case but adjudicated at LCIA or ICC under the UNCITRAL Rules.

Therefore, it can be concluded here that, although consolidation can be a useful tool for disputes emanating from the same treaty, it will do very little to solve the inconsistency problem in the present situation where there are about three thousands autonomous BITs which have no consolidation provision. Worse enough, the ICSID and UNCITRAL Rules are also silent on the matter. Unless the rules are amended to that end consolidation stand a small chance of curbing inconsistency in investor – state arbitration system.

# 1.2 Effective application of res judicata and lis pendens principles

Another suggested solution is the application of the principles of res judicata and lis pendens.<sup>60</sup> Res judicata means that the matter has already been determined by another competent body hence it cannot be adjudicated upon again while lis pendens means that the matter is being adjudicated in another competent court.<sup>61</sup> In order to apply these two principles it must be proved that the matters before the two courts are the same and involve same parties. Res judicata and lis pendens are very useful and are frequently applied in many countries in civil litigation and they help a lot to avoid parallel proceedings and inconsistent results.<sup>62</sup>

## 1.2.1 Strengths

The principle of res judicata aims to serve three purposes. At first, it aims at bringing to an end of a legal dispute. It is used to ensure that no defendant is tried twice on the same case. Secondly, the rule intends to serve judicial economic interest as it aims at preventing relitigation of a previously decided case. Thirdly, the rule aims at ensuring legal certainty by preventing the possibility of having divergent conclusions on cases of the same nature and facts.<sup>63</sup>

Lis pendens, on the other hand, aims at barring initiation of a new proceeding where there is another proceeding pending in another competent court involving same parties and same subject matter. The principle serves or aims at achieving the same goals as res judicata. It aims to bring judicial economy by preventing costly parallel proceedings and ensuring legal certainty by avoiding parallel conflicting decisions.

## 1.2.2 Weaknesses

While the arguments put forward in favour of res judicata and lis pendens are to a large extent, overwhelmingly convincing, there are a number of obstacle in its way. The preconditions for the applicability of res judicata and les pendens pose a great challenge for the two principles to be applied successfully in investor - state arbitration. The first challenge is that the two principles require that both the parties and the subject matter be the same in both proceedings and the dispute has to arise in the same legal setting. In investor - state dispute these requirements may not be easily met as most of the time Corporations and shareholders are considered different legal entities hence capable of suing on their own names. In addition, at times Corporations forms subsidiary companies to operate in the respondent state country and such companies can sue or be sued without necessarily involving the parent corporation. Furthermore, different disputes could be filed in different legal settings each with autonomous jurisdiction. This could be the case where one dispute is filed in the local court while the other at an international adjudicative body. Neither body between the two will have the mandate in the circumstances to order res judicata or lis pendens over the other.

Therefore, while the subject matter could be the same, the disputes may fail to meet the res judicata and lis pendens requirements due to the lack of same or identical parties to the dispute. These scenarios can be well elaborated by the previously discussed cases CME V Czech Republic and Lauder v Czech Republic.<sup>64</sup> In CME V Czech Republic and Lauder v Czech *Republic* the facts and the respondent state were the same except that the claimants were different. In the former Mr. Lauder sued Czech Republic through a company he controlled while in the later he sued the same Respondent State in his own capacity as an investor in the Czech Republic. Furthermore, there is the possibility of multiple arbitrations and local court proceedings in parallel with different seats, different institutional or ad hoc rules, different substantive and procedural laws and identical parties. In the Lauder cases, there were parallel arbitration proceedings running under UNCITRAL Rules, at the same time there was another arbitration proceeding filed under ICC Rules and other numerous court cases in the Czech Republic courts and one in the US pertaining almost the same dispute.65 The principles of res judicata and lis pendens could not be applied because the disputes emanated from different autonomous legal settings as well as different parties.<sup>66</sup> A dispute at ICSID is not a bar to another dispute under the UNCITRAL Rules or even other proceedings in a local court. Under this scenario multiple inconsistent awards may be rendered and multiple enforcement proceedings may take place.

Another possible hindrance to the application of the two principles could be the difficulty of establishing same cause of action. Investors could have different available remedies against host states, one under the contract entered with the state authorities and another under the applicable BIT. Nothing prevents both the contract and the treaty claims to be brought simultaneously by the same investor, in different proceedings and forums.<sup>67</sup> In *Biwater Gauff v Tanzania*<sup>68</sup> a British-German

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http://unctad.org/en/PublicationsLibrary/webdiaepcb2013d3\_en. pdf\_accessed on 23/07/2013.

 $<sup>^{60}</sup>$  See Reinisch A, note 11 above at 912.

<sup>&</sup>lt;sup>61</sup> Reinisch A 'The use and limits of *res judicata* and *lis pendens* as procedural tools to avoid conflicting dispute settlement outcomes' (2004) *3 Law & Practice of International Courts & Tribunals* 37 at 43.

<sup>&</sup>lt;sup>62</sup> Knahr C, note 45 above at 4.

<sup>&</sup>lt;sup>63</sup> Reinisch A, note 61 above, at 43.

<sup>&</sup>lt;sup>64</sup> Lauder and CME, note 54 above.

<sup>&</sup>lt;sup>65</sup> See *Lauder*, note 54 above at para 143.

<sup>&</sup>lt;sup>66</sup> Reinisch A, note 60 above at 52.

<sup>&</sup>lt;sup>67</sup> Cremades BM and Madalena I 'Parallel Proceedings in International

Arbitration, (2008) 24 Arbitration International 509.

joint venture Biwater Gauff Tanzania (hereinafter "BGT") won a bid from the World Bank to renovate and upgrade the water system in the city of Dar es Salaam Tanzania.<sup>69</sup> The firm miscalculated the cost for the project when bidding. After 18 months the firm was in deep financial difficulties caused by the miscalculation. The water supply services in Dar es Salaam deteriorated as a result. The government of Tanzania decided to take charge of the management and the supply of water in the city.<sup>70</sup> BGT was aggrieved by the government move and decided to institute a claim at ICSID pursuant to the Tanzania - UK BIT alleging breach on expropriation, fair and equitable treatment, full protection and security, discrimination and unrestricted transfer of capital guarantees.<sup>71</sup> BGT also, through its subsidiary company incorporated under Tanzanian Law, DAWASCO, initiated a parallel proceeding under UNCITRAL Rules before a separate tribunal and alleged Tanzania breached its obligations under the project contract.<sup> $\bar{7}2$ </sup>

That is to say, there were two proceedings concurrently running against the same respondent in relation to the same dispute. In December 2007, that tribunal under UNCITRAL Arbitration Rules rejected BGT's claim and instead awarded 3 million Pounds to Tanzania.<sup>73</sup> A year later the ICSID tribunal also rendered its decision. While no compensation was awarded in the end the arbitrators held Tanzania liable for breaching the BIT but awarded no damages to the claimant. This shows that under the current investor - state dispute system multiple inconsistent awards could be rendered and multiple enforcement proceedings by the same claimant against the same respondent can also occur. This only occurred because there were two different cause of action; rights accruing from the contract and the other accruing from the BIT. It can be said that the parties were different. Therefore under the strict application of the principles of res judicata and lis pendens, these two cases cannot qualify for the defenses.

It can be concluded that with such multiple nationalities of individual investors and corporations the principle of res judicata and lis pendens will hardly find room of application in investor state arbitration.

### 1.3 Use of Mediation/Conciliation Techniques

This is another suggestion which has received attention and could be vital in enhancing the legitimacy of the investor – state system. The ICSID system provides for two alternate mechanisms for settlement of investor – state disputes.<sup>74</sup> The dispute can be settled by way of conciliation or arbitration.<sup>75</sup> Currently, conciliation is almost redundant in investor - state dispute settlement. For the last twenty years only 7 cases have

<sup>73</sup> Biwater Gauff, as above note 68, para 477.

been resolved through conciliation.<sup>76</sup> It is argued that the redundancy is caused by the fact that the mechanism lacks mandatory force and is mostly considered informal.<sup>77</sup> Mediation and conciliation are normally used interchangeably and they both mean a dispute resolution technique under which the mediator/conciliator attempts to bring the parties to agreement using many different styles and techniques to facilitate settlement.<sup>78</sup> In mediation or conciliation, the mediator's role is to bring the parties to their own agreed decision. In many jurisdictions today, mediation precedes any litigation or arbitration. It is only when the parties are unable to settle their dispute through mediation that the matter is referred to the court for litigation.

UNCTAD in 2009 considered the use of Mediation and Conciliation as an alternative in resolving investor - state disputes.<sup>79</sup> The Report suggests that with the surge of investor – state claims annually, mediation may be used a tool to reduce such a rapid increase of claims. It is further argued that the longevity of arbitration disputes which leads to costly inconsistent awards may be avoided if the parties turn to mediation instead.<sup>80</sup>

In a 2010 Joint Symposium on Investment and Alternative Dispute Resolution organised by UNCTAD and Washington and Lee University School of Law stakeholders discussed the ways in which ADR could help to improve the investor - state legitimacy. The symposium resulted in the UNCTAD ADR Resolution.<sup>81</sup>

http://www.google.co.za/url?sa=t&rct=j&q=&esrc=s &source=web&cd=1&ved=0CCUOFiAA&url=http% 3A%2F%2Fwww.sussmanadr.com%2Fdocs%2FFord ham%2520Investor%2520state%2520mediation%252 0-

%2520pros%2520%26%2520cons%2520as%2520sen t%2520in%25209-4-

09.doc&ei=HNsdU9080u2X7QbNq4G4Cw&usg=A FOjCNHS89xsEukJCvlO2Y0RYPvh6UOUOO&bvm= bv.62578216, d.ZGU accessed on 10/03/2014.

<sup>68</sup> Biwater Gauff (Tanzania) Ltd v United Republic of Tanzania Final Award of 24<sup>th</sup> July 2008 available at

http://icsid.worldbank.org/ICSID/FrontServlet?requestType=CasesRH&actionVa l=showDoc&docId=DC770\_En&caseId=C67.

<sup>&</sup>lt;sup>69</sup> See *Biwater Gauff*, as above, para 3.

<sup>&</sup>lt;sup>70</sup>Biwater Gauff, as above note 68, para 15

<sup>&</sup>lt;sup>71</sup> Biwater Gauff, as above note 68, para 205. <sup>72</sup> Biwater Gauff, as above note 68, para 476.

<sup>&</sup>lt;sup>74</sup> See the ICSID Convention, above note 1 Article 1(2).

 $<sup>^{75}</sup>$  Articles 28 – 35 of the Convention provides for conciliation proceedings while Article 36 - 55 provide for arbitration proceedings.

<sup>&</sup>lt;sup>76</sup> Between 1982 and 2011 see the Background Information on the ICSID, available at

https://icsid.worldbank.org/ICSID/FrontServlet?requestType=IC SIDDocRH&actionVal=ShowDocument&icsidOverview=true&l anguage=English accessed on 11/07/2013.

<sup>&</sup>lt;sup>77</sup> UNCTAD Dispute Settlement - International Centre for Settlement of Investment Disputes: selecting the Appropriate Forum 2003 UNCTAD/EDM/Misc. 232/Add. 1 at 13.

<sup>&</sup>lt;sup>78</sup> Sussman E 'Investor State Dispute Mediation: The Benefits and Obstacles' The Fordham Papers 2009 available at

<sup>&</sup>lt;sup>79</sup> United Nations Conference on Trade and Development, Latest Developments in Investor-State Dispute

Settlement, IIA Issues Note n. 1 (2010) ("UNCTAD Latest Developments 2010") at 1 available at http://unctad.org/en/docs/diaeia200911 en.pdf accessed on 10/03/2014.

<sup>&</sup>lt;sup>80</sup> Salacuse JW 'Is There A Better Way? Alternative Methods of Treaty-Based, Investor State Dispute Resolution' (2007) 31 Fordham International Law Journal 138.

<sup>&</sup>lt;sup>81</sup>UNCTAD 'Exploring Alternatives to Investment Treaty Arbitration and the Prevention of Investor-State Disputes' UNCTAD Series on International Investment Policies for Development United Nations, 2010 available at

#### 1.3.1 Strengths

A number of advantages exist in mediation over arbitration and litigation. The first advantage is that mediation is speedier than litigation and arbitration as can hardly take a year before the parties reach an agreement.<sup>82</sup> Another advantage associated with mediation is that it costs less when compared with arbitration or litigation. Recent research indicates that the investor – state arbitration system is so expensive.<sup>83</sup> Argentina is currently faced with awards which run over USD 430 million and pending claims to the tune of 65 billion USD.<sup>84</sup> The amount claimed against Russia by the three majority shareholders of the former Yukos Oil Company in the ongoing arbitration proceedings is USD 114 billion.<sup>85</sup> It is submitted that mediation proceedings would not lead to such costs as the parties resolve the dispute amicably and within a short time frame agreed by the parties themselves.

The third advantage is that the dispute under mediation ends amicably as the parties engages the mediator as a facilitator of the discussion and not an adjudicator. The parties, in other words, control the resolution of their dispute as a result they leave the negotiation sessions as friends and not antagonists as it would turn out in arbitration proceedings. Therefore considering the fact that the parties in investor – state disputes normally need each other to ensure the project ends well, with future re engagement, mediation serve both parties interests and their relationship may even improve due to the parties 'engagement in the mediation process.

#### 1.3.2 Weaknesses

Just like the previously discussed solutions, mediation also has flaws. The first practical issue is that normally parties go for arbitration after trying to resolve the dispute with the host state in

http://investmentadr.wlu.edu/deptimages/UNCTAD/UNCTADAlt ernativesArbitrationAdvancedDraft.PDF <sup>82</sup> Coe JJ Jr 'Settlement of Investor-State Disputes through Mediation: Preliminary Remarks on Processes,

<u>http://unctad.org/en/Pages/DIAE/World%20Investme</u> <u>nt%20Report/WIR2012\_WebFlyer.aspx</u> accessed on 14/08/2013.

http://www.iareporter.com/articles/20110201\_9 accessed on 05/10/2013; see also Merco Press 'Argentina Faces 65 billion dollars in

claim: plans to abandon international litigation court' 28<sup>th</sup> November 2012

available at <u>http://en.mercopress.com/2012/11/28/argentina-faces-65bn-dollars-in-claims-plans-to-abandon-international-</u> litigations-court accessed on 08/10/2013. amicable ways and when those amicable ways have failed. Therefore mediation or negotiations as many BITs requires ought to have been exhausted and proved futile before an investor approaches the ICSID. Therefore asking the parties to go for mediation would seem like a waste of time.<sup>86</sup>

Another flaw is that mediation, as a technique, is based on the principle of confidentiality of the proceedings. The modern approach in resolving investor – state dispute is to resolve the dispute in a transparent manner which allows the citizens and other interested parties to fully participate in the adjudication of public interest disputes. Therefore mediation can be seen, by today's standards, as obsolete in resolving public interest disputes.

Lastly is that mediation does not result into a final award or decision which binds the parties. Therefore it becomes difficult for either party to enforce what is agreed in mediation. In other words, mediation does not always resolve the dispute once and for all. That may attract the unscrupulous party to resist the resolution after time and resources have been spent on mediation.

## 1.4 Margin of appreciation standard in the interpretation of bilateral Investment treaties

It is contended by some that narrow scope in interpretation of treaty provisions which is based on commercial law principles is another hurdle in developing a stable international investment law regime.<sup>87</sup> It is submitted further that despite the fact that much broader variety of regulatory matters are adjudicated by the investor - state Tribunals, the line of reasoning is still based on law of contract principles.<sup>88</sup> It is therefore argued that there is a need of adopting a new standard of reasoning grounded in public law rather than private contract law.

It is on the basis of these grounds that the recommendations are made to change the way of thinking of investor – state arbitrators. The standard of review suggested is the margin of appreciation standard which has been developed in the international human rights sphere.<sup>89</sup> Margin of appreciation is a deference the court is willing to grant to the national decision makers and recognizes that the normative requirement articulated in the convention text can often be legitimately met by a range of different measures that may strike different but still normative acceptable balance between individual rights and government interests.<sup>90</sup> The margin also recognizes that some state measures against any international convention obligation are justifiable to protect national interests such as security, public health, public morals and order.

#### 1.4.1 Strength

In applying the margin, the respective court show the proper degree of respect for the objectives that contracting state parties may wish to pursue, and the trade-offs that it wants to make while at the same time preventing unnecessary restrictions on the

Problems and Prospects' in Bishop RD (ed.) Enforcement of Arbitral Awards Against Sovereigns (2009) at Chap. 4

<sup>&</sup>lt;sup>83</sup> See Jagusch S & Sullivan J 'A Comparison of ICSID and UNCITRAL Arbitration: Areas of Divergence and Concern' in Waibel M et al (eds.) *The Backlash against Investment Arbitration: Perception and Reality* (2010) 79 – 110; see also Coe JJ 'Toward a Complementary Use of Conciliation in Investor-State Disputes—A Preliminary Sketch' (2005) *University College of Davis Journal of International Law and Policy* 7 at 10; see also United Nations Conference on Trade and Development (UNCTAD) *World Investment Report* (WIR) (2012) at 88 available at

<sup>&</sup>lt;sup>84</sup> See UNCTAD World Investment Report 2012 at 87; see also Peterson LE 'Argentina by Numbers: Where Things Stands with Investment Treaty Claims Arising out of the Argentina Financial Crisis' available at

<sup>&</sup>lt;sup>85</sup> See Hulley Enterprises Limited (Cyprus) v The Russian Federation, PCA Case No AA 226; Yukos Universal Limited (Isle of Man) v The Russian Federation, PCA Case No AA 227; Veteran Petroleum Limited (Cyprus) v The Russian Federation, PCA Case No AA 228.

<sup>&</sup>lt;sup>86</sup> Salacuse J, above note 80 at 141.

<sup>&</sup>lt;sup>87</sup> Burke White W & Von Staden A 'The Need for Public Law Standards of Review in Investor –State Arbitration' in *Stephan Schill International Investment Law and Comparative Public Law* 2010, 689 at 695.

<sup>&</sup>lt;sup>88</sup> Harten G V *Investment Treaty Arbitration and Public Law* (2007) at 124.

<sup>&</sup>lt;sup>89</sup> Burke White W & Von Staden A , above note 87 at 696.

<sup>&</sup>lt;sup>90</sup> Choudhury B 'Recapturing Public Power: Is Investment Arbitration's Engagement of the Public Interest contributing to the Democratic Deficit?' (2008) 41 Van J Tran L 775 at 823.

fullness of the protection which the BIT can provide.<sup>91</sup> According to this standard, state' identification of a legitimate aim in pursuit of social and economic policies is rarely reviewed and the burden of proof showing that an initiative does not pursue a legitimate aim falls upon the applicant.<sup>92</sup> The scope of the margin to be accorded to the state authority depends on the extent to which the measure intends to address the public interest at issue. The Court in so doing acknowledges the fact that state authorities because of their closer proximity to social reality are better placed to know what constitutes public interest.<sup>93</sup>

### 1.4.2 Weaknesses

While the adoption of this solution would help to a large extent to widen the reasoning and create a balance between the public interests and the private investor interests in investor – state disputes, still there are obstacles in making this option successful.

The first obstacle could be the fact that the current rules of ICSID, UNCITRAL SCC and the rest provide for party appointed tribunals. With the current rules in place, the margin of appreciation principle cannot be consistently applied as some of the presiding arbitrators are not aware of the principles requirement as they do not have a public law background. ICSID, for example, maintains a list of potential arbitrators who to a large extent have the contract law background. A recent report reveals that only 40% of the current arbitrators in the ICSID roster have public law background and the remaining 60% comprises of lawyers with commercial law background.<sup>54</sup> The report further reveals that 12 arbitrators have been repeatedly appearing in over 60% of all ICSID cases. This is to say the ICSID jurisprudence is dominated by few selected arbitrators with contract law background. In addition, the study indicates that 50% of arbitrators on the current ICSID roster have appeared as counsel for investors elsewhere.<sup>95</sup> This signifies that there is, to a large extent, a rotation of same contract law reasoning in the current investor - state arbitration. With the current dominance of commercial law Arbitrators, the margin of appreciation principle will hardly find a way to prosper.

## 1.5 The establishment of an appellate court under the International Centre for Settlement of Investment Disputes

There is yet another suggestion of introducing an appellate facility under the ICSID Convention.<sup>96</sup> Advocates for this argue

estmentagreements/50291642.pdf at 44; see also Schneiderman D 'Judicial Politics and International Investment Arbitration: Seeking an Explanation for Conflicting Outcome' available at that in order to avoid the requirement of creating a new convention, the appellate body can be established under the ICSID Appeals Facility Rules which can be easily adopted by the Administrative Council of ICSID without the requirement of approval from all member states.<sup>97</sup>

The ICSID Secretariat in 2004 circulated a Discussion Paper to stakeholders seeking opinion on how best the appellate structure could be introduced under the ICSID Convention.<sup>98</sup> The Discussion Paper acknowledged the fact that there are inconsistent decisions existing in parallel and that the development of international investment law is jeopardized by such inconsistencies. While acknowledging the existence of inconsistency, the Secretariat was of the opinion that inconsistency was not the general feature of ICSID jurisprudence but the exception.<sup>99</sup> The Secretariat was skeptical about the introduction of an appellate structure. It opined that introducing the structure might affect more the legitimacy of the system as appellate structure may cause delay and interfere with the finality of the award.

## 1.5.1 Strength

The fact that ICSID constitute over 61% of all ISA dispute, speak volume about the viability of this suggestion. An appellate structure would therefore eliminate 61% of inconsistency issues in ISA. Proponents further argue that in order to maintain finality of proceedings, which is the key concept at ICSID; time limits could be stipulated within which the appellate body has to deliver its decisions.<sup>100</sup>

## 1.5.2 Weaknesses

It is submitted here that establishing the Appellate structure under the ICSID without incorporating other institutions involved in the investor - state adjudication system will do very little in solving the problem of inconsistency of decisions. Currently the arbitrations conducted under the UNCITRAL Rules, SCC or ICC has no connection with ICSID. The UNCTAD 2013 World Investment Report indicates that ICSID constitute 61% of all investor - state disputes while UNCITRAL constitutes 26% and others the remaining 13%.<sup>101</sup> Therefore even after the formation of such a structure at ICSID 39% of investor - state disputes will be left out and these other institutions will still have the autonomy of rendering awards without necessarily subjecting them to the ICSID appellate body. Therefore while this proposal may benefit ICSID awards, it will do little to benefit the investor - state arbitration system as a whole.

<sup>&</sup>lt;sup>91</sup> Burke White W & Von Staden A, above note 87 at 305

<sup>&</sup>lt;sup>92</sup> Choudhury B , above note 90 at 823.

<sup>&</sup>lt;sup>93</sup> Burke White W & Von Staden A, above note 87 at 309.

<sup>&</sup>lt;sup>94</sup> Gaukrodger D and Gordon K 'Investor-state dispute settlement: A scoping paper for the investment policy community', OECD Working Papers on International Investment, No. 2012/3, (2012) OECD Investment Division at p. 44

available at <u>http://www.oecd.org/daf/internationalinvestment/internationalinv</u>

<sup>&</sup>lt;u>http://works.bepress.com/david\_schneiderman/1</u> accessed on 12/02/2014.

<sup>&</sup>lt;sup>95</sup> Gaukrodger D and Gordon K, above note 94 at p. 44; see also Commission J ' Precedent in Investment Arbitration: A Citation Analysis of Developing Jurisprudence'(2007) Journal of International Arbitration 129 – 58.
<sup>96</sup>See note 11 above.

 <sup>&</sup>lt;sup>97</sup> Gaiger R 'Multilateral Approach to Investment' in Alvarez J and Sauvant K (eds.) *The Evolving International Investment Regime* (2011) 153-173 at 170.
 <sup>98</sup> ICSID Discussion Paper on Possible improvements of the framework for ICSID arbitration (2004)

http://www.worldbank.org/icsid/highlights/improve-arb.htm accessed on 13/02/2014.

<sup>&</sup>lt;sup>99</sup> ICSID Discussion Paper on Possible improvements of the framework for ICSID arbitration (2004)

http://www.worldbank.org/icsid/highlights/improve-arb.htm accessed on 13/02/2014.

<sup>&</sup>lt;sup>100</sup> Gaiger R, above note 97 at 170.

<sup>&</sup>lt;sup>101</sup> See UNCTAD Latest Developments in Investor-State Dispute Settlement, [2013] IIA Monitor, No. 1, at 1–2, U.N.Doc UNCTAD/WEB/ITE/IIA/2013/3 available at <u>http://unctad.org/en/PublicationsLibrary/webdiaepcb2013d3\_en.pdf</u> accessed on 23/07/2013.

Creating an appellate system under ICSID will entail leaving out disputes settled outside the ICSID system. It is submitted therefore that this suggestion is not as unifying as it ought to be.

#### V. WAY FORWARD: ESTABLISHMENT OF THE PERMANENT INVESTMENT COURT

As seen above, several solutions have been considered by different stakeholders. It is undoubtedly clear that the solutions suggested are accompanied with obstacles or disadvantages which, as a result, overshadow the effectiveness of the respective solutions. In addition, the suggested solutions tend to address the issue of inconsistency but leave out other pertinent issues haunting ISA system. For the reasons stated herein below, this article proposes for the establishment of permanent court with permanent members which will be mandated to resolve all investor state disputes.

## 1.1 Advantages of Permanent Investment Court Structure

It is submitted here that one of the advantages of establishing the permanent court would be to reduce the litigation costs. Under the current investor - state adjudicative system the cost for litigating in one case is too high. The UNCTAD World Investment Report 2010 clearly state that the costs in investor state disputes have skyrocketed.<sup>102</sup> It is evidenced in research works that arbitrators' charges range from USD 350 - 700 per hour per arbitrator depending on the claimed dispute amount.<sup>103</sup> These exorbitant costs at times intimidate poor developing countries from litigating hence decides to give in to the foreign investor demands even where doing so interferes with its other policy objectives.<sup>104</sup> It is submitted here that with a permanent court structure presided by fully employed judges' costs for litigation will go down as the court members are normally paid by the establishing institution and not the parties. The WTO serves a good example on this. At panel and appellate stage the parties to the dispute are exonerated from paying costs for the Appellate Body presiding members. Article 8(11) and 17 (8) of the DSU respectively provides that 'the expenses of persons serving on the panel and Appellate Body, including travel and subsistence allowance, shall be met from the WTO budget in accordance with criteria to be adopted by the General Council, based on recommendations of the Committee on Budget, Finance and Administration'.  $^{105}\,$ 

Another advantage of the court system is the possibility of establishing a strict timeframe for settling disputes. A recent study indicates that at ICSID a dispute takes up to an average of 4-5 years.<sup>106</sup> In fact there are cases which have been dragging at ICSID for over 11 years. Antoine Goetz v. Burundi,<sup>107</sup> for example, was filed in December 2000 and ended in June 2012,<sup>108</sup>(over 11 years); EDF International S.A. v. Argentina<sup>109</sup> was filed in June 2003 and ended in June 2012 (over 9 years), just to mention a few. Again the WTO permanent system has addressed the issue of timeframe appropriately. The WTO DSU clearly provides for the timeframe within which the dispute is supposed to be resolved. Article 20 of the DSU clearly set out the timeframe of settling WTO disputes at a panel stage to be nine months where no appeal lies to the AB and 12 months where there was an appeal. This means that the dispute at Panel level takes nine months while at AB it takes three months.<sup>110</sup>

In addition to the above, the court structure will help to make the investor – state machinery sustainable.<sup>111</sup> It is only when the system provide clear principles which meets the expectations of its stakeholders that the system will be able to be trusted hence make itself sustainable. Lack of trust from stakeholders will ultimately lead to members' withdrawal from using it hence the collapse of the same. The current investor - state arbitration system is not sustainable because it is not consistent and lacks predictability. As a result, some members have already shown discomfort and have withdrawn or indicated they would do so.<sup>112</sup> The adoption of an appellate structure therefore, is expected to bring sustainability of the system as the structure will be mandated to bring about consistency.

Alongside this advantage, the court structure is expected to bring predictability as well.<sup>113</sup> The relevance of predictability

<sup>108</sup>See List of ICSID Cases, available at

https://icsid.worldbank.org/ICSID/FrontServlet?reque

<sup>&</sup>lt;sup>102</sup> See UNCTAD 'Investor – State Dispute: Prevention and Alternative to Arbitration' (2010) at 16-18 available at

<sup>&</sup>lt;u>http://www.unctad.org/en/docs/diaeia200911\_en.pdf</u> accessed on 05/10/2013. <sup>103</sup>International Centre for Settlement of Investment Disputes -ICSID) fees are set

<sup>&</sup>lt;sup>103</sup>International Centre for Settlement of Investment Disputes -ICSID) fees are set at US\$3000 a day

see <u>https://icsid.worldbank.org/ICSID/FrontServlet?requestType</u> =ICSIDDocRH&actionVal=ShowDocument&ScheduledFees=Tr ue&vear=2012&language=Englishaccessed on 05/10/2013.

<sup>&</sup>lt;sup>104</sup> See the Report of the SRSG, Business and Human Rights: *Towards Operationalizing the 'Protect, Respect and Remedy' Framework* A/HRC/11/13, para 30 (2009); See also, Report of the SRSG, Business and Human Rights: *Further Steps Towards the Operationalization of the 'Protect, Respect and Remedy' Framework* A/HRC/14/27, paras 20–23 (2010), the reports can be accessed at

<sup>&</sup>lt;u>http://www.ohchr.org/EN/Issues/Business/Pages/Reports.aspx</u> accessed on 9/03/2014.

<sup>&</sup>lt;sup>105</sup>See Article 8(11) and 17(8) of the WTO Dispute Settlement Understanding available at <u>http://www.wto.org/english/tratop\_e/dispu\_e/dsu\_e.htm</u> accessed on 24/03/2014.

 <sup>&</sup>lt;sup>106</sup> Raviv A 'Achieving a Faster ICSID' (2014) 11 *Transnational Dispute* Management at 4 available at <u>http://www.transnational-dispute-</u> management.com/article.asp?key=2066 accessed on 26/03/2014.
 <sup>107</sup> ICSID Case No ARB/01/2.

<sup>&</sup>lt;u>stType=Cases</u> accessed on 23/03/2014.

<sup>&</sup>lt;sup>109</sup> ICSID Case No ARB/03/23.

<sup>&</sup>lt;sup>110</sup> See Article 20 WTO Dispute Settlement Understanding available at <u>http://www.wto.org/english/tratop\_e/dispu\_e/dsu\_e.htm</u> accessed

on 24/03/2014. <sup>111</sup> Qureshi A 'An appellate system in international investment arbitration?' in Muchlinski P et al (eds.) *The Oxford Handbook of International Investment Law* (2008) at 1157

<sup>(2008)</sup> at 1157. <sup>112</sup> Bolivia, Ecuador, Venezuela and Australia have withdrawn from using the ICSID system. For more on this see also Peterson LE & Hepburn J ' Payment Round Up New Reporting on ICSID Award Debts of Kazakhstan, Kyrgyzstan and Bangladesh'(2011) *Investment Arbitration Reporter* available at

<sup>&</sup>lt;u>http://www.iareporter.com/articles/20111231</u>; see also Baldwin E 'Limits to Enforcement of ICSID Awards' (2006) 23 *Journal of International Arbitration* 1 at 7; see also Peterson LE 'Zimbabwe Not Paying ICSID Award' (2010) *Investment Arbitration Reporter* 

<sup>&</sup>lt;u>http://www.iareporter.com/articles/20100507\_5</u> accessed on 21/10/2013.

<sup>&</sup>lt;sup>113</sup> Qureshi A , above note 111 at 1157.

cannot be overlooked. First of all, predictability is crucial as it allows the parties to understand the permissible and nonpermissible acts hence capable of putting their houses in order when they deal with one another.<sup>114</sup> Secondly, predictability is important because it helps the parties to understand from the beginning as to whether they have a winnable case or not. This helps the parties to abstain from instituting frivolous claims hence save costs and time.

In furtherance of the above, it is also expected that an independent and impartial permanent appellate body will create a balanced structure in which all parties' interests will be given same weight and adjudicated impartially. In the current system where parties choose the arbitrators, evidence shows that each arbitrator tends to protect the interest of the appointing party.<sup>115</sup> A balanced adjudicative structure will be expected to take into account the host state other policy objectives hence enable a deference to the host state on human rights, environmental protection, labour rights and other social values.<sup>116</sup> It is hoped therefore that a permanent appellate structure which is not party based will create a stable and balanced jurisprudence in which government policy making space is protected and the foreign investors' interests are also taken into account. In line with the foregoing, it is also hoped that the permanent appellate structure which is not party - appointment based will help to increase objectivity in the system.

In conclusion it can be said that there are valid and strong reasons for the call of a new court to deal with international investment disputes. The court will help in achieving justice to all parties, consistency and predictability of the system and many other problems could be remedied by this move. While there some concerns about some negative impact of the new court, this work submits that upon weighing the pros and cons one will find that establishment of the court will be more beneficial than continuing to operate in the current setting. Careful consideration of the available options will be needed so as to create a stable and sustainable court.

### 1.2 Institution to Host the Courts

It is submitted here that UNCTAD as a UN affiliate with the mandate to organise the World Investment Forum, which brings

together major players from the international investment community to discuss challenges and opportunities and to promote investment policies and partnerships for sustainable development and equitable growth, is better positioned to initiate the MAI negotiations and host the MAI and the relevant courts.<sup>117</sup> The MAI and the Courts can be established and hosted at the Division of Investment and Enterprise of the UNCTAD. The Division is recognised as 'a global centre of excellence on issues related to investment and enterprise for sustainable development'.<sup>118</sup> The division also provides technical support to over 150 world economy. This research strongly advises that hosting the dispute settlement system should be considered as technical assistance to the international investment regime.<sup>119</sup>

#### 1.2.1 Phasing out investor- state arbitration

Once the court system is established, the current system will be allowed to phase out through the member states act of signing to the new MAI system. The MAI may remain silent on the matter leaving the Vienna Convention rules on successive Treaties to take its course.<sup>120</sup> Article 59 of the Vienna Convention on the Law of Treaties provides for circumstances under which a Treaty may come to an end. The Article provides as follows:

1. A treaty shall be considered as terminated if all the parties to it conclude a later treaty relating to the same subject matter and:

(a) it appears from the later treaty or is otherwise established that the parties intended that the matter should be governed by that treaty.

Therefore upon both member states signing to the new MAI and signifying their intention to terminate the BIT, Article 59 of the Vienna Convention could be invoked to terminate the BIT in favour of the MAI. It is submitted here that through such international practice, the new system will develop quickly.

Alternatively, the MAI may provide clearly that it replaces the BITs involving the respective member states. The Central America–Mexico FTA<sup>121</sup> provide a good example as it clearly provides that it replaces the FTAs between Mexico and Costa Rica (1994), Mexico and El Salvador, Guatemala and Honduras (2000), and Mexico and Nicaragua (1997).<sup>122</sup> As earlier stated, in Europe also, the coming into force of the Lisbon Treaty of the European Union in 2009, gives the European Commission the mandate to negotiate Investment agreements on behalf of all 27

http://unctad.org/en/pages/DIAE/DIAE.aspx accessed on 26/05/2014. <sup>120</sup> Vienna Convention on the Law of Treaties (1969), available at

http://untreaty.un.org/ilc/texts/instruments/english/conventions/1 1 1969.pdf accessed on 21/05/2014.

http://www.sice.oas.org/tpd/CACM\_MEX/CACM\_MEX\_e.asp accessed on 31/05/2014. <sup>122</sup> The Central America–Mexico FTA (2011) replaces the FTAs between Mexico

<sup>&</sup>lt;sup>114</sup> Franck S 'The Legitimacy Crisis in Investment Treaty Arbitration: Privatizing Public International Law Through Inconsistent Decisions' (2005) 73 Fordham Law Review 1521 at 1619.

<sup>&</sup>lt;sup>115</sup> See Paulsson J 'Moral Hazard in International Dispute Resolution' (2010) ICSID Review - Foreign Investment Law Journal 339; see also Van Harten G 'A Case for International Investment Court' Society of International Economic Law, available at <u>http://papers.ssrn.com/sol3/papers.cfm?abstract\_id=1153424</u> accessed on 06/09/2013.

<sup>&</sup>lt;sup>116</sup> See Van Harten G & Loughlin M 'Investment Treaty Arbitration as a Species of Global Administrative Law'(2006) *European Journal of International Law* 121 at 123; see also Spear S ' The Quest for Policy Space in a New Generation of International Investment Law'(2010) 13 *Journal of International Economic Law 1037* at 1038; see also Salacuse J 'Toward a Global Treaty on Foreign Investment: The Search for a Grand Bargain' in N. Horn (ed.), *Arbitrating Foreign Investment Disputes* (2004), at 68–70; see also Mann H 'The Right of State to Regulate and International Investment Law: A Comment' in UNCTAD *The Development Dimensions of FDI: Policy and Rule Making Perspective* 2003 at 216; see also Waelde T & Kolo A 'Environmental Regulation, Investment Protection and Regulatory Taking in International Law' (2004) *International Comparative Law Quarterly* 811 - 848 at 811; see also Kingsbury B 'Public Law Concepts to Balance Investors' Rights with State Regulatory Actions in the Public Interest—the Concept of Proportionality' in Schill S (ed.) *International Investment Law Cancelts Law and Comparative Public Law* (2010) 76 – 118.

<sup>&</sup>lt;sup>117</sup> UNCTAD about Us available at

<sup>&</sup>lt;u>http://unctad.org/en/Pages/AboutUs.aspx</u> accessed on 26/05/2014.

http://unctad.org/en/pages/DIAE/DIAE.aspx accessed on 26/05/2014.

<sup>&</sup>lt;sup>121</sup> The Central America–Mexico FTA 2011 available at

<sup>&</sup>lt;sup>122</sup> The Central America–Mexico FTA (2011) replaces the FTAs between Mexico and Costa Rica (1994), Mexico and El Salvador, Guatemala and Honduras (2000), and Mexico and Nicaragua (1997).

Member states.<sup>123</sup> This means that many BITs between individual EU countries will be replaced by common EU treaties hence tremendously cutting down the number of BITs.<sup>124</sup> The European Union Regulations 1219/2012 provides how the EU Member states BITs with third States will come to an end.<sup>125</sup> The Regulations, which entered into force on January 9, 2013, provide that the member states BITs with third states will remain in force until progressively replaced by an investment agreement between the European Union and the third State in question.<sup>126</sup> Therefore, the inclusion of such a provision in the MAI will not be an isolated incident. The MAI may have a similar provision directing that all BITs to which both parties are MAI member States shall automatically come to an end by parties signing to the MAI or shall be progressively replaced with the MAI when its lifespan comes to an end. After all, the good news is that many of the old BITs are coming to an end, member states to the MAI will be encouraged to phase out the old BITs and become members of the MAI court structured dispute settlement system.127

#### VI. CONCLUSION

This article has analysed the solutions suggested by different stakeholders. In addition the article has presented its own solution which is believed can curb almost all issues haunting ISA system. The Article has shown that while some of the suggested solutions carry greater weight than others, they all aim at improving the system. It should be noted from the discussion that under the fragmented BIT system none of the suggested solutions will work better than that of creating an independent international investment court. It is further submitted here that the creation of such a court will ensure consistency; predictability, independence and impartiality of adjudicators and increased transparency. As a result, the legitimacy of the whole system could be realized.

#### AUTHORS

**First Author** – Julius Cosmas, Lecturer in Law, Mzumbe University – Morogoro Tanzania, swigo2003@gmail.com

<sup>&</sup>lt;sup>123</sup> See Art. 207(4) of the Treaty on Functioning of the European Union (TFEU), available at <u>http://eur-lex.europa.eu/legal-</u>

<sup>&</sup>lt;u>content/BG/TXT/PDF/?uri=CELEX:12012E/TXT&from=EN</u> accessed on 02/06/2014. <sup>124</sup> UNCTAD World Investment Report 2012 'Towards a New Generation of

<sup>&</sup>lt;sup>124</sup> UNCTAD *World Investment Report* 2012 'Towards a New Generation of Investment Policies' at 84 available at

http://unctad.org/en/Pages/DIAE/World%20Investment%20Repo rt/WIR2012 WebFlyer.aspx accessed on 21/05/2014.

<sup>&</sup>lt;sup>125</sup> Regulation (EU) No. 1219/2012, OJ L 351/40, 20.12.2012 available at *http://eur-*

<sup>&</sup>lt;u>lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:351:0</u> 040:0046:En:PDF accessed on 02/06/2014.

<sup>&</sup>lt;sup>126</sup> See the EU Regulations Arts. 3 and 5 available at <u>http://eur-</u>

<sup>&</sup>lt;u>lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:351:0</u> 040:0046:En:PDF accessed on 02/06/2014.

<sup>&</sup>lt;sup>127</sup> The UNCTAD *WIR Report* 2013 indicates that 1300 BITs which constitutes 45% of all existing BITs came to an end in 2013, see UNCTAD World Investment Report 2013 *Global and regional investment trends*, available at <u>http://unctad.org/en/publicationslibrary/wir2013 en.pdf</u> accessed on 20/05/2014.

# Catalytic oxidation of polyphenol trihydroxybenzene by Pd-containing poly (vinyl alcohol)

## Ahmed I. Hanafy

Chemistry department, Faculty of Science, Taif University, Taif, Saudi Arabia. Permanent address: Chemistry department, Faculty of Science, Al-Azhar University, Cairo, Egypt

**Abstract-** Simple and environment friendly Pd-containing poly (vinyl alcohol) PVA catalysts were prepared by casting from their aqueous solutions. A series of PVA containing different ratios of Pd was characterized by IR, electronic spectroscopy, thermal analysis, XRD, Field-emission scanning electron microscopy (FE-SEM) and X-ray photoelectron spectroscopy (XPS). The binding of Pd to the polymer matrix and its effect on the polymer structure was studied by means of XRD, XPS and thermal analysis. The catalytic activity of the Pd-based catalysts towards the oxidation of polyphenol trihydroxy benzene was investigated and showed a significant catalytic activity in case of the polymer sample containing the lowest Pd concentration ( $A_1$ ). The oxidation mechanism was proposed. Kojic acid was used to inhibit the oxidation reaction and it has been observed to be a non competitive inhibitor.

*Index Terms*- polymer; inorganic compound; XRD; XPS; DTA; oxidation.

#### I. INTRODUCTION

Poly (vinyl alcohol) PVA is a polymer with exceptional properties such as water solubility, biodegradability, biocompatibility, non-toxicity and non-carcinogenity that possesses the capability to form hydrogels by chemical or physical methods [1–4]. PVA, as semicrystalline material, exhibits certain physical properties resulting from the crystalamorphous interfacial effect [5]. Moreover, it contains a carbon backbone with hydroxyl groups attached to methane carbons. These hydroxyl groups can be a source of hydrogen bonding, hence they assist in the formation of polymer blends [6]. PVA is well known for its wide range of potential applications in industrial, pharmaceutical, medical fields and continues to draw much attention of the researchers [7-9] due to the role of OH group and hydrogen bonds [10]. Its fields of applicability were widely broadened during the latest years due to the development of medicine, biomaterials, controlled drug release systems, environmental protection systems, new ecological systems for water purification and conductive systems for renewable energy sources, etc. [11–13]. During the latest years many research groups focused their attention on the study of PVA films or gels obtained by the simple addition of salts to the aqueous PVA solution. Very interesting properties have been obtained. Different additives are usually added to polymer in order to modify and improve its properties. Inorganic additives such as transition metal salts have a considerable effect on the optical and electrical properties of PVA polymer [14]. Palladium is one

of the most catalytically versatile transition metals, its complexes being efficient catalysts for a wide range of C C coupling, C H functionalization, and hydrocarbon oxidation reactions [15–17]. The vast majority of Pd-catalyzed reactions involve Pd<sup>0</sup> and Pd<sup>2+</sup> oxidation states and these transformations have been extensively investigated for the past several decades [16,18–21]. Pd-catalysts are widely employed both in academia and in industry, making Pd the most extensively used metal catalyst for the synthesis of a wide variety of organic compounds [22–24], including pharmaceuticals [25,26], heteroarenes [27] and natural products[28]. Palladium compounds are interesting catalysts in the field of catalytic oxidation which is widely used in a pollution control technology for removing organic compounds. Palladium has been used in the hydroxylation of benzene [29] and oxidation of alcohols [30], ketones [31] and phenol[32].

In this study, synthesis and characterization of simply prepared and environment friendly catalysts using the easily degradable PVA and a small amount of Pd ion were presented. These catalysts were used in the catalytic oxidation of polyphenol trihydroxy benzene with and without  $H_2O_2$  at room temperature.

#### II. EXPERIMENTAL SECTION

#### **2.1. Preparation of PVA-Pd samples**

1.0 gm of poly vinyl alcohol (PVA) was dissolved in about 50 ml dist. water with heating and continuous stirring. To the above solution the required amount of PdCl<sub>2</sub> was added dropwise with vigorous steering and heating at ~100 °C. The solution was poured to the Petri dish and put in the oven at 80 °C for ~ 8h to get the plastic sheet. The Petri dish was put over the water bath, so the plastic sheet was easily removed and it will be ready for usage. Four samples were prepared by this simple method; the pure polymer PVA (A<sub>0</sub>), polymer containing 0.005 wt.% Pd (A<sub>1</sub>), polymer containing 0.01 wt.% Pd (A<sub>2</sub>), polymer containing 0.05 wt.% (A<sub>3</sub>).

## 2.2.Physico-chemical characterizations

IR spectra for PVA and PVA-Pd samples were recorded in the solid state as KBr pellet on JASCOFTIR-600 Plus with a spectral resolution of 2 cm<sup>-1</sup> and accumula-tion of 100 scans at room temperature. X-ray diffraction (XRD) data of the samples were measured at room temperature by using a Philips diffractometer (type PW 3710). The patterns were run with Nifiltered copper radiation ( $\lambda = 1.5404$ Å) at 30 kV and 10 mA with a scanning speed of 20 = 2.5°/min. All electronic spectra and kinetic studies measurement were performed using Varian Cary 4 Bio UV/vis spectrophotometer. X-ray photoelectron spectroscopy (XPS) measurements were obtained on a KRATOS-AXIS 165 instrument equipped with dual aluminummagnesium anodes using MgK $\alpha$  radiation as the X-ray source at a power of 150 W (accelerating voltage 12 kV, current 6 mA) in a vacuum of 8.0 × 10<sup>-8</sup> mPa. Thermal analysis measurements (TGA, DTA) were recorded on a Shimadzu thermo-gravimetric analyzer model TGA-50H, using 20 mg samples. The flow rate of nitrogen gas and heating rate were 20 cm<sup>3</sup> min<sup>-1</sup> and 10°C min<sup>-1</sup>, respectively. Scanning electron micrographs of Pd-PVA composite films were obtained to study their morphology by an FE-SEM Quanta 200F.

# 2.3. Kinetic reactions for Trihydroxy-benzene (THB) oxidation

The catalytic activity of the PVA-Pd samples towards the homogeneous oxidation of trihydroxybenzene (THB) in aqueous medium at 25 °C was determined by measuring the initial rate of (THB) oxidation. The increase of the absorption at 420 nm ( $\varepsilon$  = 4583  $M^{-1}cm^{-1}$ ) due to the oxidation product [33] with time was obtained on a Varian Cary 3E spectrophotometer. A plot of the formation of the product with respect to time gives the initial rate. 150  $\mu$  M of the Pd incorporated in the polymer (A<sub>1</sub>) has been used in the oxidation of different concentrations of the substrate (0.2 - 6 mM) in presence of 100  $\mu$ M H<sub>2</sub>O<sub>2</sub> to study the effect of THB concentration on the reaction. The rate laws were determined and rate constants obtained. The auto-oxidation rate of THB was determined under the same conditions in the absence of  $A_1$ . Inhibitions were carried out in a similar fashion as the kinetic measurements using 150  $\mu$ M A<sub>1</sub> related to Pd<sup>2+</sup> in presence of 100 µM H<sub>2</sub>O<sub>2</sub> and different amounts of kogic acid and different concentrations of DMSO.

#### III. RESULTS AND DISCUSSION

Poly (vinyl alcohol) PVA can strongly bind with the transition metal ions because of the numerous surface hydroxyl functional groups. A series of PVA samples with different concentrations of palladium has been prepared to investigate the structure and catalytic activity of these prepared samples

## 3.1. Infrared spectroscopy of PVA and PVA-Pd samples

Infrared spectroscopy has been used to identify interactions in polymer chains and/or metal. The IR spectrum of the pure polymer PVA (A<sub>0</sub>) (Fig. 1) showed two bands at 3414 and 1427  $cm^{-1}$  corresponding to v OH and OH bending (in plane), respectively. The band appears at 1719 cm<sup>-1</sup> is corresponding to v C=O acetate groups remained in the PVA during its synthesis [34] by hydrolysis of the poly vinyl acetate. The spectrum also, showed band at 932 cm<sup>-1</sup> assigned to vC-O stretching. The band corresponding to methylene group (CH<sub>2</sub>) asymmetric stretching vibration was detected at about 2927 cm<sup>-1</sup>. By comparing the IR spectral data of the pure PVA polymer and its Pd-composites with different palladium ratios (Fig. 1), one can observe that the intensity of the band corresponding to carbonyl C=O is decreased and shifted to lower wavenumber in case of  $A_2$  and  $A_3$  by increasing the amount of Pd ion in the PVA polymeric matrix. This is an indication to the participation of carbonyl oxygen atom in the coordination of Pd to the polymeric matrix. At the same time the vOH band in the neat polymer PVA which appears at 3414 cm<sup>-1</sup> was shifted to (3422-3347 cm<sup>-1</sup>) in the Pd-polymers. The vOH band was found to be sharp in the pure polymer and

abroad in case of  $A_3$  which may be due to the existence of water molecule accompanied by a relatively large amount of palladium coordinated to the polymer. The assumption of Pd coordination to the polymeric matrix through carbonyl oxygen atom and OH alcoholic was supported by shifting of the in plane OH bending which appear at 1427 cm<sup>-1</sup> in the PVA spectrum to (1419-1412 cm<sup>-1</sup>) in the Pd-PVA samples.



Fig. 1. IR spectra of PVA and PVA-Pd samples

#### 3.2. XRD studies

In order to study the effect of Pd and its interaction to PVA with different ratios, wide-angle X-ray diffraction study was employed for all samples and the obtained patterns are presented in Fig.2. Generally, when the polymer contains crystalline domains, the diffraction peaks are sharp and their intensities are high whereas for amorphous polymer they are broad. From Fig.2, it is observed that the diffraction pattern of pure polymer PVA exhibits a typical peak at  $2\theta = 20^{\circ}$  which can be assigned to the mixture of (1 0 1) and (2 0 0) crystalline planes [35,36]. After the addition of Pd with different ratios to PVA, the intensity of this peak was increased in case of  $A_1$  then decreased gradually in case of  $A_2$  and  $A_3$  as can be seen from the XRD patterns. The crystallinity was high in case of pure PVA  $(A_0)$  due to the presence of hydroxyl groups in its side-chain. At the same time the crystallinity of  $A_1$  may be due to that the small amount of Pd doesn't affect extensively on the hydroxyl group side chain. However in cross linked the hydroxyl groups of PVA reacted with Pd molecules resulting in a decreased crystallinity and increased amorphous domains in cross linked Pd-PVA.

#### 3.3. Surface morphology

Field-emission scanning electron microscopy (FE-SEM) photographs of the surface morphology of the  $(A_1)$  which contains 0.005 wt.%Pd,  $(A_2)$  which contains 0.01 wt.%Pd and  $(A_3)$  which contains 0.05 wt.%Pd composites are shown in Fig. 3. The surface morphology of the  $A_1$  composite sample shows that the Pd particles in the range of 140 - 850 nm are dispersed in the surface of the polymeric matrix. The surface morphology of  $A_2$  and  $A_3$  which contain a larger amount of palladium ions than that contains in  $A_1$ , show a lot of large irregular palladium particles aggregates and are randomly distributed on the top surface of  $A_2$  and embedded in PVA matrix in case of  $A_3$ .



Fig. 2. XRD of the PVA and PVA-Pd samples



Fig.3. FE-SEM photograph of the surface morphology of PVA-Pd samples

#### **3.4.** Thermal analyses

The DTA thermogram of PVA and PVA-Pd composites (not shown) reflects the phase transition of polymer composite, where the glass transition temperature Tg, is an important parameter for identifying the amorphous or the semicrystalline solids. The DTA of pure polymer PVA illustrated two distinct endothermic phase transitions at 96 and 195 °C. These transitions are corresponding to glass and melting phase transitions, respectively. On the other hand the glass transition was not observed in case of  $A_1$ ,  $A_2$  and  $A_3$ . This result indicates that the presence of Pd doesn't lead to a decrease in the overall lamellar size of the PVA. However, the presence of Pd caused a decrease in the decomposition temperature from 253 °C in  $A_0$  to 180 °C, 165 °C and 80 °C in  $A_1$ ,  $A_2$  and  $A_3$ , respectively. This confirms a strong interaction between PVA and Pd. It is known that the crystalline nature of PVA results from the strong intermolecular interaction between PVA chains through the intermolecular hydrogen bonding [37]. Thus, it is possible that in our study the interactions between PVA chains and Pd particles led to the decrease of intermolecular interaction between E(38) as shown in XRD.

TG for the pure PVA polymer  $A_0$  and its Pd-polymers  $A_1$ , A<sub>2</sub> and A<sub>3</sub> (Fig. 4) shows inflection points within the range of 25-600 °C. The pure polymer shows four inflection stages. The first one in the rage of 56-114 °C with weight loss 4.6% is corresponding to the loss of adsorbed moisture and/or evaporation of the trapped water. The decomposition stages started with the second inflection stage at 253 °C with weight loss 59.4%. At the same time, the TG of the Pd-polymer samples shows two inflection stages. The first stage in the range of 65-120 °C with weight loss 2.6% and at the range of 78-149 oC with weight loss 4.3% for A<sub>1</sub> and A<sub>2</sub>, respectively, are corresponding to removal of adsorbed water. Moreover, the decomposition process in the Pd-polymer samples started with the second inflection stage in A1 at 180 °C with weight loss 81.6% and A2 at 165 °C with weight loss 70.9%. It is noticed that the thermal degradation of sample  $A_3$  started early with the first inflection point at 80 °C with weight loss 35.8% and finished at 460 °C. This may be due to destroying the network crossliking between the polymeric chains as a result of incorporation of more Pd in the polymeric matrix.



Fig. 4. TGA of PVA and PVA-Pd samples

**3.5. 3.5. X-ray photoelectron spectroscopy (XPS)** To obtain information about the structural features of the PVA-Pd catalysts, X-ray photoelectron spectroscopy (XPS) studies have been performed on the neat polymer PVA and its Pd-composites.

The C 1s, O 1s and Pd 3d core level spectra have been collected and analyzed. Fig. 5 shows the C1s binding energy of

PVA at 287.88 and 284.07 ev attributed to C=O [39,40] and single C-C, respectively, [41]. The C1s binding energy for  $A_1$ ,  $A_2$ and  $A_3$  shows no significant change in the B.E. corresponding to C-C, while the binding energy attributed to C=O appeared at higher B.E. (288.37-288.54) due to the participation of the carbonyl group in binding to Pd. XPS of  $A_2$  and  $A_3$  show shoulder at 286.06 and 286.02 e.v. attributed to C-O-Pd [41].



Fig. 5. C 1s XPS of PVA and PVA-Pd samples

The binding energy of O1s (Fig. 6) in the pure polymer  $A_0$  is 531.48, while the binding energy of O1s in the  $A_1$ ,  $A_2$  and  $A_3$  is shifted to higher B.E. (532.26-532.44). The results show that the lone-pair of electrons on oxygen atom transfers to palladium and the electron cloud density around oxygen atom decreases due to the participation of oxygen atom in the coordination to Pd atom.



Fig. 6. O 1s XPS of PVA and PVA-Pd samples

The Pd 3d spectrum of  $A_2$  (Fig.7) showed two peaks for the 3d5/2 and 3d3/2 components at binding energies of 335.59 and 340.69 eV, respectively. Such values for the binding energies indicate that the Pd in the  $A_2$  are exactly the same as those of zero-valence Pd species (Pd<sup>0</sup>) [42,43]. At the same time the Pd 3d spectrum for  $A_3$  (Fig.7) revealed the presence of palladium in a +2 oxidation state with binding energies 336.84 eV (3d5/2) and 342.08 eV (3d3/2).

#### 3.6. Electronic spectroscopy

The electronic spectra of the pure polymer PVA and its palladium composites (not shown) show a small peck at 270 nm attributed to  $n \rightarrow \pi^*$  for pure polymer  $A_0$ . This band is shifted to higher wavelength at 305 nm for  $A_1$ ,  $A_2$  and  $A_3$ . The spectra of PVA-Pd show a peak for Pd<sup>2+</sup> at around 423 nm, which results from ligand to metal charge transfer transition (LMCT).



#### 3.6. Catalytic reaction 3.6.1. Oxidation of trihydroxy benzene THB

Hydrogen peroxide constitutes a potentially green and environmentally friendly oxidant because it releases only water as a by-product. Thus, many efforts have been put into the research for ideal conditions for its use in oxidation reactions. In this study, the simply prepared and easily degradable Pd-PVA samples, with and without hydrogen peroxide, were used in an aqueous medium and at room temperature in the oxidation of polyphenol trihydroxybenzene. THB has been employed as a substrate to investigate the catalytic activity of the Pd-PVA samples towards the oxidation of polyphenol compound. The activities and reaction rates of the oxidation can be determined using electronic spectroscopy by following the appearance and increasing of the absorption maximum of the quinone. Prior to a detailed kinetic study, it is necessary to get an estimation of the ability of the pure polymer PVA  $(A_0)$  and its Pd-PVA samples towards the oxidation of THB. The pure polymer PVA showed a negligible observed rate towards the oxidation, while the A<sub>3</sub> showed a small observed rate of  $1.5 \times 10^{-5}$  mM/s. At the same time  $A_1$  and  $A_2$  showed the high observed rate of 0.016 and 0.13 mM/s respectively, as shown in the Fig. 8. These results revealed that  $A_1$  which contains the lowest concentration of palladium incorporated into the polymeric matrix showed the highest catalytic activity. To determine the dependence of the rates on the substrate concentration and study the catalytic activity of  $A_1$ and its interaction with H<sub>2</sub>O<sub>2</sub> towards the oxidation of 1,2,3trihydroxybenzene,  $A_1$  was treated with increasing amounts of THB. A first order dependence was observed at low concentrations of the substrate, whereas saturation kinetics was found at higher concentrations.



Fig. 8. Oxidation of THB using PVA and PVA-Pd samples in the presence of H<sub>2</sub>O<sub>2</sub> at 25 °C

The oxidation rates of THB by  $A_1$  containing 150 µM pd at different concentrations of THB (Fig. 9) were determined in the presence of 100 µM H<sub>2</sub>O<sub>2</sub>. The rate of THB oxidation is found to be nonlinear, reaching saturation at high THB concentrations. The oxidation reaction produces a first-order rate constant k = $0.316 \text{ s}^{-1}$  (t<sub>1/2</sub> = 2.2 s). The catalysis shows  $1.2 \times 10^5$  times rate enhancement in terms of the first-order rate constant ( $k/k_o$ , wherein  $k_o = 2.53 \times 10^{-6} \text{ s}^{-1}$  is the rate constant for the uncatalyzed reaction. The oxidation of THB in the absence of H<sub>2</sub>O<sub>2</sub> (Fig.9) showed the same trend as that has been showed in the oxidation of THB in the presence of H<sub>2</sub>O<sub>2</sub> with a first order rate constant  $k = 0.486 \text{ s}^{-1}$  (t<sub>1/2</sub> = 1.4 s)





3.6.2. Mechanism of oxidation of THB

The saturation pattern which has been observed during determination of the oxidation rates may suggest an enzyme-like pre-equilibrium kinetics. This kinetics can be described as the binding of THB with the catalyst  $A_1$  to form an intermediate THB- $A_1$  complex, followed by conversion of the bound substrate (THB) into products. On the other hand, the oxidation reaction may also follow free radical mechanism. To investigate the existence of free radical in the reaction mechanism, various concentrations of dimethyl sulfoxide (CH<sub>3</sub>)<sub>2</sub>SO have been used in the oxidation of 1.0 mM THB in presence of H<sub>2</sub>O<sub>2</sub> using  $A_1$  (Fig. 10). The free radical scavenger (CH<sub>3</sub>)<sub>2</sub>SO [44] was found to inhibit the oxidation reaction under the experimental conditions showing IC<sub>50</sub> = 11µL, suggesting the presence of free radical inducing the oxidation reaction of THB.



Fig. 10. Effect of DMSO on the oxidation of THB using  $A_1(\circ)$  in the absence of  $H_2O_2$  and (•)in the presence of  $H_2O_2$ .

As shown in scheme 1, THB is oxidized by Pd<sup>2+</sup> to semiquinone radical (A), then, by aerobic oxidation, the semiquinone radical was oxidized to the quinone structure and superoxide radical was produced (B). The superoxide radical reacts with the hydrogen atoms to form hydrogen peroxide (C). Hydrogen peroxide oxidize Pd<sup>0</sup> to Pd<sup>2+</sup> and is reduced producing free hydroxyl radical OH, which is widely known as an active oxidizing agent via a single electron process (step D). The OH. radical oxidize THB to the quinine structure (step E) and produce water molecules as side products. The observed rate constant of the THB oxidation in the presence of  $H_2O_2$  is found to be lower than the observed rate measured in the absence of  $H_2O_2$ , indicating that the addition of hydrogen peroxide may be push the reaction (step C) somehow to the left side and decreases the formation of OH<sup>-</sup>. Upon addition of DMSO, the oxidation rate is dramatically inhibited in the absence and in the presence of H<sub>2</sub>O<sub>2</sub>. The inhibitory effect of DMSO on the THB oxidation may be due to the oxidation of DMSO itself to form dimethylsulfone [45] eq. 1



Fig. 11; (a) Inhibition of THB oxidation using kojic acid. (b) Inhibation of THB oxidation at (•) without kojic acid, (○) 300 μM kojic acid, (▲) 1000 μM kojic acid.



Eq. 1. Oxidation of DMSO using PVA-Pd in presence of H<sub>2</sub>O<sub>2</sub>

## 3.7. Inhibition of trihdyroxybenzene oxidation by kojic acid:

Since Kojic acid is a well known compound for inhibition of polyphenol oxidation [46]. It was used to inhibit  $A_1$  complex towards oxidation of trihydroxybenzene. Fig. 11 shows that the Kojic acid inhibits the oxidation of THB with IC<sub>50</sub> ~ 650  $\mu$ M. The inhibitory effect of the kojic acid was studied in the oxidation of different THB concentrations. Various concentrations of kojic acid were used in the oxidation reaction in the presence of H<sub>2</sub>O<sub>2</sub>. Kojic acid has been observed to be a non competitive inhibitor towards the oxidation of THB (Fig 11)

#### **3.8. Effect of temperature**

The effect of temperature on the first order rate constant of the catalytic oxidation of trihydroxybenzne using  $A_1$  in the presence of hydrogen peroxide was studied in the temperature range of 10– 50 °C. The activation energy value was calculated by using Arrhenius equation (eq. 2):

$$\ln k = \ln A - \left(\frac{2\pi}{RT}\right)$$
(2)  
where A is Arrhenius constant.

where A is Arrhenius constant, k is the rate constant, Ea is the apparent activation energy, R is the ideal gas constant ( $R = 8.314 \text{ J K}^{-1}\text{mol}^{-1}$ ) and T is the absolute temperature (K). The Ea was calculated from the slope of the plot (ln k vs. 1/T), Fig. 12, and found to be 14.8 kJ/mol.



Fig. 12. Effect of temperature on THB oxidation.

This small value of the activation energy indicates that the oxidation reaction can proceed more quickly.

#### IV. CONCLUSION

A Series of Pd-containing poly(vinyl alcohol) was prepared and fully characterized by different tools. The Pd ion coordinated to the polymeric matrix through oxygen atoms. The Fieldemission scanning electron microscopy (FE-SEM) photographs showed that the polymeric matrix contains particles in a nano scale on the surface of  $A_1$ . In case of  $A_2$  and  $A_3$  (FE-SEM) showed a lot of large irregular palladium particles aggregates and are randomly distributed on the top surface of  $A_2$  and embedded in PVA matrix in case of  $A_3$ . The oxidation rate of THB using  $A_2$ in the absence of H<sub>2</sub>O<sub>2</sub> was found to be higher than the oxidation rate in the presence of the H<sub>2</sub>O<sub>2</sub>. Thus, the catalyst reveals an excellent catalytic system which contains a small amount of Pd and can be simply prepared. This system also can be used without  $H_2O_2$  to give a significant catalytic activity towards the oxidation of polyphenolic compound. The oxidation reaction of THB follows the free radical mechanism and dramatically inhibited by kojic acid and DMSO.

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#### AUTHORS

**First Author** – Ahmed I. Hanafy; Chemistry department, Faculty of Science, Taif University, Taif, Saudi Arabia. Permanent address: Chemistry department, Faculty of Science, Al-Azhar University, Cairo, Egypt, Tel. (Fax): 0096628322143; E-mail; ahmedih@yahoo.com

# Some Fixed Point and Common Fixed Point Theorems of **Integral Expression on 2-Banach Spaces**

<sup>1</sup>Mrs. Jyoti Gupta, <sup>2</sup>Dr.K.Qureshi Add. Director(Rtd), <sup>3</sup>Dr. Anupama Gupta

<sup>1</sup>The Research scholar of M. V. M. Bhopal (M.P.) <sup>3</sup>Dept. of B.U.I.T. Bhopal (M. P.)

Abstract- In the present paper we prove some fixed point and common fixed point theorems in 2-Banach spaces for rational expression. Which generalize the well-known results.

Index Terms- Banach Space, 2-Banach Spaces, Fixed point, Common Fixed point.

### I. INTRODUCTION

Fixed point theory plays basic role in application of various branches of mathematics from a branches of mathematics from elementary calculus and linear algebra to topology and analysis.

The study of non-contraction mapping concerning the existence of fixed points draws attention of various authors in

## **Definition:** (1.1), 2-Banach Spaces:

In a paper Gahler[8] define a linear 2-normed space to be pair  $(L, \mathbb{I}, \mathbb{I})$  where L is a linear space and  $\mathbb{I}, \mathbb{I}$  is non-negative, real

valued function defined on L such that a, b,  $c \in L$ 

(i) ||a, b|| = 0 if and only if a and b are Linearly dependent

(ii) ||a, b|| = ||b, a||

(iii)  $||a, \beta b|| = |\beta| ||a, b||, \beta$  is real

(iv)  $|| a, b + c|| \le ||a, b|| + ||a, c||$ 

Hence II., . I is called a 2-norm.

**Definition:** (1.2), A sequence  $\{x_n\}$  in a linear 2-normed space L, is called a convergent sequence if there is,  $x \in L$ , such that  $\lim_{n\to\infty} \|\mathbf{x}_n - \mathbf{x}, \mathbf{y}\| = 0$  for all  $\mathbf{y} \in \mathbf{L}$ 

**Definition:** (1.3), A sequence  $\{x_n\}$  in a linear 2-normed space L, is called a Cauchy sequence if there exists y,  $z \in L$ , such that y and z are linearly independent and

 $\lim_{m,n\to\infty} \|\mathbf{x}_m - \mathbf{x}_n, \mathbf{y}\|_{-0}$ 

Definition: (1.4), A linear 2-normed space in which every Cauchy sequence is convergent is called 2-Banach spaces.

**Theorem (1.1)** Let (X, d) be a complete metric space,  $c \in (0, 1)$  and f: X  $\rightarrow$  X be a mapping such that for each x,  $y \in X$ ,

 $d(fx, fy) \le cd(x, y)$  Then f has a unique fixed point a  $\in X$ , such that for each  $_{\mathbf{x}} \in _{\mathbf{X}} \lim_{n \to \infty} f^n(\mathbf{x}) = a.$ 

After the classical result, Kannan[12] gave a subsequently new contractive mapping to prove the fixed point theorem. Since then a number of mathematicians have been worked on fixed point theory dealing with mappings satisfying various type of contractive conditions.

In 2002, A. Branciari[3] analysed the existence of fixed point for mapping f defined on a complete metric space(X, d) satisfying a general contractive condition of integral type.

**Theorem(1.2):** (Branciari) Let (X, d) be a complete metric space,  $c \in (0, 1)$  and let  $f : X \to X$  be a mapping such that for each  $x, y \in X$ 

non-linear analysis. It is well know that the differential and integral equations that arise in physical problem are generally non-linear, therefore the fixed point methods especially Banach's contraction principle provides a powerful tooi for obtaining the solutions of these equations which were very difficult to solve by any other methods .Resently Verma[14] described about the application of Banach's contraction principal [4]. Gahler [8 jintroduced the concept of 2-Banach spaces. Recently Badshah and Gupta[5], Yadava, Rajput and Bhardwaj[15] also worked for Banach and 2-Banach spaces for non-contraction mappings. In present paper we prove some fixed point and common fixed point theorems for non-contraction mapping, in 2-Banach spaces motivated by above, before starting the main result first we write some definitions.

$$\int_{0}^{d(fx,fy)} \emptyset(t) dt \leq c \int_{0}^{d(x,y)} \emptyset(t) dt \text{ where } \emptyset: [0, +\infty) \to [0, +\infty)$$

is a Lebesgue integrable mapping which is summable on each compact subset of  $[0,+\infty)$ , non-negative, and such that for each  $\varepsilon > 0$ ,  $\int_0^{\varepsilon} \emptyset(t) dt$ , then f has a unique fixed point a  $\in X$ , such that for each  $x \in X$ 

$$\lim_{n\to\infty} f_n(\mathbf{x}) = \mathbf{a}.$$

After the paper of Branciari, a lot of research works have been carried out on generalizing contractive condition of integral type for different contractive mappings satisfying various

Known properties. A fine work has been done by Rhoades [5] extending the result of Branciari by replacing the condition [1.2] by the following

$$\int_{0}^{d(fx,fy)} \emptyset(t)dt \leq c \int_{0}^{\max\{d(x,y),d(x,fx),d(y,fy),\frac{d(x,fy)+d(y,fx)\}}{2},} \emptyset(t)dt.$$

Theorem(1.3): Let T be a mapping of a 2-Banach spaces into itself. If T satisfies the following conditions:

(1)  $T^2 = I$ , where I is identity mapping

(2) ||Tx - Ty, a||

$$\geq \\ \alpha \frac{\|\mathbf{x} - \mathbf{T}\mathbf{x}, \mathbf{a}\| + \|\mathbf{y} - \mathbf{T}\mathbf{y}, \mathbf{a}\|}{\|\mathbf{x} - \mathbf{y}, \mathbf{a}\|} + \\ \beta \frac{\|\mathbf{y} - \mathbf{T}\mathbf{y}, \mathbf{a}\| \|\mathbf{y} - \mathbf{T}\mathbf{x}, \mathbf{a}\| \|\mathbf{x} - \mathbf{T}\mathbf{y}, \mathbf{a}\| + \|\mathbf{x} - \mathbf{y}, \mathbf{a}\|^{3}}{\|\mathbf{x} - \mathbf{y}, \mathbf{a}\|^{2}} + \\ \gamma \left[ \frac{\|\mathbf{x} - \mathbf{T}\mathbf{x}, \mathbf{a}\| + \|\mathbf{y} - \mathbf{T}\mathbf{y}, \mathbf{a}\|}{2} \right] + \delta \left[ \frac{\|\mathbf{x} - \mathbf{T}\mathbf{y}, \mathbf{a}\| + \|\mathbf{y} - \mathbf{T}\mathbf{x}, \mathbf{a}\|}{2} \right] + \\ \eta \|\mathbf{x} - \mathbf{y}, \mathbf{a}\|$$

Where  $x \neq y$ , a > 0 is real with  $8\alpha + 10\beta + 4\gamma + 2\delta + 3\eta > 4$ . Then T has unique fixed point. Our main result is modified the above result in integral type mapping. A. S. Saluja[1].

### II. MAIN RESULT

## Theorem (2.1)

Let T be a mappings of a 2-Banach space X into itself. T satisfy the following conditions: (1)  $T^2 = I$ , where I is identity mapping,

(2) 
$$\int_{0}^{\|Tx-Ty,a\|} \phi(t)dt \ge a \int_{0}^{\frac{\|x-Tx,a\|}{\|x-y,a\|}} \phi(t)dt + \beta$$

$$\int_{0}^{\frac{\|y-Ty,a\|}{\|y-Tx,a\|} + \frac{y-Ty,a\|}{\|x-y,a\|^{2}}} \emptyset(t)dt + \gamma \int_{0}^{\frac{\|x-Tx,a\|}{2} + \frac{y-Ty,a\|}{2}} \emptyset(t)dt$$
$$+ \delta \int_{0}^{\frac{\|x-Ty,a\|}{2} + \frac{y-Tx,a\|}{2}} \emptyset(t)dt + \eta \int_{0}^{\frac{\|x-y,a\|}{2} + \frac{y-Ty,a\|}{2}} \emptyset(t)dt$$

For every x, y  $\in$  X,  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$ ,  $\eta \in [0,1]$  with x  $\neq$  y and

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 $8\alpha + 10\beta + 4\gamma + 3\delta + 2\eta >_{4. Also} \emptyset: [0, +\infty) \to [0, +\infty) \text{ is a Lebesgue integrable mapping which is summable on}$ each compact subset of  $[0, +^{\infty})$ , non- negative and such that for each  $\varepsilon > 0$ ,  $\int_{0}^{\varepsilon} \emptyset(t) dt$ , Then T has unique fixed point. **Proof**: Suppose x is any point in 2-Banach space X.

Taking y = 
$$\frac{1}{2}(T+I)$$
 x, z = T(y)  
$$\int_{0}^{\|z-x,a\|} \emptyset(t)dt = \int_{0}^{\|Ty-T^{2}x,a\|} \emptyset(t)dt = \int_{0}^{\|Ty-T(Tx),a\|} \emptyset(t)dt$$

$$\geq^{\alpha} \int_{0}^{\frac{\|y-Ty,a\|\|Tx-T(Tx),a\|}{\|y-Tx,a\|}} \emptyset(t)dt$$

$$+ \beta \int_{0}^{\frac{\|Tx-T(Tx),a\|\|Tx-Ty,a\|\|y-T(Tx),a\|+\|y-Tx,a\|^{3}}{\|y-Tx,a\|^{2}}} \phi(t) dt$$

$$\sum_{2\alpha} \int_{0}^{\|y-Ty,a\|} \phi(t) dt + \frac{\beta}{2} \int_{0}^{4\left[\frac{1}{2}\|x-Tx,a\|+\|y-Ty,a\|\right] + \frac{\|x-Tx,a\|^{3}}{\|x-Tx,a\|^{2}}} \phi(t) dt + \gamma$$

$$\int_{0}^{\frac{\|y-Ty,a\|+\|Tx-x,a\|}{2}} \emptyset(t)dt + \delta \int_{0}^{\frac{\|x-Tx,a\|+\|y-Ty,a\|}{2}} \emptyset(t)dt + \frac{n}{2} \int_{0}^{\frac{\|x-Tx,a\|}{2}} \emptyset(t)dt$$

$$\geq 2\alpha \int_{0}^{\|y-Ty,a\|} \emptyset(t) dt + \frac{\beta}{2} \int_{0}^{[3\|x-Tx,a\|+4\|y-Ty,a\|]} \emptyset(t) dt + \gamma$$

$$= \frac{\|y-Ty,a\|+\|Tx-x,a\|}{2} = \frac{\|x-Tx,a\|+\|y-Ty,a\|}{2} = \frac{\|x-$$

$$\int_{0}^{\frac{\|y-Ty,a\|+\|Tx-x,a\|}{2}} \phi(t)dt + \delta \int_{0}^{\frac{\|x-Tx,a\|+\|y-Ty,a\|}{2}} \phi(t)dt + \frac{n}{2} \int_{0}^{\frac{\|x-Tx,a\|}{2}} \phi(t)dt$$

$$\geq \left(\frac{3\beta}{2} + \frac{\gamma}{2}\right) \\ + \frac{\delta}{2} + \frac{\eta}{2} \int_{0}^{\|x - Tx, a\|} \emptyset(t) dt + (2\alpha + 2\beta + \frac{\gamma}{2} + \frac{\delta}{2}) \int_{0}^{\|y - Ty, a\|} \emptyset(t) dt \\ \geq \frac{1}{2} \left(3\beta + \gamma + \delta + \eta\right) \int_{0}^{\|x - Tx, a\|} \emptyset(t) dt + \frac{1}{2} (4\alpha + 4\beta + \gamma + \delta) \int_{0}^{\|y - Ty, a\|} \emptyset(t) dt \\ \dots (2.1.1)$$

Now for

$$\int_{0}^{\|u-x,a\|} \phi(t)dt = \int_{0}^{\|2y-z-x,a\|} \phi(t)dt = \int_{0}^{\|Ty-Ty,a\|} \phi(t)dt$$

$$\geq \alpha \int_{0}^{\frac{\|x-Tx,a\|\|y-Ty,a\|}{\|x-y,a\|}} \phi(t)dt$$

$$+ \beta \int_{0}^{\frac{\|y-Ty,a\|\|y-Tx,a\|\|x-Ty,a\|+\|x-y,a\|^{3}}{\|x-y,a\|^{2}}} \phi(t)dt$$

$$+ \gamma \int_{0}^{\frac{\|x-Tx,a\|+\|y-Ty,a\|}{2}} \phi(t)dt + \delta \int_{0}^{\frac{\|x-Ty,a\|+\|y-Tx,a\|}{2}} \phi(t)dt$$

$$+ \eta \int_{0}^{\frac{\|x-Tx,a\|+\|y-Ty,a\|}{2}} \phi(t)dt$$

$$+ \beta \int_{0}^{\frac{\|y-Ty,a\|\frac{1}{2}\|y-Tx,a\|\frac{1}{2}\|x-Ty,a\|+\frac{1}{8}\|x-Tx,a\|^{8}}{\frac{1}{4}\|x-Tx,a\|^{2}}} \phi(t)dt$$

$$\begin{split} & \int_{0}^{\frac{1}{2} ||x-Txa|| + |y-Tya||} \emptyset(t) dt + \\ & \int_{0}^{\frac{1}{2} ||x-Txa|| + \frac{1}{2} ||x-Txa||} \emptyset(t) dt \\ & \int_{0}^{\frac{1}{2} ||x-Txa|| + \frac{1}{2} ||x-Txa||} \emptyset(t) dt + \\ & \int_{0}^{\frac{1}{2} ||x-Txa|| + \frac{1}{2} ||x-Txa||} \| \emptyset(t) dt + \\ & \int_{0}^{\frac{1}{2} ||x-Txa|| + \frac{1}{2} ||x-Txa||} \| \emptyset(t) dt + \\ & \int_{0}^{\frac{1}{2} ||x-Txa|| + \frac{1}{2} ||x-Txa||} \| \emptyset(t) dt + \\ & \int_{0}^{\frac{1}{2} ||x-Txa|| + \frac{1}{2} ||x-Txa||} \| \emptyset(t) dt + \\ & \int_{0}^{\frac{1}{2} ||x-Txa|| + \frac{1}{2} ||x-Txa||} \| \emptyset(t) dt + \\ & \int_{0}^{\frac{1}{2} ||x-Txa|| + \frac{1}{2} ||x-Txa||} \| \emptyset(t) dt + \\ & \int_{0}^{\frac{1}{2} ||x-Txa||} \| \emptyset(t) dt + \\ & \int_{0}^{\frac{1}{2} ||x-Txa||} \| \emptyset(t) dt + \\ & \geq \frac{1}{2} (\beta + \gamma + \delta + \eta) \int_{0}^{\frac{1}{2} ||x-Txa||} \| \emptyset(t) dt + \frac{1}{2} (4\alpha + 2\beta + \gamma) \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & = \frac{1}{2} (3\beta + \gamma + \delta + \eta) \int_{0}^{\frac{1}{2} ||x-Txa||} \| \emptyset(t) dt + \frac{1}{2} (4\alpha + 4\beta + \gamma + \eta + \delta) \\ & \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & \geq \frac{1}{2} (3\beta + \gamma + \delta + \eta) \int_{0}^{\frac{1}{2} ||x-Txa||} \| \emptyset(t) dt \\ & + \frac{1}{2} (4\alpha + 2\beta + \gamma) \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & = \frac{1}{2} (3\beta + \gamma + \delta + \eta + \beta + \gamma + \delta + \eta) \int_{0}^{\frac{1}{2} ||x-Txa||} \| \emptyset(t) dt \\ & + \frac{1}{2} (4\alpha + 4\beta + \gamma + \delta + 4\alpha + 2\beta + \gamma) \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & = \frac{1}{2} (4\beta + 2\gamma + 2\delta + 2\eta) \int_{0}^{\frac{1}{2} ||x-Txa||} \| \emptyset(t) dt \\ & = \frac{1}{2} (4\beta + 2\gamma + 2\delta + 2\eta) \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & = \frac{1}{2} (4\beta + 2\gamma + 2\delta + 2\eta) \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & = \frac{1}{2} (4\beta + 2\gamma + 2\delta + 2\eta) \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & = \frac{1}{2} (4\beta + 2\gamma + 2\delta + 2\eta) \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & = \frac{1}{2} (4\beta + 2\gamma + 2\delta + 2\eta) \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & = \frac{1}{2} (4\beta + 2\gamma + 2\delta + 2\eta) \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & = \frac{1}{2} (4\beta + 2\gamma + 2\delta + 2\eta) \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & = \frac{1}{2} (4\beta + 2\gamma + 2\delta + 2\eta) \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & = \frac{1}{2} (4\beta + 2\gamma + 2\delta + 2\eta) \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & = \frac{1}{2} (4\beta + 2\gamma + 2\delta + 2\eta) \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & = \frac{1}{2} (4\beta + 2\gamma + 2\delta + 2\eta) \int_{0}^{\frac{1}{2} ||y-Tya||} \| \emptyset(t) dt \\ & = \frac{1}{2} (4\beta$$

On the other hand

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$$\int_{0}^{\|z-u,a\|} \emptyset(t)dt = \int_{0}^{\|T(y)-(2y-z),a\|} \emptyset(t)dt$$
$$= \int_{0}^{\|T(y)-2y+T(y),a\|} \emptyset(t)dt$$
$$= 2 \int_{0}^{\|Ty-y,a\|} \emptyset(t)dt$$

So

$$\begin{split} & \int_{0}^{2} \int_{0}^{\|Ty-y,a\|} \emptyset(t) dt \geq \frac{1}{2} (4\beta + 2\gamma + 2\delta + \\ & 2\eta) \int_{0}^{\|x-Tx,a\|} \emptyset(t) dt \\ & \quad + \frac{1}{2} (8\alpha + 6\beta + 2\gamma + \delta) \int_{0}^{\|y-Ty,a\|} \emptyset(t) dt \end{split}$$

$$[4-(8\alpha+6\beta+2\gamma+\delta)\int_0^{\|T_y-y,a\|}\phi(t)dt \ge$$

$$\begin{aligned} (4\beta + 2\gamma + 2\delta + 2\eta) \int_{0}^{\|x - Tx, a\|} \emptyset(t) dt \\ &\int_{0}^{\|x - Tx, a\|} \emptyset(t) dt \leq \frac{4 - (8\alpha + 6\beta + 2\gamma + \delta)}{(4\beta + 2\gamma + 2\delta + 2\eta)} \int_{0}^{\|Ty - y, a\|} \emptyset(t) dt \\ &\int_{0}^{\|x - Tx, a\|} \emptyset(t) dt \leq k \int_{0}^{\|Ty - y, a\|} \emptyset(t) dt \\ &as (8\alpha + 10\beta + 4\gamma + 3\delta + 2\eta > 4) \end{aligned}$$

Where k =  $\frac{4 - (8\alpha + 6\beta + 2\gamma + \delta)}{(4\beta + 2\gamma + 2\delta + 2\eta)} < 1$ 

Let R = 
$$\frac{1}{2}(T+1)$$
, then  

$$\int_{0}^{\|R^{2}(x)-R(x),a\|} \emptyset(t)dt = \int_{0}^{\|R(x)-R(x),a\|} \emptyset(t)dt$$

$$\int_{0}^{\|R(y)-y,a\|} \emptyset(t)dt = \frac{1}{2}\int_{0}^{\|y-Ty,a\|} \emptyset(t)dt$$

$$< \frac{k}{2}\int_{0}^{\|x-Tx,a\|} \emptyset(t)dt$$

By the definition of R we claim that  $\{R^n(x)\}$  is a Cauchy sequence in X,  $\{R^n(x)\}$  is converges to so element  $x_0$  in X. So  $\lim_{n \to \infty} \{R^n(x)\} = x_0$ . Hence  $T(x_0) = x_0$ SO  $x_0$  is a fixed point of T.

## Uniqueness:

If possible  $y_0 \neq x_0$  is another fixed point of T. Then

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$$\int_{0}^{\|x_{0}-y_{0},a\|} \phi(t)dt = \int_{0}^{\|Tx_{0}-Ty_{0},a\|} \phi(t)dt$$

$$\geq \alpha \int_{0}^{\frac{\|x_{0}-Tx_{0},a\|\|y_{0}-Ty_{0},a\|}{\|x_{0}-y_{0},a\|}} \phi(t)dt$$

$$+ \beta \int_{0}^{\frac{\|y_{0}-Ty_{0},a\|\|y_{0}-Tx_{0},a\|\|x_{0}-Ty_{0},a\|+\|x_{0}-y_{0},a\|^{3}}{\|x_{0}-y_{0},a\|^{2}}} \phi(t)dt$$

$$\gamma \int_{0}^{\frac{\|x_{0} - Tx_{0}, a\| + \|y_{0} - Ty_{0}, a\|}{2}} \emptyset(t) dt + \\\delta \int_{0}^{\frac{\|x_{0} - Ty_{0}, a\| + \|y_{0} - Tx_{0}, a\|}{2}} \emptyset(t) dt$$

$$_{+}\eta \int_{0}^{\|x_{0}-y_{0},a\|} \emptyset(t) dt$$

$$\geq \beta \int_{0}^{\|x_{0}-y_{0},a\|} \phi(t)dt + \delta \int_{0}^{\|x_{0}-y_{0},a\|} \phi(t)dt + \eta \int_{0}^{\|x_{0}-y_{0},a\|} \phi(t)dt$$

$$\geq (\beta + \delta + \eta) \int_0^{\|x_0 - y_0, a\|} \emptyset(t) dt$$

Which is contradiction as  $(8\alpha + 10\beta + 4\gamma + 3\delta + 2\eta > 4)$ 

So  $x_0 = y_0$ . Hence fixed point in unique.

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#### AUTHORS

**First Author** – Mrs. Jyoti Gupta, The Research scholar of M. V. M. Bhopal (M.P.), E-mail: jyoti.gupta1709@gmail.com **Second Author** – Dr.K.Qureshi Add. Director(Rtd), Dept. of

B.U.I.T. Bhopal (M. P.)

**Third Author** – Dr. Anupama Gupta, Dept. of B.U.I.T. Bhopal (M. P.)
# A Survey on Object detection and Object tracking in Videos

# S. Rosi<sup>\*</sup>, W. Thamba Meshach<sup>\*\*</sup>, J.Surya Prakash<sup>\*\*</sup>

<sup>\*</sup>Computer Science and Engineering, Prathyusha Institute of Technology and Management. <sup>\*\*</sup> Computer Science and Engineering, Prathyusha Institute of Technology and Management

*Abstract*- This paper presents survey on moving object detection and tracking methods is presented by classifying them into different categories and identify new trends. This survey shows moving object detection and tracking using different and efficient methodologies. Object detection and object tracking is used to track the object type(such as human, vehicles) and detect the movement of the object(such as moving, standing). This survey shows various methodologies for object detection and tracking such as background subtraction, background modeling, intensity range based background subtraction. The simulated result shows that used methodologies for effective object detection has better accuracy and with less processing time consumption rather than existing methods.

*Index Terms*- Background modeling, Background subtraction, Object detection, Object tracking.

#### I. INTRODUCTION

Video surveillance is the monitoring behavior, activities (or) other changing information usually of the people for the purpose of influencing, managing, directing or protecting them. Video surveillance is useful to government and law enforcement to maintain social control, recognize and monitor threats and prevent/investigate criminal activity.

Object detection and tracking in video is a challenging problem. It has application in numerous fields such as video compression, video surveillance, video indexing and retrieval etc. Object detection and tracking are two closely related processes. Object detection can be performed through various approaches such as region based segmentation, background subtraction, temporal differencing etc. The goals of object tracking are segmenting a region of interest from a video Scene and keep tracking of its motion, positioning, and occlusions. The object detection and object classification are preceding steps for tracking object in sequence of images. Object detection is performed to check existence of objects in video and to precisely locate that object. The detected object can be classified in various categories such as humans, vehicles, birds, floating clouds, swaying tree, and other moving object. Object tracking is performed using monitoring objects spatial and temporal changes during a video sequence includes its presence, position, shape, size etc. The direct LL mask band scheme (DLLBS) is used for moving object detection and tracking using low resolution image [1].The DLLBS method can effectively reduce this noise, with low computing cost, in both indoor and outdoor environments. Together with DLLBS and CPR (characteristic point

recognition), the problems associated with occlusions are alleviated. With a combination of DLLBS and CPR can accurately track various types of obstructed movements. This DLLBS is suitable for real time video surveillance system applications such as object classification and the descriptive behavior of objects.

# II. MOVING OBJECT DETECTION AND TRACKING TECHNIQUES

Video surveillance system for the purpose of security has been developed. Many researches try to develop intelligent video surveillance systems [2]. The intelligent video surveillance can detect moving object in its initial stage and subsequently process the function such as object classification, object tracking, and object behavior descriptions. The accurate location of the moving object does not only provide a focus of attention for post processing but can also reduce the redundant computation for the incorrect motion of the moving objects. In this paper on application involving the surveillance of people or vehicles, and include full range of surveillance methods. Surveillance applications involving people or vehicles include the following.

#### A. Access control in special areas

When somebody is about to enter in some sensitive locations such as military based and important government units, the system could automatically obtain the visitor's features, Such as height, facial appearance and walking gait from images taken in real time, and then decide whether the visitor can be cleared for entry.

### B. Person-specific identification in certain scenes

Personal identification at a distance by a smart surveillance system can help the police to catch suspects. The system automatically recognize and judge whether or not the people in view are suspects. If yes, alarms are given immediately, such systems with face recognition have already been used at public sites, but the reliability is too low for police requirements.

#### C.Anomaly detection and alarming:

To analyze the behaviors of people and vehicles and determine whether these behaviors of people are normal or abnormal. For example, visual surveillance system set in parking lots and supermarkets could analyze abnormal behaviors indicative or theft. Normally, there are two ways of giving an alarm. One way is to automatically make a recorded public announcement whenever any abnormal behavior is detected; the other is to contact the police automatically. For social security, cooperative surveillance using multiple cameras could be used to ensure the security of an entire community, for example by tracking suspects over a wide area by using the cooperation of multiple cameras. For traffic management, interactive surveillance using multiple cameras can help the traffic police discover, track and catch vehicles involved in traffic offences.

# III. BACKGROUND SUBTRACTION AND SHADOW DETECTION

The background subtraction algorithm is used to detect foreground objects and apply shadow detection algorithm to remove shadows [3]. The background subtraction and shadow detection is used in both indoor and outdoor environments and does not require color cameras. Background detection techniques may use gray scale or color images, shadow detection methods make use of chromaticity information. The car tracking system of Koller et al. [4] used an adaptive background model based on monochromatic images filtered with Gaussian and Gaussian derivative (vertical and horizontal) kernels. McKenna et al. [5] proposed a background model that combines pixel RGB and chromaticity values with local image gradients. In their W4 system, Haritaoglu and collaborators [6] used grayscale images to build a background model, representing each pixel by three values; its minimum intensity value, its maximum intensity value and the maximum intensity difference between consecutive frames observed during the training period. Elgammalel[7] proposed a nonparametric background model based on kernel based estimators, that can be used to both color and grayscale images. KaewTrakulPong and Bowden [8] used color images for background representation. In their method, each pixel in the scene is modeled by a mixture of Gaussian distributions (and different Gaussians are assumed to represent different colors). Cucchiara's group [9] temporal median filter in the RGB color space.

Shadow detection algorithms have also been widely explored by several authors, mostly based on invariant color features that are not significatively affected by illumination conditions. McKenna et al. [5] used each channel pixel and edge information of the normalized RGB color space (or rgb) to detect shadowed pixels. Elgammal [7] also used the normalized rgb color space, including a lightness measure to detect cast shadows. Prati's and Cucchiara's groups [9, 10] used the HSV color space, classifying as shadows those pixels having the approximately the same hue and saturation values compared to the background, but lower luminosity. KaewTrakulPong and Bowden [8] used a chromatic distortion measure and a brightness threshold in the RGB space to determine foreground pixels affected by shadows. Salvador et al. [11] adopted the c1c2c3 photometric invariant color model, and explored geometric features of shadows. A few authors [12, 13, 14, 15] was showed shadow detection in monochromatic video sequences, used in mind applications such as indoor video surveillance and conferencing. Basically, they detect the penumbra of the shadow, assuming that edge intensity within the penumbra is much smaller that edge intensity of actual moving objects. Clearly, such hypothesis does not used for video sequences containing low-contrast foreground objects (especially

in outdoors applications). More about background subtraction and shadow removal can be found in [16, 17]. Also, there are several shadow detection algorithms to remove undesired segmentation of cast shadows in video sequences. However, in accordance with other authors [9, 6], we chose to use a background model based on median filtering, because it is effective and requires less computational cost than the Gaussian or other complex statistics. More specifically, we improved the background model proposed in [6], and included a novel shadow detection algorithm that is effective for both indoor and outdoor applications.

#### IV. BACKGROUND SUBTRACTION USING INTENSITY RANGE

Wren proposed a method to model the background independently at each pixel location which is based on computation of Gaussian probability density function (pdf) on the previous pixel values [18]. Stauffer and Grimson developed a complex procedure to accommodate permanent changes in the background scene [19]. Here each pixel is modeled separately by a mixture of three to five Gaussians. TheW4model presented by Haritaoglu is a simple and effective method [6]. It uses three values to represent each pixel in the background image namely, the minimum intensity, the maximum intensity, and the maximum intensity difference between consecutive frames of the training sequence. Jacques brought a small improvement to the W4 model together with the incorporation of a technique for shadow detection and removal [3]. McHugh proposed an adaptive thresholding technique by means of two statistical models [20].One of them is nonparametric background model and the other one is foreground model based on spatial information.

In Vibe, each pixel in the background can take values from its preceding frames in same location or its neighbor [21]. Then it compares this set to the current pixel value in order to determine whether that pixel belongs to the background, and adapts the model by choosing randomly which value to substitute from the background model. Kim and Kim introduced a novel background subtraction algorithm for dynamic texture scenes [22]. This scheme adopts a clustering-based feature, called fuzzy color histogram (FCH), which has an ability of greatly attenuating color variations generated by background motions while highlighting moving objects. Instead of segmenting a frame pixel-by-pixel, Reddy used an overlapping block-by-block approach for detection of foreground objects [23]. The scheme passes the texture information of each block through three cascading classifiers to classify them as background or foreground. The results are then integrated with a probabilistic voting scheme at pixel level for the final segmentation.

Generally, shadow removal algorithms are employed after object detection. Salvador developed a three step hypothesis based procedure to segment the shadows [11]. It assumes that shadow reduces the intensities followed by a complex hypothesis using the geometrical properties of shadows. Finally it confirms the validity of the previous assumption. Choi in their work of [24] have distinguished shadows from moving objects by cascading three estimators, which use the properties of chromaticity, brightness, and local intensity ratio. Liu[12] proposed a novel method for shadow removal using Markov random fields (MRF), where shadow model is constructed in a hierarchical manner. At the pixel level, Gaussian mixture model (GMM) is used, whereas at the global level statistical features of the shadow are utilized.

#### V. CONCLUSION

In this paper, the detection of moving object and tracking of moving object was discussed. From this study, background subtraction using complex wavelet transform domain outperforms with all the above mentioned techniques based on moving object detection provides more accurate in segmentation under various illuminations, less time consuming process, flexibility in background updating model, less sensitive to background noise. In Background subtraction using intensity range compares the initial background object compares with all foreground objects and find the moving object in videos, these does not provide more accurate result of object. Likewise many techniques are used to detect the moving object but it is not efficient. In complex wavelet transform domain the foreground object is compared with the entire background object using background updating model. The result of this domain based object detection provides more accurate result of the object. Accuracy can be estimated based on sensitivity, root mean square error, peak signal to noise ratio, correlation coefficient. Based on this study complex wavelet transform domain is recommended for moving object detection.

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#### AUTHORS

**First Author** –Rosi.S, Pg scholar, Prathyusha Institute Of Technology and Management, <u>rosi.june22@gmail.com</u>. **Second Author** –Thamba Meshach.W, Associate Professor, Prathyusha Institute Of Technology and Management, <u>thambameshac.cse@prathyusha.edu.in</u>.

**Third Author** – Surya Prakash.J, Assistant Professor, Prathyusha Institute Of Technology and Management, suriya.engineer@gmail.com.

**Correspondence Author** – Rosi.S, <u>rosi.june22@gmail.com</u>, 8344414411

# Design Template for a Small Scale Solar Power Plant in Nigeria

Jonathan O. Obande<sup>1</sup>, Andrew Akor<sup>2</sup>, Jeremy Namo<sup>3</sup>

<sup>1</sup>Department of Electrical / Electronic Engineering. Nasarawa State Polytechnic, Lafia. Nasarawa State, Nigeria.
 <sup>2</sup>Department of Electrical / Electronic Engineering. Nasarawa State Polytechnic, Lafia. Nasarawa State, Nigeria.
 <sup>3</sup>Department of Electrical / Electronic Engineering. Nasarawa State Polytechnic, Lafia. Nasarawa State, Nigeria.

*Abstract*- This study presents the possibilities for power generation in Nigeria through the utilization of the sun's energy. It highlights the basic science for the design and selection of components for successfully harnessing solar power. The article introduces a concise, rational and practical method of designing a Stand-alone photovoltaic system.

*Index Terms*- Solar energy, Renewable energy, solar electric (photovoltaic) conversion,

#### I. INTRODUCTION

The changing lifestyle with rapid industrialization has made electricity an indispensable and essential commodity over the years. During the last few decades, increasing prices of electricity with increasing demand and decreasing fossil fuel reserves have raised many concerns for policy makers, investors, and customers. Moreover, existing supply chain also poses a challenge of carbon foot print due to its dependency on fossil fuels like coal and oil for electricity generation [1-3].

To alleviate the concern, policy makers across the world have been looking for some sustainable and feasible alternative input energy sources for electricity generation. They found many options like nuclear, wind, solar, hydro, biomass, tidal, geothermal, and so forth [3-4]. However, literature supports solar energy as it is the most ready and green option available across the world [5]. The report published by Indian Meteorological Department (IMD), Ministry of Earth Sciences, Government of India (GoI) [6] states that: The solar energy received by the earth is more than 15,000 times the world's commercial energy consumption and over 100 times the world's known coal, gas and oil reserves. And this energy is readily available during the day for anyone to tap and that too free and without any constraint. Even though most of the energy of the earth would not be present without the sun, only a few forms of power are considered to be solar power. In the context of renewable energy, solar power is associated with the harnessing of the sun's present emissions of heat or light. Solar power, besides providing heat and light, also causes the wind that we feel here on earth. Winds are created when various layers of the atmosphere absorb different amounts of heat and therefore expand differently. This creates regions of lower and higher pressure, resulting in masses of air that circulate both at ground level and at higher altitudes [7]. Initially used to supply electricity to satellites due to its high generation cost, solar technologies and its potential have improved enough

to supply electricity not only to remote locations but also to supplement the national grid power at multi-megawatt levels [8]. Solar panels are made up of solar cells which are an array of photovoltaic cells (PV). Any type of equipment used to convert sunlight into energy is considered solar cell or panels. The technology behind Solar panels has varied widely throughout the five or six decades and while Sola cells were the true origin of modern solar panels, today researchers are shifting to new platform and approaches to gathering energy from sunlight which including crafting solar cells from silicon semiconductor configured to trap and convert sun energy which are coated in an antireflective coating and contained under a glass cover plate to protect the cell from the elements [9]. In the 1950s General Pearson, Calvin Fuller and Daryl Chaplain (of Bells Laboratories) discovered how well silicon worked as a semiconductor. Silicon is what solar cells and panels are generally made up of today [10]. An ambiguous study has been made of using a solar satellite which is continuously in direct sunlight to collect the energy, convert into electricity and direct a microwave beam to a receiver on earth where it would be reconverted to electricity [2]. How-ever, the cost of such a scheme is likely to prohibit its realization.

Nigeria is blessed with both fossil fuels such as crude oil, natural gas, coal and renewable energy resources like solar, wind and biomass [11]. It has been estimated that Nigerian has about 3billionMWh/year of solar potential, crude oil reserve stands at 40billions barrels as at 2008[12] with a daily average output of 2 million barrels [13]. The one of natural gas represents 5 trillion cubic metres (cu m) of probable gas reserves or 120 trillion standard cubic feet (scf) of proven gas reserves, with 2 billion scf of associated gas produced daily, 1.75 billion scf of it flared and only 12.4% currently being used for commercial purposes, mainly power generation and rejection to enhance oil recovery [12, 13].

In Nigeria, wind and solar-based systems have been getting good response under the conducive environment created through different policy measures. In this paper, our focus is on the development of solar-based electricity supply systems.

#### II. DATA ACQUISITION AND ISOLINES' REPRESENTATION

According to Ojosu [14], the LM 300/10 solar recorders and MR-5A pyranometers were used between 1982 and 1986, to measure and record the global solar radiation on a horizontal surface for a network of thirty (30) stations across the country.

Based on this, average daily solar irradiation values for twenty five (25) city/centres were obtained.

By considering the geographical location of Nigeria and dividing latitudes  $4^{0}N-15^{0}N$  and longitude's  $2^{0}E-15^{0}E$  into 130 sections will give  $1^{0} \times 1^{0}$  of latitude by longitude as seen in figure 1. On the basis of this division, information on solar radiation data for each section were obtained from satellite – derived meteorological and solar energy parameter tables from NASA [15]. Using the spread sheet and drawing functions of the surfer-8 software.



Fig 1 Solar irradiation map of Nigeria [20]

#### III. NIGERIA'S POTENTIAL FOR SOLAR ENERGY

The daily average solar radiation (KW .hr/m<sup>2</sup>.day), for Nigeria which lies between  $2^0 \text{ E-}15^0\text{E}$  longitude and  $4^0\text{N-}15^0\text{N}$ latitudes, enclosing Nigeria, geographically was determined using average solar radiation data from meteorological centres in Nigeria and satellite-derived metrology and solar energy parameters from National Aeronautics and Space Administration (NASA).

The deviations in results, when comparing solar radiation data from earth (ground) stations in Nigeria with those from NASA are very negligible, the average daily solar radiation on horizontal surface across the country is within the range of 4.5 KW.hr/m<sup>2</sup> in the southern parts to 6.6 kW.hr/m<sup>2</sup> northwards. Using the average daily solar radiation of the entire country, which is 6kW.hr/m<sup>2</sup>, taking the efficiency of PVC panel to be 10% and for 1% of the country's surface area (1% of 923768 x  $10^6$  m<sup>2</sup>), about 5545 x  $10^3$  MW.hr electric energy can be received from solar radiation on daily basis. [16]

The sunshine hours for which solar radiation can effectively be converted into electricity in Nigeria is between the ranges of four (4) hours in the south to about seven (7) hours in the northern parts of the country. With well over 60% of Nigerian rural communities without links to the national grid and those that are connected can hardly boast of six (6) hours of electricity daily, the use of solar radiation through PVC panels may likely alleviate the poor state of power supply and, at the same time, transmission and distribution losses from grid supply will be highly reduced. Employing other renewable energy resources such as biomass, biogas, wind power and so on will also reduce over dependency on firewood as source of heat and cooking, thereby preserving the trees and thus reducing desertification process, especially in the northern parts of the country.

#### IV. SOLAR ELECTRIC (PHOTOVOLTAIC) CONVERSION

Solar-electric (photovoltaic) conversion is the direct conversion of sunlight in to electricity through a photocell. This could be in a centralized or decentralized fashion. Solar-electric (Photovoltaic) technologies convert sunlight directly into electrical power. Photovoltaic system is made up of a balance of system (BOS), which consists of mounting structures for modules, power conditioning equipment, tracking structures, concentrator systems and storage devices. Photovoltaic conversion could be small scale for stand-alone systems or large scale connected to national grid. Solar cell also referred to as photovoltaic (PV) cells, which as the name implies (Photo meaning "light" and voltaic meaning "electricity"), convert sunlight directly into electricity. Panel stands for a group of modules connected mechanically and electrically. A module is a group of cells connected electrically and packaged into a frame (more commonly known as a solar panel), which can then be grouped into larger solar arrays. Photovoltaic cells are made of special materials called semiconductors such as silicon, which is most commonly used. Basically, when light strikes the cell, a certain portion of it is absorbed within the semiconductor material. This means that the energy of the absorbed light is transferred to the semiconductor. The energy knocks electrons loose, al-lowing them to flow freely. PV cells also have one or more electric field that acts to force electrons freed by light absorption to flow in a certain direction. This flow of electrons is the current, and by placing metal contacts on the top and bottom of the PV cell, we can draw that current off for external use say, to power a calculator. This current, together with the cell's voltage (which is a result of its built-in electric fields), defines the power (or wattage) that the solar cell can produce [17]. PV modules are integrated into systems designed for specific applications. The components added to the module constitute the "balance of system" or BOS. Balance of sys-tem components can be classified into four categories [18].

**4.1. Deep Cycle Battery** store electricity to provide energy on demand at night or on overcast days. They are designed to be discharged and then re-charged hundreds or thousands of times. These batteries are rated in amp hours usually at 20 hours and 100 hours. Like solar panels, batteries are wired in series and/or parallel to increase voltage to the desired level and increase amp hours:

**4.2. Inverters** are required to convert the direct current (DC) power produced by the PV module into Alternating current (AC) power. Most solar power systems generate DC current which is stored in batteries while nearly all lighting, appliances, motors and so on, are designed to use AC power, so it takes an inverter to make the switch from battery-stored DC to standard power (240VAC, 60Hz);

**4.3. Charge Controller** A charge controller monitors the battery's state-of-charge to insure that when the battery needs charge current it gets it, and also insures the battery isn't over charged. Connecting a solar panel to a battery without a regulator seriously risks damaging the battery and potentially causing a safety concern. Some systems also require other components which are not strictly related to photo-voltaics[19].

V. DESIGN PROCEDURES	
5.1. Energy Requirement: Sample List for DC and AC Load with Inverter Draw!	
$Energy (Wh) = \frac{Total Power (W) \times Usage (h)}{Efficiency (Decimal)}$	(1)
Established based on your Total Energy Requirement the System Voltage	
5.2. System Voltage: choose as a multiple of 12Volts (subject to System Size!) Max Current (A) = <u>Total Power (W)</u> System Voltage (V)	
Charge Required (Ah) = <u>Energy Required (Wh)</u> PV System Voltage (V)	(2)
<b>5.3. Select Battery:</b> Ideal C <sub>20</sub> 12Volts (available Voltage 2, 6, 12 V <sub>dc</sub> )	
$C_{20}$ Battery 100(Ah) $\approx 100$ Ah/20h = 5A for 20 hours	
Battery Capacity Required (Ah) = <u>Charge Required(Wh) xAutonomy(d)</u> Maximum DoD (decimal)	(3)
No batteries (series) = $\frac{PV \text{ System Voltage (V)}}{\text{Nominal battery voltage (V)}}$	(4)
No batteries (parallel) = <u>Battery Capacity Required (Ah)</u> Selected battery capacity (Ah)	(5)
Total no battery required = No. of batteries (parallel) x No. of batteries (series)	(6)
<b>5.4. PV Array Sizing</b> PV Array Output Need (Ah) = <u>Charge Required (Ah)</u> Battery Charging Efficiency (decimal)	(7)
NOCT = $45^{\circ}$ C, G=920Whm <sup>-2</sup> , T <sub>amb</sub> = $35^{\circ}$ C, PSH =3.5hours, PV Panel Data: 80Wp, I <sub>mp</sub> 4.54	
Temp. Coefficient Crystalline: 0.5%/ <sup>0</sup> C Amorphous 0.25%/ <sup>0</sup> C	
$T_{cell} = T_{ambient} + (NOCT - 20) \times G = 35 + (45 - 20) \times 0.92 \text{ kWm}^{-2} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots$	(8)
$T_{cell} = 35 + (25) x (1.15) = 63.75^{\circ}C$	
$P_{derated}(Wp) = f_{temp} x P_{stc}(Wp) = [1 - (\gamma_{vmp} x(T_{cell} - T_{stc}))] x P_{stc}(Wp) \qquad \dots$	(9)
= [1 - [0.5 x(63.75 - 25)]]x80 Wp $100$	
$=0.806 \ x \ 80 \ Wp = 64.5 \ Wp \ _{derated}$	
$V_{derated} (V) = \frac{P_{derated} (Wp)}{I_{mp}} = \frac{64.5Wp}{4.54A} = 14.21V$	(10)

Short Form use: Tcell = T ambient +25C

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No module in series = $\frac{PV System Voltage}{V_{derated}}$	(11)
No module in parallel = <u>PV Output Required</u> PV Daily Output	(12)
$PV module \ daily \ output \ (Ah) = I_{mp} x P_{sh} \qquad \dots$	(13)

Total No of modules required = No of modules in series X No of modules in parallel ..... (14)

 $P_{array stc}(Wp) = P_{mod stc}(Wp) X$  Total no module required ..... (15)

#### VI. CONCLUSION

This paper focused on a step-by-step approach in designing a solar power plant that could be used in a variety of areas such as residence, industry, agriculture, schools and hospitals. Employing other renewable energy resources such as biomass, biogas, wind power and so on will also reduce over dependency on fossil fuel as a source of electricity generation which is the main policy backbone of the government.

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#### AUTHORS

First Author - Jonathan O. Obande, Department of Electrical / Electronic Engineering. Nasarawa State Polytechnic, Lafia. Nasarawa State, Nigeria.

Second Author – Andrew Akor, Department of Electrical / Electronic Engineering. Nasarawa State Polytechnic, Lafia. Nasarawa State, Nigeria.

Third Author – Jeremy Namo, Department of Electrical / Electronic Engineering. Nasarawa State Polytechnic, Lafia. Nasarawa State, Nigeria.

# Factors affecting the consumer's attitudes on online shopping in Saudi Arabia

### Nahla Khalil

College of Computers and Information Technology, Taif University, Saudi Arabia

**Abstract-** The invention of the internet has created a new pattern of the traditional way people shop. Today, online shopping is ideal for many of people with disabilities, people with children, people with hectic schedules, and others who just may not have the time *or* the energy to spend all day walking around the mall.

The purpose of this paper is to review and study the factors affecting the consumer's attitudes directly for online shopping in Saudi Arabia.

The survey was conducted and 210 questionnaires collected from students and staff of different universities and general public in Saud Arabia.

The collected data have been analyzed by means of frequency distribution, average and chart analysis. The results of the survey has shown that most of people already shopping online and prefer to make their purchases online, also there are factors that make the buyer hesitant to come online purchasing, Where security and privacy top concern of the purchaser. Among the factors influencing the purchase online are the price, the trust, the convenience and the recommendations

The growth of internet technology in Saudi Arabia has enormous potential as it reduces the costs of product and service delivery and extends geographical boundaries in bringing buyers and sellers together.

Factors such as price, trust in quality and brand or the availability of products images may all serve, to different degree, as important elements in customer decision making when purchasing products online.

The study achieved that the purchase online is easy, comfortable and better than conventional shopping due to various factors.

#### I. INTRODUCTION

**S** audi Arabia has been linked to the Internet in 1993, but public access was not widely available until January 1999. Internet connectivity was launched in many Universities and some government agencies in February 1999 [5] and made available to the public through commercial ISPs.

Using internet has facilitated access a large range of collecting information, purchasing goods and services that were almost hard to obtain. With few mouse clicks, information about most topics can be found in seconds and keeping in touch with distant friends has never easier. Among the many information resources and services the internet provides is online shopping. Online shopping is the process of buying goods and services from merchants who sell on the Internet, which has grown dramatically in the last decade [1]. This incredible growth can be seen in the online population [2]. Whereas, the United States,

followed by Europe, represents the largest share with about 79% of the global E-Commerce revenue, over 875 million consumers have shopped online [7]. The number of online shoppers has also increased up to 40% in the last two years. Among Internet users with Internet access shopping, the highest percentage for online shopping is found in South Korea (99%), UK (97%), Germany (97%), Japan (97%), and US (94%). African and Middle Eastern regions, on the other hand, have the smallest share with about 3% of the global E-Commerce revenue [8].

Furthermore, more recent statistics predicts [9] that online retail revenue will grow from \$191.7 billion in 2011 to \$248.7 billion in 2014, representing an 8 percent compound annual growth rate.

There is no doubt that in the 21st century Saudi Arabia has entered a new phase of globalization. The growth of internet usage in Saudi Arabia changes the behaviour of customers doing business and it has become one of the most significant communication channels. Furthermore, [3] conducted a recent study to identify the factors that encourage the adoption of online banking by customers in Saudi Arabia.

But, the internet has not yet been fully exploited in the Saudi market, as it has been in the European, American and Asian countries. Recently, the internet has seen a great improvement in the number of Saudi internet users. That's where merchants have sought to sell their products to people who surf the Internet. Shoppers can visit web stores from the comfort of their homes and shop as they sit in front of the computer and buy a variety of items from online stores. In fact, people can purchase just about anything from companies that provide their products online. Books, clothing, household appliances, toys, hardware, software, and health insurance are just some of the hundreds of products consumers can buy from an online store. Many people prefer using shopping online because of the convenience.

In Saudi Arabia began using purchase online from other countries, where the trade process is completed and the money was transferred through a credit card to other country's company. They found that individual attitudes toward e-shopping significantly and positively affect user acceptance. Also various motives of buyer online while taking into account the emotional behaviour with benefits related to the purchase of goods and services online.

Moreover, companies continue to establish a presence on the Internet, they find that some consumers are still hesitant to shift in the same direction.

Despite the convenience of online shopping, not everyone chooses to purchase items and services online. Some people like the idea of physically going to a store and experiencing the shopping process. They like to touch the merchandise, try on clothing, and be around other people. Online shopping doesn't permit shoppers to touch products or have any social interaction. It also doesn't allow them to take the merchandise home the same day they buy it.

Other people may worry about shopping online because they fear their <u>credit card</u> information will be compromised. Since it's necessary to provide credit card information when purchasing products online, people worry they may become the victims of <u>identity theft</u>. This discourages some consumers from participating in online shopping.

Another reason some consumers avoid shopping online is the fact that they worry that the products they purchase are not accurately portrayed in the website's picture. They worry that the picture of the item may appear one way, but the actual item may look completely different — perhaps of lesser quality. It's also impossible to try on apparel when conducting online shopping.

A consumer has to rely on body measurements in order to make sure the clothing will fit properly. If the clothing arrives in the mail and it's too small, the consumer has to return the item. This is a potential inconvenience that some shoppers may not wish to face.

On the other hand, [4] buying motives are related to emotional needs of individuals for enjoyable and interesting shopping experiences. The e-shopping tendency is increasing rapidly among buyers across the world [4] In today's world of commerce, the Internet fills a need for busy consumers similar to those mail-order catalogs that were so popular a century ago.

Most of people have found that today's online shopping experience is much safer, more efficient, and immensely more convenient than a trip to the mall.

Online sales from the Kingdom alone amounted to 3 billion US dollars in 2010 and 39% of internet users engaged in ecommerce. Market statistics indicate that we're talking about a young, tech-savvy consumer society with access to credit cards

### II. LITERATURE REVIEW

The growth of Internet technology in Saudi Arabia has enormous potential as it reduces the costs of product and service delivery and extends geographical boundaries in bringing buyers and sellers together.

There is a limited amount of published research exploring the precedents that govern the adoption acceptance of ecommerce by customers in developing countries in the Middle East [3, 21, 1].

Regarding consumer online shopping [35, 36, 37] have made a great deal of research and discussed many influential factors on online shopping. They have studied consumer online shopping intention, motivation and decision making.

Early researchers observed the great potential contribution of electronic commerce in business performance and attempted to study the important aspects, attributes and their properties related to the success of online shopping stores [23, 24, 27, 25, 26]. Also, confirmed the importance factors that affected the success online shopping include system quality, information quality, on-time delivery, sale services, [28, 26]. Also, there have been extensive studies of online shopping attitudes and behaviour in recent years to determine the factors that influence the buying decisions online [22] Taking into consideration what online store attributes and the important in choosing an online store [29, 30, 32, 4, 31, 33] Website design significantly affects the user's shopping attitudes and behaviour in term of purchasing decision and purchasing recurrence [34]

The usage of the Internet recently is no longer limited to the media networks, but exceeded to use it as a means of transaction for consumers in the global market [6].

The researchers explored several different aspects of the factors that affect the consumer adoption and acceptance of online shopping. [2] May be conducted a recent study to provide an understanding of the adoption of online shopping within Asian countries. Their investigation falls into three main categories: consumer attitudes towards online transaction management systems; the privacy and security of consumers' personal information within vendor systems; and trust in the reliability of online sellers. Their findings show that security issues of the online transaction procedure and the reliability and trustworthiness of online merchants have a direct impact on consumers' confidence in adopting online shopping [2].

Furthermore, [3] conducted a study to investigate the factors that encourage the adoption of online banking by customers in Saudi Arabia. Also, [10] a study noted that, the Saudi Arabia E-Commerce spending is 12 billion Saudi Riyal (SR) in 2010; however, only 14.26% of the Saudi population were involved in E-Commerce activities.

In the United States many other studies have contributed to an understanding of E-Commerce adoption [11, 12, 13], and also throughout Europe [14, 15, 16]; and in Australia [17, 18, 19] and Asia [20, 2, 8].

### III. RESEARCH METHODOLOGY

This study employed a survey research in order to find out how consumers shape their attitudes and make aim shopping across online. The random samples can be used where the population can be divided into sub units, and then randomly selected from all these groups. Various methods used such as questionnaires and observations. They have been used by investigation for the study in a different exit to online shopping between different gender, different demographic areas, and different types of age group of interest of expectance, interest, based on the study, the design of a questionnaire and are chosen by the public as a huge and professionally.

The survey was depending on examining the position of the 210 of the people to fill out the questionnaire online shopping based on the closed ended questions. The data were collected through different population of Teachers and students from various institutions and the general public from various professions. The questionnaires have been circulated among 140 teachers and students and 70 of the general public from different region in Saudi Arabia. They asked them to give the answer yes, do not and don't know.

	Discription	Freq	uency	Percent
	Male	150	71.43	
Gender	Female	60	28.57	
	Total	210	100	
Age	18-28	102	48.57	
	29-39	90	42.86	
	Over 40	18	8.57	
	Total	210	100	

# Result and analysis data in terms of demographical information

# Table 1.The results of the survey on demographical information



Figure 18: Illustrates gender purchase online

The results of the demographic profile analysis according to the result on Table 1.which showed in the figure 1, that 71.43% of the male and 28.57% of the female respondents participated in online shopping survey. The study revealed that, the online shoppers were deviated toward males, and showed that the gap between males and females was so big



Figure 2: Illustrates purchase online by age

In this survey, the respondents are categorized into 3 levels of age groups; 18 to 28 years old; 29 to 39 years old and over 40 years old. As stated in Table 1, and show in figure 2. a majority of the respondents (48.57%) fall in the age range between 18 to 28 years of age. This is followed by 42.86% of the respondents from the 29 to 39 years of age category. Finally, 8.57% of the respondents fall in the over 40 years of age category.

The results of the survey reveal that investigation on online shopping attracting mostly young population age group of 18 - 28 years old, has more potential to shop online because of their interest in using new technologies to search for product information and compare and evaluate alternatives.



Figure 3: Shows people moving rapidly toward online shopping

Online shopping is a new thing for people in Saudi Arabia. According to the survey results figure 3, shows that people are rapidly moving towards online shopping. About 55% of the respondent replied that they have enjoyed online shopping and surfing the internet for pleasure, having access to a broader, deeper product selection, a greater variety of stores and having fun shopping experiences. Also 45% of the respondent declared that they have never experienced online shopping at all.

Expectedly, more people of Saudi Arabia will try to do online shopping in the future. Saudi Arabia is finally recognizing the various benefits of online shopping. The benefits of online shopping are endless and it is about time that our local businesses seize this opportunity and enter the 21st century digital age, because what's better then enjoying a great shopping experience from the comfort of your own home? Unfortunately, some Saudi shoppers have yet to be convinced of this worldwide popular shopping method, as they still don't fully trust websites with their credit card information. We need to take a leap of faith and persuade other shoppers to get into the digital frenzy.

#### A. Convenience

The online generation has witnessed a massive sea of innovative ideas that has changed the way we do anything, forever. The simple task of shopping has now been made much simpler by making it possible for you to shop in the middle of the night, on your couch, in your pajamas, from any country you desire and that's the ultimate dream.

Also not having to deal with crowded lines at the register, the slow credit card machines or when it comes to Saudi women, the missing driver. It is also tremendously convenient for those of us with busy schedules who just don't have the time to go skipping from store to store.

The absolute advantage of being able to choose from a wide range of different brands and sellers at one stop only. As well as landing the items that are sold-out or unavailable in store.

Through online shopping we can get the product easily by just typing the keywords of the product rather than physically finding the product in the market. Online shopping has facilitated the customers to get their required product from internet according to their needs and demands by just entering the details and needs about the product.

Most of the respondents consider that online shopping involves less effort than actual physical shopping. It seems that we never have the time to go look for the perfect gift for a special someone; online shopping now makes that almost effortless. It is now feasible to send your gift across the world on the exact date you want. Wrapped, signed and delivered.



Figure 4, results confirms that almost 48% people have opinion in accordance with this fact that online shopping is convenient and easy, being able to conduct a wider information search, being able to make a broader product selection, and buying at better prices, as compare to shopping in the market.

The consumers shop online because it is convenient in terms of being quick and easy to shop and to make product and price comparisons 24/7 from wherever they are. Consumers can order products twenty-four hours a day wherever they are, and do not have to walk through countless boardwalks to find and examine goods.

On the other side about 22% were in opposition to this perception that it is not very convenient and easy for everyone to find the right product easily through online shopping. About 30 % were neutral in this regard that online shopping is neither convenient nor inconvenient. Overall respondents have a positive attitude towards online shopping is convenient.

#### B. Trust & Security

Probably the most important thing consumer should research in an online merchant is their security level. Security indicates how safe consumer credit card information will be by using encryption and the SSL (secure socket layers) technology, the industry-standard method for protecting all Web communications.

Legitimate merchants will work hard to employ obvious measures that will earn consumer trust.

Trust and security is the main factor that hinders people from purchasing online. This will investigate comprehensively the respondent attitude towards trust and security when shopping online. It has been asked from the respondent how much they felt secure when shopping online. The use of credit and debit cards and other account details while shopping online creates a risk of disclose of personal details due to which it could be misuse of personal and account information of the customer.

Security online is significantly an ongoing issue concerning online merchants for several reasons. Consumers have concerns about providing credit card numbers online due to unauthorised use thereof, hackers and viruses. They are also concerned that online vendors may not satisfactorily deliver the goods ordered or that the merchandise may be inferior, incorrectly selected, or may never arrive.



gure 5: Illustrates security and trust factor for online shopping

According to survey results figure 5, show that majority of the respondent about 55% of the consumers felt secure for online shopping and saying shopping online was as safe as shopping in a store. It is very important for the people to feel secure when purchasing goods online. At the same time about 30% of the respondents not felt secure when doing online shopping. About 15% of the respondents were neutral in trust and security factor for online shopping. It is enlightening that majority of the respondents have positive attitude towards feeling secure when shopping online in Saudi.

#### C. Time Saving

One of the best reasons to <u>shop online</u> is the ability to save time. Modern lives have become very busy, with work and leisure activities quickly taking over all the hours of the day. While some lucky guys may love nothing more than to hit the high street and shop, others simply don't have the time as they are too busy with their families or with work. This is where online shopping is becoming increasingly important as it saves valuable time which can be put to better use elsewhere.

Time is the major concern for the people, using shopping online their major desires to save time while shopping.



Figure 6: Illustrates saving time factor in online shopping

The results in figure 6, show that about 68% of the people positively believe that much time is saved while shopping online because it is the fact that when shopping online from home or office does not involve to leave that place, that could be consider as a time saving. On the other side about 28% of the people have neutral attitude about this and 4% of the people have negative attitude towards time saving factor through online shopping.

#### D. Price

The most important factor that shoppers around the world consider before making a purchase online is price, closely followed by reliability and choice.

Also Price is the major concern that people in Saudi takes in consideration before purchasing online and people have mixed fear that cost is usually high. Price factor involves checking the respondent's attitude to save money when shopping online.



Figure 7: Illustrates price factor for online shopping

Figure 7 show whether the respondent felt that they are saving money when they are shopping online as compare to physical shopping. It shows that about 44% of the respondents believe that the Price is not high when shopping online and they had saved money and it is very necessary to save money when shopping online in Saudi. Prices for goods online may be relatively low for various reasons. Such as, the overhead cost of maintaining a web site is much less than that of a regular retail outlet, yielding a cost saving which may be passed on to the consumer. Prices are driven down by a larger number of competing stores, since the internet closes the geographical distance of physical stores.

About 32% of the respondents believe that the cost is usually high through online shopping and they have not saved money. At the same time about 24% people say either the cost is high or low. Their attitude towards price factor was neutral

#### E. Language

Every one prefers the website for online shopping which is familiar with the language that a person knows so that he or she can easily understands the details about the product to shop online but if a consumers does not know the language he / she would not be able to purchase anything from that particular website and the consumer prefer to shop physically rather than online shopping.



Figure8: Illustrates convenience toward website language of online shopping

Figure 8, show that overall respondents have positive attitude towards website language which is convenience for online buyers to shop online their products easily. About 47% of the respondents have agreed with this expression and 29% are neutral in this regard and 24% of the respondents weren't agreed with this factor.

#### F. Recommended

Massive and huge expansion of Internet from the past decade, the people of Saudi are taking high interest in online shopping. When people try to do online shopping while they are sitting in their homes or work place and find what they need without having to leave the house, or worry about a car park. So to help keep them even more protected when you shop online, after obtaining good service response, product quality, competitive price and on time delivery through online shopping, they always try to recommend their friends and family members for online shopping.

The majority of people prefer to purchase goods together with their family members to talk things over with them whether to purchase this or that thing or not. There is also on-line social commerce, Social shopping service covers all the areas of commerce and gives an opportunity to get necessary materials on shopping matters at the site. In this way you have an opportunity to talk about the items you're interested in, to exchange thoughts on numerous questions and to get assistance in selecting an item you are looking for.



Figure 9: recommendation factor in online shopping

According to the survey, results in figure 9, are evidence for that about 58% of the participant were not advisable by someone to buy products online, at the same time only 42% of the people were recommended by someone either their friends or family members to do online shopping.

#### G. Promotions

Online shopping companies have found opportunities to market their products in the whole world. Also they can easily increase the sale of their product by offering discount. While another factor is consumer enjoying promotion on online shopping. Sometimes different companies introduce different discounted deals for its customers but dealers do not sometimes let their consumers to enjoy those benefits but through online shopping consumers can get discounts directly from the company. That encourage consumer to shop online.

It is no surprise that you are able to find the same items that are in store for a much better price online, especially if you have a discount coupon. The reason for that is that your items get delivered to you directly from the manufacturer through the Internet, instead of going through a middle-man, which results in higher prices.

It's amazing how much you can save with online discount coupons; you can get a good deal on almost anything from restaurant meals, <u>hotel bookings</u> to amusement park tickets.



Figure10: promotion and discounts deals in online shopping

The results of the survey in Figure 10, demonstrate that about 65% of the respondents have agreed with this contemplation that different organizations would be able to market their products or brands through online shopping via Internet and they can offer cash discount deals on online shopping instantly. About 17% of the respondents neither agree nor disagree on online marketing and get discounted deals directly. Only 18% of the respondents were in opposition to this stance and they had never get discounted deals through online shopping.

#### H. Buying behaviour

Consumers believe that moods influence buying behaviour. In Saudi Arabia culture, there are bounties of the factors which are affecting online shopping consumers buying behaviour. For instance psychological, social, emotional and privacy factors have major affects on consumer's buying behaviour.



Figure11: Illustrates buying behaviour in online shopping

Figure 11, results shows that 39% of the respondent had agreed on that Psychological factor is the main factor not to do online shopping and affecting consumer buying behaviour . About 23% of the respondents pointed out the privacy factor, 21% pointed out social factor and 17% pointed out emotional factor affecting Saudi consumers buying behaviour. It has been mentioned that adverse to democratic belief, the consumers will not have to pay for privacy, and consists of the elimination of the revelation of the identity of the Internet Services.

#### IV. CONCLUSION

The study was identified the impact of consumers' attitude and buying behaviour towards online shopping in Saudi Arabia. Online shopping is getting more and more fashionable in Saudi Arabia as well as in rest of the world, but the speed of online shopping in Saudi Arabia is slower compared to the entire world. According to our survey, online shopping is getting popular in the younger generation such as students and professionals. Students usually prefer to buy goods from its original source and often they prefer to shop online. When consumers like to make purchases online to buy something, he or she is affected by a variety of factors. The main influencing factors were identified as, price, confidence, security, convenience, time, sale service and discounted deals. The price factor encourages consumers because the prices are often lower via online shopping compared with actual purchases in the market. Buying online can be of great benefit to the consumer in terms of convenience, saving time and money.

Also the promotion and discount deals encourage consumers to get positively involve and purchase online.

According to this study, one of the main obstacles in the way of online shopping is that trust and security factor influence Saudi consumers trust in shopping online.

To improve this business is somehow under control of internet vendor. So consumers must be provided with sufficient protection of internet shopping. People usually get petrified when the other computer demands the complete details of the customers. Due to which a customer gets anxious that his or her personal details may get revealed and their precious money and account details get damaged. Tranquillity is obviously necessary given that the consumer must share personal information (full name, delivery address and date of birth) and financial information (credit card detail) when shopping online. That makes trust and confidence an important factor.

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#### AUTHORS

**First Author** – Nahla Khalil, College of Computers and Information Technology, Taif University, Saudi Arabia

# Study and Design of Impact Attenuator for Passenger Vehicle

# Mayank Jain\*, Aman Ved Kalia\*\*

Faculty Guide: R.C. SAINI (Asst. Professor) Department of Mechanical Engineering MAHARAJA AGRASEN INSTITUTE OF TECHNOLOGY, G.G.S.I.P. UNIVERSITY DELHI

*Abstract* - In a modern day vehicle, usually a monocoque chassis is preferred which is designed and manufactured as a single structure. Such a chassis in case of a collision absorbs the impact energy by getting deformed itself and also reduces the deceleration to an appreciable extent such that no fatal damage is impinged on the passenger. In the motorsport world, a mechanical structure called an Impact Attenuator is used to prevent extreme damage to the vehicle chassis in the event of collision.

The working of an Impact Attenuator is based on the energy conservation principle which states that energy can neither be created or destroyed but can only be transformed from one form to other. In case of an Impact Attenuator, the kinetic energy (K) of the vehicle just before impact gets transferred into the Internal energy or Strain energy (S) of the attenuator after velocity of the vehicle ceases to zero. The aim of the paper is to study the working of an Impact Attenuator by understanding the underlying physics and mathematics responsible for its working followed by formulating a design for a passenger vehicle chosen for the project as reference and analysing its effect under a probable situation of collision which is within our approach. The CAD platforms used for the purpose are SOLIDWORKS for 3d modeling and ANSYS for working out the simulation of the cad model for optimizing the design so as to yield the best possible results.

The paper is conceptualized around the possibility of using an Impact Attenuator for passenger vehicles. A passenger vehicle can vary in weight from as low as 600 Kg to as high as 2000 Kg depending on the class.

Index Terms- Impact Attenuator, Passengers Safety, Impact Test, Formula FSAE, ANSYS.

# I. INTRODUCTION

A vehicle is sold by the manufacturer for its highlighting features like engine performance, mileage, passenger carrying capacity, boot space and many more exciting features or in plain words those attributes which are visible to the naked eye. But in addition to all these features, safety provided by a vehicle in an event of collision to the passengers is of utmost importance. This attribute is included during the vehicle design and testing stage by the vehicle engineer so that the vehicle is able to withstand the impact force during collision.

Collision is a very plausible scenario in case of vehicles, owing to over speeding and reckless driving by the driver. As per research and real events it has been observed that in absence of safety equipment like seat belts and airbags a passenger undergoes a deceleration of more than 30G's in case of collision which is fatal for humans. After several tests, it has been affirmed by doctors that for deceleration less than 20G's the human body can sustain the impact force without any extenuating damages. This forms the benchmark for designing the *Impact Attenuator* for vehicles.

In the motorsport world, especially in F1 racing vehicles a mechanical structure called an *Impact Attenuator* is used to prevent extreme damage to the vehicle chassis in the event of collision.

II. PRINCIPLE AND MATHEMATICAL FORMULAE

Mechanical energy conservation principle The principle states that if the net work done by non conservative forces is zero, the total mechanical energy of an object is conserved; that is, it doesn't change. Applying this principle between two points on a racing track — Point 1 and Point 2 — so that the car is at two different heights and two different speeds at those points because mechanical energy is the sum of the potential energy

(mass × gravity × height)

And kinetic energy

 $\left(\frac{1}{2}$ mass × velocity<sup>2</sup> $\right)$ ,

The total mechanical energy at Point 1 is  $ME_1 = mgh_1 + \frac{1}{2}mv_1^2$ 

At Point 2, the total mechanical energy is

 $ME_2 = mgh_2 + \frac{1}{2}mv_2^2$ 

What's the difference between *ME*2 and *ME*1? If there's no friction (or another non-conservative force), then ME1 = ME2, or

 $mgh_1 + \frac{1}{2}mv_1^2 = mgh_2 + \frac{1}{2}mv_2^2$ 

Further, this kinetic energy on impact gets mostly transferred into the strain energy (*U*) of the body and causes the body to deform permanently. The remaining energy (if it remains) is distributed to the environment as heat or sound. The relation for strain energy is given as:  $U=1/2(k*dx^2)$ 

# III. MATERIAL SELICTION

After understanding the theoretical concepts behind the working of an Impact Attenuator the next step was to determine the suitable material for manufacturing the attenuator. Several factors considered in selecting a suitable material are weight, strength, cost, availability and manufacturability. On a cursory look upon the attenuators made in the past the most obvious materials were Steel and its alloys, Aluminium and its alloys. On further, detailed study for the mechanical properties of materials we shortlisted two materials for our project, namely Galvanised Iron sheet (GI sheet) and Aluminium 2024 sheet.

The table given below compares the two materials on various attributes which were necessary during the selection process.

ATTRIBUTES GI Sheet AL 2024 Sheet	GI Sheet	AL 2024 Sheet
Density (kg/m^3)	7850	2780
Ultimate Tensile (MPa)	640	220
Yield Strength (MPa)	448	95
Shear Modulus (GPa)	79.9	28
Poisson Ratio	0.29	0.33
Cost (per Kg in INR)	140	190
Availability	Easily Available	Easily Available
Manufacturability	Easily to manufacture	Easily to manufacture

TABLE 1

As the material has to be subjected to impact force and the intention is to deform the object made from the material so as to provide the necessary outcome, then based on the details provided in the table the final choice for the material was AL 2024 sheets being commercially available, light in weight and the sheets are easily weldable using tungsten inert gas welding.

# IV. DESIGN AND VIRTUAL ANALYSIS

A two step deign is adopted so that the crushing would occur in steps and the impact gets distributed on to the second member in a uniform pattern. Furthermore, the design incorporates slots so that the sheets can undergo fracture or deformation easily without any resistance from the material itself. In material science also it is observed that cuts and slots on a material increase stress concentration in the region which is helpful in this scenario. The aluminium sheets are available in varying thickness but we settled for a thickness of 1mm, reason being that for thickness <1mm the attenuator was so flexible that it couldn't provide deceleration to the impacting body and for thickness >1mm the attenuator acted as a rigid body and provided an extremely large amount of deceleration.

Therefore, after analysing each and every design we finalised Design shown below as the one to be manufactured as the final product:

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FIGURE 1.



FIGURE 2.

V. ANALYSIS OF THE DESIGN

Simulation of a CAD model requires

The analysis of the design was conducted using the ANSYS analysis software. Among the various packages available Explicit dynamics package for Non – Linear calculations is used. It uses AutoDyn solver to solve the problem which works with microsecond increments. For the analysis an .IGES file of the CAD model of the attenuator was

first designed in Solid works and then imported into ANSYS workbench. To simulate the drop test a cuboidal shape was created in ANSYS such that it was in a position of impact with the attenuator. Structural steel NL was selected as the material for the cuboidal shape which made the drop weight equal to 600 Kg (similar to our reference vehicle).



FIGURE 3.

After setting the appropriate boundary conditions as per rule and mentioned previously analysis was conducted to determine the Total acceleration of the cuboidal shape (replica of vehicle) and Total deformation of the attenuator. The results were obtained as graphs as shown here in fig 4 & 5 and the same are provided for the designs considered

# V. RESULTS AND DISCUSSION

The results obtained from the virtual analysis of the Impact attenuator subjected to two testing conditions are provided here as per the ANSYS report generated. The results obtained for simulating an Impact of a vehicle of weight 600 Kg having an impact velocity of 4.95 ms-1 are given as follows:

Deceleration vs Time plot.



FIGURE 4.

As it can be clearly observed from the Deceleration v/s Time plot that the peak deceleration obtained is 110.7 ms-2 which is equivalent to 11.3G. This value obtained is within the 20G limit and this suffices the goal of the paper. The results were also obtained for simulating a plausible situation where the velocity of impact was 11.11 ms-1 (40 km/h). Similar, to the previous case graphs for deceleration and deformation were obtained and the same are provided below.



The plot clearly shows that the peak acceleration after impact is 117.07 ms-2 which is equivalent to 12G. Once again this value is within the 20G limit as mentioned previously and also fulfils the goal of this paper.

The analysis results obtained from the virtual analysis of the Impact Attenuator conducted using ANSYS software – AUTODYN solver and Explicit Dynamics package for two different impact velocities has provided with peak deceleration results of 11.3G and 12G, respectively. When compared to the results published by other researchers in papers addressing Impact Attenuator design and analysis for FSAE vehicles the results obtained from our study are closer to the results published in the research paper published by Politecnico de Torino, Italy students. There deceleration came out to be 14G which is closer to our results. Furthermore, as per the rule book for FSAE published by SAE International the maximum deceleration of *11.3G* which is again within the specified limits.

# VI. CONCLUSION

On successfully completing all the phases and obtaining the desired results as mentioned it can be concluded that the goal set at the beginning i.e. *to provide an average deceleration of maximum 20G* is attained and proved by the reports of analysis conducted.Further, it can be concluded that this Impact Attenuator if used in the reference vehicle will provide necessary safety to the passenger and the vehicle in case of any frontal collision.

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AUTHORS

First Author – Mayank Jain , B.Tech, MAIT, GGSIP University, jainmayu1991@gmail.com Second Author – Aman Ved Kalia, B.Tech, MAIT, GGSIP University, amanved.kalia@gmail.com

Correspondence Author – Mayank jain, jainmayu1991@gmail.com, jainmayu@yahoo.com, +91-7503994554

### Ahmed Alhuseen\*

\* Landscape Ecology, Faculty of Natural Sciences, Comenius University in Bratislava

Abstract- This research paper focuses on the analysis of the network that links governmental institutions, non-governmental organizations and United Nations agencies involved in the process of adapting to climate change in Sudan; to find out how they are communicating and cooperating. This paper has adopted qualitative method approach and Desk-based review of various documents and similar research papers as methodology to attain the results. Interviews and focus group discussions have been carried out with key ministries and institutions at national and sub-national levels. executive personnel in local nongovernmental organizations and with some United Nations agencies working in Sudan. The diagram drawn from the data collected during interviews has yielded a visualization of the main actors of the process of adapting to climate change in Sudan. The study has concluded that; using the concepts of network analysis methodologies has helped in acquiring a clear image of institutional and policy network of adapting to climate change in Sudan

*Keywords*- adaptation, climate change, Policy network, Sudan.

#### I. INTRODUCTION

Effective communication, collaboration and networking amongst governmental and non-governmental institutions involved in the process of adapting to climate change, are prerequisites tools for effective adaption to climate change. This research paper focuses on network analysis of governmental institutions, non-governmental organizations and United Nations agencies working in Sudan, to find out how they are communicating and cooperating in order to tackle the issue of adapting to climate change in Sudan. However, specific objectives of this research are:

- 1) To help increase knowledge and understanding of key institutions and their roles in adapting to climate change in Sudan.
- 2) To provide insight to institutional environment and linkages in adapting to climate change in Sudan.
- 3) To visualize the network of main stakeholders of adapting to climate change in Sudan.

Institutional analysis considered as a valuable tool for clarifying the roles and relationships between the key agencies, government and non-government, which have an interest in adapting to climate change. Institutional analysis can identify the institutional counterparts that are most likely to effectively take the lead on mainstreaming adaptation to climate variability and climate change in national planning or on implementing adaptation measures (I. Gelil, 2011). The policy network approach is a model which identifies actors participating in a particular policy issue or arena, traces their interactions and resource sharing, and assesses their respective influence (Rhodes and Marsh, 1992). It is limited in its ability to explain policy change or learning; but it is a useful tool to use in conjunction with theories lacking adequate conceptualizations of interaction (John Turnpenny et al., 2005). Evaluating effective network governance is a complex process, and to date only a limited number of studies have addressed this issue (Provan and Milward 2001).

Sudan is one of the most vulnerable countries to the adverse impacts of climate change; therefore, adaptation is considered as a priority for the implementation of the United Nation Framework Convention on Climate Change (UNFCCC). Various studies proved that climate change will have adverse impacts on the development process particularly on sectors like water, agriculture and health. Sudan has crossed an advanced path in preparing adaptation plans to climate change, The National Adaptation Plan - 2013 (NAP) contained programs to increase adaptive capacity for vulnerable communities, programs to increase resilience for certain agricultural, environmental and social systems. NAP also contained proposals for institutional reform to include and implement NAP in the developmental programs (N. Goutbi, 2013).

On the other hand, environment management institutions, similar to other institutions in Sudan; were subject to continuous change and reshaping due to political instability. In 1994, Sudanese system moved from centralization toward political decentralization. Federal system adopted with Sudan re-divided into twenty six states; each with significant autonomy and powers. The federal system adopted in Sudan in accordance with the recommendations of the National Conference for Peace in 1989. In 2011, following the independence of Republic of South Sudan, Sudan is now composed of 18 states. In this system, ministerial portfolios divided into two; federal ministries and state ministries. Federal ministries exercise its power at national level with wider sovereignty and jurisdictions while states' ministries planned to act only at state level. Each state is composed of localities, administrative units and popular committees and each state headed by governor "Wali". Main duties of each state's government are to execute and manage all educational, health, agricultural and service activities at the level of localities (Eltayeb, 2003). Sudan started issuance of various natural resources laws in 1902 and has set up the first governmental Environmental Committee in 1977. Sudan has participated in international conferences that laid milestones in environmental safeguard and protection such as the Stockholm Conference on Environment and Human Development in 1972, the UN Conference on Desertification in 1976, and participated in the Earth Summit in 1992 and Johannesburg Summit in 2002. Sudan has taken necessary steps over time towards meeting its

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obligations under the Rio Conventions. Environment protection act released in 2001, has empowered Higher Council for Environment and Natural resources (HCENR) to be responsible for safeguard, management of natural resources and adapting to climate change.

### II. METHODS

This paper has adopted qualitative method approach. Interviews and focus group discussions have been carried out with key actors at federal and Khartoum state ministries and institutions, executive personnel in four local nongovernmental organizations, three United Nations agencies and staff personnel of three localities (municipalities) at Khartoum state level have been also interviewed (Table 1). Desk-based review of various documents and similar research papers has been also followed as a methodology to carry out this study. Policy and relation network approach has been followed in this study. According to K.G. Provan and H.B Milward, 2001; the network of relations represents a structured system on different levels including the community or organization level; the network of stakeholders or agents; and the level of individuals or participants in the network. Each level is interconnected with all others, and as such, each level cannot be considered outside the context of the network (S. Kinnear et al. 2013).

Table I: Description and numbers of respondents

Respondent	Number
Federal and Khartoum state ministries and institutes	16
United Nations Agency	3
Nongovernmental organization	4
Khartoum State locality (Municipality)	3
Total of respondents	26

In this research paper; centrality measures are used to describe the importance of an actor in the network based on the actor's location and connections with others. There are various centrality measures, but in this research paper, the concentration was on the degree of centrality and betweenness centrality. The degree of an actor refers to the number of ties it has within the network, and degree of centrality provides an indication of popularity or activity (LC. Freeman 1979) as well as potential for power and influence (N. Kapucu 2005). Betweenness centrality indicates how often an actor lies between other pairs of actors; being between two actors indicates a sense of dependence and influence, as the actor has the potential to control information flow (N. Kapucu2005). In contrast to degree centrality, high betweenness centrality indicates that an actor is important in keeping the network together. Often, but not always, high degree actors are the same as high betweenness actors. Typically, high degree actors are quite publicly visible (after all, they have many ties); whereas high betweenness actors with low degree may not be well recognized for how important they are to network structure Kinnear et al. 2013).

### III. RESULTS AND DISCUSSIONS

Figure 1 illustrates an overall pattern of policy and institutional network and linkages. The focal agency for adapting to climate change is HCENR which falls under Ministry of Environment, Forests and Physical planning. HCENR was established in 1992 as a central government agency coordinating governmental efforts for sustainable development including adapting to climate change related activities, responsibility for drawing and coordinating national policies and plans and proposing legislation for environmental protection and conservation of natural resources. HCENR has been liaising international agreements pertaining to environmental safeguard and climate change, all international conventions, Multilateral Environmental Agreements (MEAs) and Global Environment Facility (GEF) projects have been managed by this body.



Figure I: Adapting to climate change linkages and relations.

HCENR is well connected to the UNFCCC Secretary, Conferences of Parties and IPPC. Through negotiations; HCENR was able to access some resources which have been allocated according to the UNFCCC and its following decisions by the Conferences of Parties; funding adaptation is a responsibility of developed countries, especially in the case of the least developed countries (LDCs) such as Sudan. Through communication reports submitted to IPCC and UNFCCC secretary, HCENR has been able to fulfill the country's commitment to the conferences of parties. From the literature reviewed, ties between HCENR and some regional influential institutions like African Union and Arab League to coordinate the efforts to tackle climate change issues seems to be invisible.

At the local level, HCENR has membership in 26 ministries, a representative for environmental NGOs and two representatives of universities. In preparation of NAP, HCENR has involved 17 states out of 18 states of Sudan. NAP document is now being raised to the cabinet of ministers for mandating and later for deliberation and legislation by the legislative body (National Assembly) with ultimate aim to be endorsed by executive cabinet as a national climate change policy. However, four important elements emerged during carrying the interviews relating to climate change network in Sudan.

Coordination: Higher council for Environment and Natural Resources (HCENR) which lies under Federal Ministry of Environment, Forests and Physical planning is the hub of the process of adapting to climate change in Sudan; therefore, the whole set of governmental ministries and agencies that are concerned to the process of adapting to climate change are linked to this body. From the interviews and focus group discussions held during the fieldwork, there is coordination taking place between concerning ministerial departments and HCENR; the coordination means are reports, periodical publications and joint projects take place targeting adapting to climate change. However, as it has been stated by the interviewees that: "the reporting mechanism is weak and ineffective". On the other side, the coordination mechanisms between HCENR, UN agencies and civil society organizations are remarkably vivid and continuous. From the interviews and discussions; it has been noticed that HCENR and the Higher Council for civil Defense - as a responsible body for disaster risk reduction- are in no direct coordination and there is no cooperation between them and this may weaken the process of adapting to climate change. Recently, there has been more discussion on the similarities between Ministry of Agriculture & Forestry climate adaptation and disaster risk reduction approaches hence, coordinated responses between these disciplines have been proposed. Furthermore, as it has been stated by some active members of civil society organizations interviewed during carrying out of this study; adapting to climate change projects are lacking for monitoring and evaluation due to logistic and accessibility problems for some areas of Sudan.

> **Participation:** In the process of adapting to climate change, HCENR has involved federal government, research, academia and civil society institutions, then moved into involving similar institutions in other four states in the preparation and implementation of National Adaptation Plan of Action (NAPA) which also involved wide range of stakeholders at the state-level including affected communities. Recently during the preparation of the National Adaptation plan (NAP), which is being finalized in 2013, HCENR involved all the 18 states of Sudan, three of these states have been established during the NAP preparation 2011-2014, still HCENR managed to get them involved. The preparation of both the NAP and NAPA, involved consultations at all levels, from local to state to national level involving all relevant stakeholders, not less than 2000 people participated in these processes selected through institutional approach. HCENR also worked with universities and research communities and now climate change, including adaptation is a subject in the curricula of many universities and in the research programs. NAPA projects are being implemented now in six states covering wide range of affected communities. However, more work is needed at the community and grass root level to get more affected communities be involved in adaptation planning and implementation and to build their adaptive capacities and knowledge.

> **Human resource:** From focus group discussions conducted with main actors; issues included availability of human resources and building their capacities, tend to be a pressing need facing the process of adapting to climate change in Sudan at national as well as sub-national level. Preparation, implementation and evaluation of NAPA and recently NAP projects depended mainly

on qualified as well as long experienced academicians and bureaucrats however; there is still lack of dedicated full time staff who is dealing with climate change files. HCENR has only six fulltime staff members dealing with adaption to climate change. This staff shortage can contribute to undertake and coordinate the development of planning and implementation for the assigned projects. Most of interviewed actors stated that; either they have no specialized staff at all in climate change matters or have very limited number of qualified trained staff. Furthermore, some of the ministerial departments personal have shown little commitment to climate change issues due to lack of rewarding salaries, knowledge, and tools to implement the projects. In addition, availability of trained staff and well equipped with from rewarding salaries considered by interviewees Administration of Civil Defense - Khartoum state as prerequisites pace to enable the civil defense take sufficiently and effectively its role in disaster risk reduction.

National funding resources: Sudan has spent a lot of resources on adaptation - given the meager resources it has- from the regular budget allocation, some of the development interventions as well as in form of co-funding (local components) contribution to the donor-funded projects. The later in many cases far exceeded the outside funding. According to the UNFCCC and its following decisions by the conferences of parties, funding adaptation is a responsibility of developed countries, especially in the case of the least developed countries (LDCs) such as Sudan. So far Sudan was able to access some resources mainly through multilateral sources such as the Global Environment Facility (GEF), which is a financial mechanism for the UNFCCC and from very few bilateral sources. For political reasons, Sudan lacks the opportunity to access funding through bilateral sources. However so far support received is not adequate to enable an adequate adaptation response by Sudan, not sufficient even to implement its National Adaptation Program of Action (NAPA). So, Sudan is actually spending on adaptation in water, agriculture and health sector as part of its regular activities within these sectors. Sudan prepares its NAPA as required by the UNFCCC to access support for its urgent adaptation needs. But the developed countries so far failed to meet their convention obligations to support even to urgent and immediate needs of the most vulnerable group. The results gained from interviews and focus group discussions showed that a major weakness and threat to adapt to climate change in Sudan is lack and discontinuity of external funding in accordance to the UNFCCC obligations, while the existing institutional setup for mainstreaming adaptation to climate change into development plans considered as a main strength.

### IV. CONCLUSION

This study has concluded that; using the concepts of network analysis methodologies has helped in yielding a clear image of institutional and policy network of adapting to climate change in Sudan. The current institutional set up needs to be boosted with clear cut climate change policy while, major weakness and threat to adapt to climate change in Sudan is lack and discontinuity of external funding in accordance to the UNFCCC obligations, while the existing institutional setup for mainstreaming adaptation to climate change into development plans considered as a main strength.

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#### AUTHORS

**First Author** – Ahmed Alhuseen, PhD Student, Faculty of Natural Sciences, Comenius University in Bratislava, Bratislava 842, 15 4

Email address, ahmedalhuseen@yahoo.com

#### Correspondence Author – Ahmed Alhuseen

Email address, ahmedalhuseen@yahoo.com

Alternate email address,alhuseen74@yahoo.com Contact number: +421-944979411

# The Impact of HIV/AIDs on Household Income: The Case of Dodoma Municipal

# Natalia Kalimang`asi<sup>\*</sup>, Robert Majula<sup>\*\*</sup> and Nanzia Florent<sup>\*\*\*</sup>

<sup>\*</sup>Department of Research, Short Course and Consultancy, Local Government Training Institute- Dodoma, Tanzania <sup>\*\*</sup>Department of Community Development, Local Government Training Institute, Dodoma- Tanzania <sup>\*\*\*</sup>Department of Accounting and Finance, Local Government Training Institute, Dodoma- Tanzania

Abstract- The study assessed implication of HIV/AIDs on household income in Dodoma Municipal. A sample of 150 respondents was purposively and randomly selected and a case study design was adopted. Primary and secondary data were collected. The qualitative and Quantitative data were analysed by using the MS-Excel. The results showed that majority of the respondents (60%) engaged themselves in farming and gardening. Also, findings revealed that the respondents whose monthly income was below Tshs.100, 000/= or the equivalent of \$ 60 spent a great portion of their income on transport and medication, while those who earn income above Tshs. 100,000/= spent a great portion of their income on special food and transport. Furthermore, findings showed that HIV/AIDS awareness among the respondents was high (90%) among respondents with formal education, implying that respondents were aware about HIV/AIDs epidemic Transmission. Moreover, respondents admitted that by having an affected member in the family production time is reduced, some assets were sold to foot medical and other associated costs something which results in the increase of poverty level and whereby land was found to be the asset mostly sold (50%). The study recommends on jointly multidisciplinary efforts from all stakeholders such as government and non-government are required overcome challenges of HIV/AIDS and the control activities should be complemented with poverty alleviation measures. New effective approaches should be determined and adopted. Institutional strengthening and integrations of programmes in government and community systems are among key issues emphasised for HIV/AIDs control to impact on household income.

*Index Terms*- Impact of HIV/AIDs, Household Income, Expenditure

#### I. INTRODUCTION

The Acquired Immunodeficiency Syndrome (AIDS) pandemic poses the greatest health challenge of our time in Tanzania and perhaps may be the worst in her long history. AIDS causes the loss of young adults in their most productive years of life, which certainly affects the overall economic output. The Country HIV/AIDS prevalence was 5.8% in 2008 (URT-NBS, 2008)

Young people are particularly vulnerable to Human Immunodeficiency Virus (HIV) infection because of risky sexual behaviour, drug abuse and lack of access to HIV/AIDS information and preventive services. Large numbers of young people in sub- Saharan Africa begin sexual activity at a relatively early age and are sexually active before marriage, are not monogamous and do not use condoms regularly enough to ensure protection from HIV infection (UNAIDS, 2007).

The AIDS pandemic is rampant among the economically active section of the population (Erickson, 1990). This greatly affects production, loss of labour, results into loss of income, which is a reduction of the available financial resources for the household. The spread of HIV/AIDS among the most productive age groups of the population seriously affects the economic development of any country in the world.

According to NACP (2008) the Youth in Tanzania form a group which is most affected by the HIV/AIDS epidemic. This is the most productive age upon which families and the nation depend for sustenance, production, and development, indeed the very future of families and the nation. Since agriculture is the backbone of the Tanzanian economy and most agricultural workers are in the age group 15-45 who are mostly affected by the epidemic, the impact of HIV/AIDS on rural communities is increasing (RDS, 2009; NACP, 2009). Since HIV/AIDS in Tanzania has affected the most productive age group of the population, there have been both lowering in production levels and deterioration of service delivery in the health care system. Among the unemployed people in Tanzania, 60% are youths. The consequences of this problem are that youth engage in promiscuous behaviour like theft, armed robbery, drug abuse and unsafe sex (NYDP, 2008).

Data from blood donors have shown a rapid increase in HIV/AIDS prevalence among the youth of 15-24 years in Tanzania (NACP, 2001). The 15-24 years age group makes up 21% of the adult population in Tanzania (NYDP, 2006). This group constitutes altogether the future generation, the nation's dependable resource for providing the labor force for national development.

The government efforts with the technical support from the World Health Organisation Global Programme on AIDS (WHO-GPA) formed the National HIV/AIDS Control Programme (NACP) under the Ministry of Health. NACP formulated the Short Term Plan (1985-1986), and three 5 years Medium Term Plans (MTP): MTP-I (1987-1991), MTP-II (1992-1996), MTP-III (1997-2000), MTP IV (2001-2003), and MTP V (2004-2007). The national response consisted of mobilising funding to implement a number of strategies to prevent, control and mitigate the impact of HIV/AIDS epidemic, through health education, decentralisation, multi-sect oral response and community participation. Despite all the efforts, which have been done in the past to control HIV/AIDS, the situation of the pandemic is not stabilising but in the contrary, the HIV prevalence cost at

Household level in the country is general increasing and affecting more the youth, the country's most productive and dependable workforce.

Since most of studies in HIV/AIDS have focused on Impact of HIV/AIDS on households food productivity, poverty acceleration (ESRF, 2004), rural livelihood (ECA, 2006), and on nutritional status, loss of productive labour force (Loevinsohn et al, 2009), no study has been done to assess the impact of HIV/AIDS on households income. Therefore, in order to establish this, the researchers conducted a study to assess the Implications of HIV/AIDS on household income in Dodoma Municipal. The reason behind this study is to understand the extent in which HIV/AIDS has affected household income.

#### II. MATERIALS AND METHODS

#### Study area

This study was conducted in Dodoma Municipal. The Municipality is one among the seven councils found in Dodoma region. Dodoma municipal was selected due to the following main reasons: For many years Dodoma has been reported among the highest HIV/AIDS cases in the country and this is because of the rapid population increase due to political situations where by there are huge inflows and outflows of politicians, business men and activists. Also the existence of higher learning Institutions like University of Dodoma( UDOM), College of Business Education(CBE),Institute of Rural Development Planning(IRDP),Local Government Training Institute( LGTI), St. John's University and Minerals Institute which bring in a huge number of students from across the country. Though Dodoma is the national growing capital it is among the poorest and least developed area of Tanzania and suffers the highest mother/infant mortality and HIV/AIDS (www.nbs.go.tz, 5<sup>th</sup> July, 2014).

#### **Research Design**

The study used a case study design because this design is convenient in depth study of a situation rather than statistical survey. This design was chosen due to the limitations of time and funds. The structured questionnaires were used.

#### Sampling size and sampling procedure

Study used a sample of 150 respondents selected from 350 households. Both probability and non-probability sampling designs were used. For probability sampling design a multistage

sampling was used and for non-probability sampling design, a purposeful sampling design was used. These sampling designs were used to select Divisions, wards, Streets and villages from which youths to be interviewed were obtained. Multi-stage random sampling was chosen because it was suitable for drawing samples from large populations (Cooksey and Lokuji, 1995).

#### Data collection and analysis

Structured questionnaires were used to collect data from the household. Both primary and secondary data were collected. Primary data was collected using structured questionnaires with both open and closed ended questions. Secondary data was obtained from Commission for AIDS, National University Libraries, Medical Libraries, Regional and District AIDS Coordinators, Dodoma Social Economic Profile, National Bureau of Statistics, Dodoma Municipal HIV/AIDS Report, National Census Report, 2012. Also secondary data was gathered through reading of relevant documents, publications and reports. The focus was to obtain data, which could not be obtained sufficiently through primary data sources. The qualitative data were analysed by using the MS-Excel.

#### III. RESULTS

#### Demographic characteristics

The understanding of HIV/AIDS implications on household income was found to vary significantly between respondents with different levels of wealth and marital status. It was higher among those with least average income than in those with minimal or inadequate income. On average, 19.1-32.7% of the respondents had some difficulties in providing clear costs and budget on HIV/AIDS. Level of education was also an important factor for someone to understand clearly on HIV/AIDS epidemic. A total of 150 household members responded with females accounting for 58% of the respondents, where respondents aged 46-60 comprised 48% and 15-45 (44.7%). A larger proportion (41.3%) of the respondents had completed primary school education. Over half of the respondents were married (65.3%). Majority of the respondents were farmers and business people (78%) Table 1. Results revealed that majority (87%) of respondents had formal educational level. This implies that respondents were aware of HIV/AIDS infections and Impacts.

Factors	Responses				Respondents
Age	Below 15	15-45	46-60	Above 60	150
	1(0.6%)	67(44.7%)	72(48%)	10(6.7%)	
Sex	Male	Female			150
	63(42%)	87(58%)			
Marital Status	Single	Married	Widow	Divorced	140
	29(20.7%)	98(70%)	5(3.6%)	8(5.7%)	
Educational	Informal	Primary education	Secondary	College	150
	education		education	education	

Table 1: Demographic characteristics of respondents

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	18(12.1%)	62(41.3%)	48(32%)	22(14.6%)	
Occupation	Farmer	Business	employee	student	150
	75(50%)	43(28.6%)	22(14.6%)	10(6.8%)	

Source: Field data (2010)

# The community's major source of Income for HIV/AIDS patients

Table 2 below shows the community's major sources of income for HIV/AIDS patients. Results indicate that major source of income included Agriculture, Trade/business and Employment. Majority of HIV/AIDS patients (60%) got their income from agriculture of which 70% were involved in poultry and gardening; and 26.7% of HIV/AIDS patients got their

income from trade/business of which 95% were involved in small and medium size businesses. The study also revealed that 13.3% of HIV/AIDS patients got their income from employment of which 80% were in informal sector. Findings indicate that agriculture and trade/business were the major economic activities in the study area as they were performed by more than 80% of HIV/AIDS patients.

Table 2: Community's major sources of medine for mix/AIDS patients	Table 2:	Community's	maior source	s of income f	for HIV/AIDS	patients
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Source of Income	Responses				Respondents
Agriculture	Poultry	Grazing	farming	Gardening	90
	31(34.4%)	12(13.3%)	15(16.7%)	32(35.6%)	
Trade/ Business	Small	Medium	Large		40
	26(65%)	12(30%)	2(5%)		
Employment	Formal sector	Informal sector			20
	4(20%)	16(80%)			
Total					150

Source: Field data (2014)

### Household Income level and Expenditure

Table 3 presents household income level and expenditure. Findings from the table revealed that there were negative impacts of HIV/AIDS on household income after having a member suffering from HIV/AIDS. Under this study majority of respondents (62.2%) were found to earn between Tshs.101, 000 -600,000 per month. On the side of expenditure, this group spent almost 64% on special food while 42.2% spent on medical treatments and 35.3% spent on transport. This implies that most of them are aware of HIV/AIDS epidemic hence mostly use their income on special diet to keep them healthier. Also they spent less on medical treatment because some medical costs e.g. for ARVs are supplemented by the Government. Furthermore the earners of below Tshs100,000/= per month or \$ 60 spend much of their income on transport (62%), medical treatments (57%) and lastly on special foods (36.2%). This implies that this group spent more on transport because most of them do not own private transport; hence they mostly depend on hired transport which is expensive. Also this group spent less on special foods because of their income status, hence special food is not a priority.

Group of household whose income per month was above 600,000 spent more on transport and special foods. This group consisted of people who were aware of HIV/AIDS. Special food to them was an ordinary menu.

Table 3: Household Income level and	l expenditure (Tanzanian S	Shillings)
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Criteria	Income Categor	ies /Reponses			Total Respondents
	Below 100,000	101,000 - 300,000	301,000 - 600,000 -	Above 600,000	
Income level per month	23(15%)	55(36.7%)	42(28%)	30(20%)	150
Medical treatment	66(56.9%)	34(29.3%)	15(12.9%)	1(0.8%)	116
Special food	42(35.3%)	42(35.3%)	32(26.9%)	3(2.5%)	119
Transport	72(62.1%)	28(24.1%)	13(11.2%)	3(2.6%)	116

#### Source: Field data (2014)

#### **HIV/AIDS** Awareness and Place of Treatment

Table 4 below shows HIV/AIDS Awareness and Place of Treatment. Majority of respondents (90%) were aware of HIV/AIDS epidemic and 20% of respondents admitted to have patients in their families. Majority of those admitted to have affected members in their families get medication from Hospital (66.7%). This implies that there is high degree of awareness in

the community which results in majority to attend to hospital and health centres. However, the result shows that 6.7% of respondents get medical treatment from traditional healers. This shows that there is still a need to sensitize and educate people on proper care, prevention, protection and treatment of HIV/AIDS epidemic.

 Table 4: Respondents HIV/AIDS Awareness

Factors	Responses	Total		
Awareness	Yes	No		150
	135(90%)	15(10%)		
HIV/AIDS patient	Yes	No		150
neighbourhood	30(20%)	120(80%)		
Place of Treatment	Hospital/ health centres	Traditional	Traditional healers	30
		nealers	and Hospital	
	20(66.7%)	2(6.7%)	8(26.6%)	

#### Source: Field data (2014)

#### Effects of HIV/AIDS to family member and Assets Disposed

Results in table 5 below show the effects of HIV/AIDS to family member and assets disposed. Out of 30 respondents who admitted to have affected member in their families, more than 90% replied that by having an affected member in family, production time is reduced which results into increased poverty level. In addition to that, 40% of respondents who had affected member in the family admitted to have sold an asset to cover health care of the affected member. The findings also showed that half of respondents who admitted to have an affected member in the family said they had sold land. This finding agrees with Nyamuryekung'e; K. (2000)and Mikael L. (2003) who argued that having an affected member in the family reduces availability of disposable income. This is also supported by Barnett et al., (2008) who stated that the family with an affected member may sell assets to meet urgent expenditure needs. AIDS death brings with it loss of productive resources through the sale of livestock to pay for sickness, mourning and funeral expenses, as well as sharp decline in productivity.

Gillespie (2006) argued that, the net effect of these losses is that such households rarely recover even their initial level of living, since their capacity is eroded. As a result, a true process of structural economic decline quickly sets in. It is therefore reasonable to expect that HIV/AIDS will bring about increase in the proportion of households that are poor. Loevinsohn et al (2009), states that, sickness also contributes to the scarcity of labour because of both the incapacity of workers and the time others have to devote to looking after them. The extended families of people who have fallen sick and died of AIDS also suffer economically because of the burden of supporting and educating children orphaned by AIDS.

Table 5	: Effects	of affected	member	and	Assets	disposed
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Categories	Responses			Total Respondents
Effects of affected	Reduction o	f Termination from	n Increase of	30
member to family	production time	production	poverty level	
		activities		
	15(50%)	2(6.7%)	13(43.3%)	
Assets disposed	Yes	No		30
	12(40%)	18(60%)		
Types of Asset Sold	Livestock	Furniture	Land	12
• •	4(33.3%)	2(16.7%)	6(50%)	1

Source: Field data (2014)

#### IV. CONCLUSION

HIV/AIDS has a marked impact on and off household income (loss of assets, savings, remittances, etc) and particularly on the availability of disposable cash while it also increases household expenditures (for medical treatment and transport, special foods). The results showed that majority of the respondents engaged on farming and gardening as their major economic activities. Further, results revealed that the respondents whose monthly income was below Tshs.100, 000/= spent a great portion of their income on transport and medication, while the middle and higher income earners (income above Tshs. 100,000/=) spent a great portion of their income on special food and transport. Also results showed that HIV/AIDS awareness among the respondents with formal education were higher implying that respondents are aware about transmission, care and treatment of the epidemic. Major impact of HIV/AIDS on households income were noticed on reduction of production time, sold of assets were. Land was the mostly sold asset. This implies that household income was diverted from funding development activities to social services (cover the cost of HIV/AIDS).

#### V. RECOMMENDATIONS

The study recommends that in order to overcome challenges of HIV/AIDS jointly multidisciplinary efforts from all stakeholders such as government and non-government are required and the control activities should be complemented with poverty alleviation measures. New effective approaches should be determined and adopted. Institutional strengthening and integrations of programmes in government and community systems are among key issues emphasised for HIV/AIDs control to minimise costs on household income.

#### VI. POLICY IMPLICATIONS

HIV/AIDS is among the development agenda in the National Strategy for Poverty Eradication (MKUKUTA), and the National Development Vision of 2025. Therefore, government effort to emphasize policy mainstreaming in all sectors should be increased in order to Prevention and Control HIV/AIDS in all sectors and to improve the well-being of the people.

In response to the HIV/AIDS pandemic, the Government of Tanzania has made substantial valuable progress in nearly all areas of HIV/AIDS prevention, care, and treatment. The challenges of HIV/AIDS need concerted and multidisciplinary efforts from all sectors, government and non-government, including civil society organizations and the community at large. In line with this, the Tanzania Commission for AIDS (TACAIDS) was created by a statute of the Parliament in 2001. TACAIDS is mandated to provide strategic leadership and coordination of multispectral response as well as monitoring and evaluation, including research, resource mobilization, and advocacy.

To address the multiplicity of factors that fuel the spread of HIV infection in the country, a comprehensive prevention approach is adopted. Hence the policy measures include the adoption of risk-reducing counselling or sexual behaviour change, reduction of multiple concurrent sexual partners, proper and consistent use of condoms, transfusion of safe blood, HIV testing and counselling, prevention and treatment of sexually transmitted infections, and use of antiretroviral medicines to prevent mother to child transmission and to provide postexposure prophylaxis in the workplace and including victims of sexual violence. Also addressed is legislative reform to criminalize intentional transmission of HIV and reduce sexual abuse related transmission. Emerging preventive measures such as male circumcision and the use of microbicides are also considered (URT, 2007:6).

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#### AUTHORS

First Author: Natalia Kalimang`asi – Master of Business Administration (Finance), Bachelor of Science in Agricultural Economics and Agribusiness, Email: <u>mwaseu@yahoo.com</u> Second Author: Robert Majula – Master of Business Administration (Marketing), Bachelor of Commerce (Marketing), Email: <u>majurobby@gmail.com</u> Third Author: Nanzia Florent: Masters of Science in Economics (Project Planning and Management), Bachelor of Science in Economic (Population Development), Email: <u>naflo30@yahoo.com</u>

**Correspondence Author**: Natalia Kalimang`asi – Email: <u>mwaseu@yahoo.com</u>; +255 787 577 082

# Determinants of Consumers` Attitudes on Imported Products in Tanzania: The Case Study of Dodoma Municipal

Nanzia Florent<sup>\*</sup>, Natalia Kalimang`asi<sup>\*\*</sup> and Robert Majula<sup>\*\*\*</sup>

\*Department of Accounting and Finance, Local Government Training Institute, Dodoma- Tanzania \*\*Department of Research, Short Course and Consultancy, Local Government Training Institute- Dodoma, Tanzania \*\*\*Department of Community Development, Local Government Training Institute, Dodoma- Tanzania

*Abstract*- Consumers' attitudes towards purchasing either foreign or local products have been a matter of debate. Therefore the objective of this study was to investigate the determinants of consumers' attitudes on imported products in Tanzania by exploring factors which attract Tanzanian consumers to purchase imported products. This study employed cross sectional design. Data were collected in Dodoma Municipal in which selfadministered questionnaires were used to collect the required information. The study randomly sampled 200 respondents who included 92 business men/women, 60 students and 48 servants. The data obtained were analyzed using MS – Excel computer software.

The results showed that Tanzanian consumers' attitudes on imported products were heavily influenced by the sense of proud, advertising and marketing, local market destructions, consumers' awareness about the imported products, import brand name, group reference and unavailable local substitutes. These variables have affected the Tanzanian consumers to purchase foreign products differently.

The study recommends that local companies should emphasize on the use of promotion, marketing, labelling and brand names that will attract and make local consumers to be proud when consuming local products. Also local companies should search for good strategies like making local consumers more patriotic and aware about their local products specifically on the matter of standard, quality and the use of group influence to attract consumers to use local products. In addition, the government should strengthen local companies' production by providing subsidies and lower their product tax in such a way that local companies will be attracted to produce more instead of being agencies of foreign countries products. Lastly the government should implement regulations and policies that restrict importation of products that are locally produced. This will eventually promote the domestic production of goods and services.

Index Terms- Consumer Preference, Attitudes, Imported Goods

#### I. INTRODUCTION

Consumers' attitudes towards foreign products are widely discussed by the renowned researchers of marketing (Muhammad and Shah, 2011). Attitudes towards products choice are examined through true motives, desires, and expectations in buying a product. Consequently, "consumers' attitudes toward products originating from foreign countries have been of interest to international business and consumer behavior researchers for decades. One of the factors which may affect a consumer's decision to buy domestic or foreign products is consumer ethnocentrism" (Sumner, 1985) in Habibur et al., (2011).

In Africa, attempts have been made to examine this concept of country of origin effect in various spheres. Agbonifoh and Elimimian (1999) in Ferguson et al., (2008) showed that products from the technologically more advanced countries were viewed more positively by nationals of developing countries than those from the technologically less advanced countries. Ferguson et al. (2008) have studied the country of origin effects in service evaluation in five West African countries. They found that personal characteristics like motivation and ability to process information may influence use of the country of origin attributes in evaluating a service. Besides individual characteristics such as ethnocentrism, culture orientation may influence the country of origin preference in service evaluation. Opoku and Patrick (2009) found that in Tanzania products from East Africa tend to be less preferred than those made by their fellow Tanzanians; with this fact the main challenge which face Tanzanians is to enhance the competitiveness of domestic firms and entrepreneur's domestic markets into the global market.

The problem of attitude to local or non-local products has been recognized in many parts of the world as a key economic issue in the consumer behavior markets. Bias against imports is high among people with positive attitudes towards their host countries (Durvasula *et al.*, 1997) in Boonghee and Naveen, (2005). Moreover the mentioned study observed that people in developed country are more likely to purchase their locally made products because of positive attitude on these products while it is the opposite of developing countries. Likewise, attitudes toward products from culturally similar countries are more favourable than those toward products from culturally dissimilar countries (Watson and Wright, 2000). However, the effects of negative attitude to local products are diverse and affect local industries, local culture style of life and behaviours and the economy at large.

Increasing of global market use and development of information and technology tend to facilitate Tanzanian consumers being able to buy products from different countries either by non-store sources like the internet, and local source markets. Also the flowing of imported products is observed to be higher specifically the Chinese made products which seem to be cheap. Most Tanzanians go for the imported products mostly than the locally made products and this is what attracts the researcher to examine empirically the determinants of Tanzanian consumers' attitudes towards imported products. The researchers noted that the imported products are highly purchased than local products despite the fact that they are of almost the same quality



Figure 1: Conceptual diagram of the Study

Source: Researcher's own Construct 2012

#### II. METHODOLOGY

and they are cheaply available. In Bank of Tanzania quarterly

#### **Study Area**

This study was carried out in Dodoma region, specifically in Dodoma Municipal. The study targeted the consumers around this region. The choice of this study area was due to the fact that the region has high number of interaction of people from different sections, specifically the politicians, students, and business men and women. Demographically, Dodoma has a general population around of 2 million (Census, 2012). The economic activities of this area are agriculture, business, office works, animal husbandry and hunting. The major employers in this region are the private and public organizations that deal with provision of goods and services at either profit or not for profit.

#### Research design and data collection

The research design of this study was cross sectional approach since the data were collected at once. This design is considered the best because the researcher meets his/her respondents once, by (Kothari, 2007). This study employed primary and secondary data collection techniques, in which selfadministered questionnaires were provided to respondents so as to fill the information asked. The questionnaires were structured with closed ended questions with two sections. The first section of the questions included respondents profile and the second section was about respondent's attitudes towards imported products.

#### Sample Size and Sampling Techniques

The probability sampling techniques was used because every members of the population had a known non zero probability of a selection. Thereafter, simple random sampling was used to get respondents. In addition, the sample size of the study was based on the theory of central limit. This theory assumes that any sample size greater than thirty (30) is a good representative of the population at 5 percent level so this study used a sample of 200 respondents.

### **Data Analysis**

Responses from respondents were coded and summarised using excel. Both descriptive and quantitative data were analysed using Microsoft excel program. Descriptive statistics was used to determine the frequency of occurrences and percentages. Results of the analysis were presented descriptively in a tabular form followed by narrative description of the results.

#### III. Results

#### **Demographic Characteristic of Respondents**

Out of 200 respondents who participated in giving the information 63.5 % (127) out of 200 were males, and the rest (36.5%) were females. The respondents were costumers aging from 15 years and above while in terms of marital status, about 52 % (104) were married. Respondents with primary and secondary level of education were about 86% (173) out of the 200 participants. The occupation of respondents varied where majority of the respondents (86%) were self-employed and it was found out that 43% of the respondents were diagnosed with less than 100,000 TZS and 37% had income between100,000 – 300,000 TZS per month. In this study the majority responded to favour foreign products more than local products and had positive attitudes to these products.

However, in this study demographics such as age, sex, income and occupation worked quite well. Young people were more likely to buy fashionable products than old, women were likely to buy feminine hygiene products and low income earners weren't. In many categories, demographics are of little use in this study as the researcher based on social economic determinants of import products and not specific type of the products. The results of the analysis are presented in table 1, 2, 3, and 4

#### **Consumers Preference**

Table 1 shows the results focused on finding what determine consumers' attitudes in the context of consumers' preference. The doubting information here was whether consumers' preference has influence on consumers' attitudes to purchase imported products. Questions to capture information on which factors are influential on consumer's preference on purchasing import products were asked to the respondents and the findings are as follows.

It has been observed that most of the respondents (76.5%) tend to like purchasing foreign products as shown in table 1 below. Also result indicates that more than half of respondents (52.5%) are proud to purchase foreign made products than local products. This implies that Tanzanians were likely to consume imported products because they were proud of them. The tendency to purchase foreign products also resulted from globalization that has emerged with new fashions and life style as

the table 1 found that 60 % prefer to purchase foreign goods due to fashion.

Also the findings presented in Table 1 show that 49.5% of respondents are not encouraged and convinced to purchase local made products. The study, therefore, observed that Tanzania consumers were opting to purchase local products because local companies do not do enough promotion to convince them to choose local products. The same study was done in China and revealed that Chinese economic growth has done little to change the tendency of the Chinese to prefer western products (Vincent and Chike, 1999). In Bangladeshi where consumers overwhelmingly preferred western made products, though there were differences in their perceptions across product classes as well as degree of suitability of sourcing countries (Habibur *et al.*, 2011).

Table 1:	Consumers	Preference
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Criteria	Responses			Respondents
Do you like to purchase imported products?	Yes	No	I don't know	200
	153 (76.5%)	34 (17%)	13(6.5%)	
How do you feel when you purchase	Good	Proud	unconcerned	200
foreign made products?	65(32.5%)	105(52.5%)	30(15%)	
What influences you to purchase foreign	fashion	Price	accessibility	200
products?	120(60%)	55(27.5%)	25(12.5%)	
Is there enough promotion for local	Yes	No	I don't know	200
product?	36(18%)	99(49.5%)	67(33.5%)	

Source: Research Findings, 2012

#### **Consumers' awareness**

This study also analyzed the influence of consumer's awareness about imported products on their decision to buy these products. It examined whether consumers' awareness about imported products had influence on their decisions to purchase these products. The results are shown in Table 2.

The results in Table 2 show 69.5 % of respondents said that the consumers chance to use imported product was increased as a result of the destruction of local industries. Results also showed that 61.5% of respondents purchase foreign products as they have no enough information about local market. This reduces chances of awareness to their decision on what products to purchase. Local industries collapsed due to unfair global competition, trade liberalization and mismanagement. This influences Tanzanians consumers to opt for foreign products. This means as local markets collapse consumer's awareness about their domestic products decreases and chances to buy foreign products increases. This reduces the marketability of the local products and consumers may end up lacking enough information about the available goods.

The result shows that almost (78%) of consumers tends to opt foreign products due to the popularity of their brand names advertised either in TV, Radio or Internet etc. This was used as a signal of quality as well accessibility and affordability, where 68% of respondents opted foreign products because they perceive foreign products as of high quality. They believe that products with very popular brand names have high quality and were more preferred than those with unpopular brand names.

<b>Fable 2: Consumers</b>	Awareness	about the	Purchased	<b>Products</b>
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	Responses         Respondents           voce_forcion_products         Voc         No         1 don't know         200					
Criteria	Responses			Respondents		
A. Do you Purchase foreign products	Yes	No	I don't know	200		
because local industries have	139(69.5%)	38(19%)	23(11.5%)			
collapsed?						
B. Do you opt for imported products	Yes	No	I don't know	200		
because of the information you have	38 (19%)	123(61.5%)	39(19.5%)			
about these products?						
C. What products feature influences your	Brand name	Packaging	Price	200		
purchasing habit?	157(78.5%)	35(17.5%)	8(4%)			
D. Do you purchase foreign products	Yes	No	I don't know	200		

	because of their quality?	136(68%)	42(21%)	22(11%)	
Source	e: Research Findings, 2012				

#### **Group reference**

The results in Table 3 show that family habits influence their members to purchase certain products as it was found that 56.5% of respondents purchase imported products because they have been induced by their family members. This study tested the influence of different groups on consumer's decision to purchase imported products; where in the same table about (49.5%) of respondents indicated that they bought imported goods because

of the influence from family members. Also the research found that the decision to purchase certain products begins from the reference group around the consumers. This implies that decisions of Tanzanian consumers to purchase imported products were influenced by members of their family and group references.

#### **Table 3: Group References**

Criteria	Responses			Respondents
A. Do family habits influence you to use	Yes	No	I don't know	200
foreign products?	113(56.5%)	61(30.5%)	26(13%)	
B. Who influence you to purchase	Family	Friends	Politician	200
imported products?	member			
	99(49.5%)	58(29%)	43(21.5%)	

Source: Research Findings, 2012

#### Uses of local substitutes

The results from table 4 show that 47.5% of the respondents agreed that the tendency to buy foreign products is increasing when local substitute are unavailable. For example respondents explained that when there were no locally made clothes, pharmaceutical products and home utensils they tend to purchase substitutes imported products. Also in the same table 55.5% of the respondents found that if there is a shortage substitutes in

local market, consumers' tendency of purchasing imported products accelerates. Local markets should, therefore diversify their products to reduce consumers chance to opt for imported products. These also were proved by the study of Garland and Coy, (1993); Herche, (1992) which found that the ethnocentric consumer will have no choice but to purchase imported goods if and only if there are no domestic made products.

#### Table 4: Unavailable Local Substitute

Crit	eria	Responses			Respondents
Α.	Do you buy foreign products just	Yes	No	I don't know	200
	only when there are no local	95(47.5%)	78(39%)	27(13.5%)	
	substitutes				
Β.	Is your buying decision of foreign	Yes	No	I don't know	200
	products driven by insufficient local	111 (55.5%)	60(30%)	29(14.5%)	
	products				

Source: Research Findings, 2012

#### IV. CONCLUSION

The tendency to purchase foreign products increased due to globalization that emerged with variety of new fashions of consumed products. Also when there are local companies producing with the same products as those of foreign companies, the local companies should strive to encourage consumers to purchase the local products. At the end, the consumers tend to shift their decision to local products. The use of imported goods increased with the destruction of local markets. This was because, having many foreign products in Tanzania, might have reduced the marketability of the local goods and hence may end up discouraging local productions and local trade. Likewise the tendency to search for the producer's particulars of foreign products as well as local products was the determining factor for consumers' decision to purchase a product. This was used as a sign of quality as well and affordability. Products with very popular brand names were reported to be purchased more than those whose brand names were not popular. Similarly family life style and habits played a great role to influence their members on the use of imported products. This is very common where there is a habit of using imported products in family. This tends to influence family members to adapt that habit. So, family habits to consume some products has tendency to influence purchasing decision of households. Lastly the findings showed that the chance to buy imported products increased with unavailability of local substitutes. It can be concluded that unavailability of local substitutes increases the chance of purchasing foreign products.
#### V. RECOMMENDATIONS

The government of Tanzania should enforce laws intended to reduce the exploitation of consumers by producers in areas of product quality, price and promotions. In this regard, the organization dealing with standard of goods in Tanzania should conduct frequent inspection for local manufacturers. More vigorously and extensively, manufacturers should constantly undertake marketing research to identify the most important psychological factors, which affect Tanzanian consumer's attitudes of their products so as to evolve a target marketing strategy for effective exploit of local market.

Local marketing strategies should be employed, such as the consumer's sense of proud, pricing strategy, brand strategy, promotion strategy, and advertising among local consumers. Finally, the government should restrict the importation of goods that can be manufactured locally in sufficient quantities so as to change the purchasing attitudes towards imported and instead should be towards local products.

Imports are usually seen as determined by level and dynamics of domestic income, level and dynamics of each GDP components (investment, consumption, public expenditure, as differentiated drivers of imports, exports) price competitiveness of domestic production, normally influenced by exchange rate level and fluctuations as well as by inflation differentials between the country and foreign nations, non-price competitiveness of domestic production, for example as far as product quality, technological innovativeness, design, promotion are concerned, national attitudes toward foreign goods, shift in domestic patterns of demand and supply, including the organization of supply chains and the ownership of distribution channels, historical links with certain origin countries, structural trends toward economic integration with other countries. So from this fact in order for local consumers to purchase local goods mostly unless otherwise it suggested the following areas should be considered when making national policies and regulations.

Promotion using local brands more and less than non-local brand products in Tanzania but simultaneously would have very beneficial effects and sustainability to economic growth.

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It would have been impossible to finish the study without an assistance of many who devoted their time, material and moral support. Special thanks should go to Municipal Director who gave us permission to conduct research in his area of jurisdiction. Furthermore, researchers acknowledge the cooperation made by consumers who gave their views about imported goods in Dodoma Municipal.

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#### AUTHORS

**First Author**: Nanzia Florent: Masters of Science in Economics (Project Planning and Management), Bachelor of Science in Economic (Population Development), Email: <u>naflo30@yahoo.com</u>

Second Author: Natalia Kalimang`asi – Master of Business Administration (Finance), Bachelor of Science in Agricultural Economics and Agribusiness, Email: <u>mwaseu@yahoo.com</u> Third Author: Robert Majula – Master of Business Administration (Marketing), Bachelor of Commerce (Marketing), Email: <u>majurobby@gmail.com</u>

**Correspondence Author**: Nanzia Florent – Email: <u>naflo30@yahoo.com</u>;, +255 717 445 642

# The role of Microfinance Institutions in Improving the Economic Status of Women in Tanzania:

# The Case Study of PRIDE TANZANIA (Arusha Branch)

Tiberius P. Mlowosa<sup>\*</sup>, Natalia Kalimang'asi<sup>\*\*</sup>, and Bundala Dodo Mathias<sup>\*\*</sup>

\*Mwalimu Nyerere Institute of Management and Administration (MNIMA) – Dar es Salaam- Tanzania \*\*Local Government Training Institute (LGTI) – Dodoma -Tanzania

*Abstract*- The roles of Micro finance institution is to provide small loans to their clients, creation of employment opportunities, capacity building to borrowers by offering different skills such as use of loans, entrepreneurship and managerial skills. The research intended to examine the role played by financial institution's operations in improving the economic status of women in Tanzania through provision of soft loans, by taking PRIDE TANZANIA-Arusha as a case of study basing on the fact that women are the poorest amongst the world's poor people.

Both primary and secondary data were collected. Primary data was collected by questionnaires, interviews and observation for 100 women respondents whereby Secondary data were obtained from books, journals, research reports, news papers, dissertation and Inter-net website. Responses from interviewees were coded and analyzed by using Statistical Package for Social Science (SPSS) tool. Results from the analysis showed that majority of loan beneficiaries(83.0%) use loans for invest in business and 65.0% of respondents use the profits generated from Pride Tanzania to meet family needs. This implies that most PRIDE TANZANIA loan beneficiaries invest their loan received in business Nearly three quarter of respondents (68.0%) said that they have managed to improve their standard of living after receiving PRIDE TANZANIA loans and the rest said that they have experienced an increase in consumption. Findings from this study proved that microfinance (PRIDE TANZANIA) operations works among the poor people. Furthermore, findings evidenced that women economic status in the community changed from living in difficulties to a better life. The researchers recommends to the policy formulating organs to institute appropriate interventions that will enable easy accessibility of provision of small soft loans to make poor rural people get out of poverty.

*Index Terms*- Microfinance institutions, Loans, Women economic Empowerment

### I. INTRODUCTION

Tanzania got its independence in 1961. Soon after independence Tanzania declared war against three development enemies namely ignorance, diseases and poverty, but there were no specific action against poverty. In Tanzania poverty is caused by many factors such as drought, unemployment, underemployment, low level of production, poor technology and gender bias, division of labour, diseases, large household size, unequal exchange in international trade, problems of refugees, debts burden, dependence on foreign aids, poor policies and introduction of new policies. World bank (2000) argued that dependence on natural rain water causes poor harvest, which result in food and income shortages which would in turn have helped them to afford other social services such as education, housing and health services.

Microfinance is a system that allows people in poor countries to borrow small amount of money to help them start a small business. It is the provision of financial services to those who are excluded from conventional commercial financial services since most are too poor to offer much - or anything - in the way of collateral. Poor people have few <u>assets</u> that can be secured by a bank as <u>collateral</u>

Traditionally women are undermined, they are not given chance to own means of production such as land and other assets. Microfinance institutions (MFI) are organizations that provide microfinance services, ranging from small non-profit organizations to large commercial banks. The nature of commercial banks is that interest rates need to be high to return the cost of the loan. Most commercial banks provide loans on collateral basis. Poor people can not get those loans since they have few <u>assets</u> to be secured by banks which would have helped them to engage in economic activities as a means of poverty alleviation.

Microfinance both credit and savings has potential in improving the well being of the poor in developing countries. Currently the availability of suitable Microfinance institutions (MFIs) in Tanzania, which are capable of serving households, small farmers, small and micro enterprises in rural as well as in urban area, is limited. For the vast majority of Tanzanians whose incomes are low, access to financial services would offer the possibility in managing scarce household and enterprise resources more efficiently, protect against risks, provision for the future, and taking advantages for investment opportunities for economic returns and hence poverty reduction. This is only possible through establishment of well designed and sustainable microfinance activities in the country. PRIDE TANZANIA is one of the microfinance institution involved in the provision of credit to the low income earners in Tanzania.

It is from this context that the study wanted to know to what extent micro finance institutions operations in Tanzania through loans provision improve the economic status of women by taking PRIDE TANZANIA - Arusha branch as a case of study.

### The Concept of Micro Finance

Microfinance both credit and savings has potential to improve the well being of the poor in developing countries. Micro financing is a provision of small loans to small entrepreneur who lack the credentials and collateral demanded by banks. These small loans are normally provided by microfinance institutions (MFIs). They provide financial service which include; saving, credit and insurance. Apart from financial services some MFIs provides social services such as group formation and training on investment skills and group management (Salay, 2006).

MFIs mostly SACCOS are more supportive and friendly to poor ordinary people who are ignored by the sophisticated financial services systems (Banks). These institutions work hand in hand with the Government in extending small loans to poor people to avoid risks/loss of their funds. The groups use the loans in establishing micro business or enriching the already owned micro business.

Having explained the background information of the operations of MFIs it is now appropriate to define the term microfinance. Different scholars have defined the term microfinance differently depending on contingent factors. Microfinance is defined by Longman dictionary of contemporary English (2003) as a system that allows people in poor countries to borrow small amount of money to help them start a small business. Microfinance has also been defined by www.Wikipedia.org as the provision of financial services to lowincome earners. And PRIDE TANZANIA has defined microfinance as Microfinance that involves activities directed at provision of access to financial services for the lower income earners or small and micro-enterprises. In this study the definition given by PRIDE TANZANIA is used.

# The role of MFIs on Women in Developing Countries-Tanzania model

The roles of Micro finance institution is to provide small loans to the low income earners, creation of employment opportunities , capacity building to borrowers by offering different skills such as use of loans, entrepreneurship and managerial skills. Poverty alleviation is a global issue which lies on the concept of upgrading the position of developing countries in the world, focusing to Tanzania. Women need access to MFIs so that they can further raise their income.

The world's poorest, especially women, improve their lives and escape poverty through access to microfinance and technology. Global poverty is a daunting challenge. But by making very small soft loans using available MFIs to very determined people, millions of the poor rural Tanzanians will pull themselves out of poverty (Hon. Eng. Mnyaa (MP) during18 Parliamentary session, seat No. 11 on 08 February, 2010).

According to World Bank report (1989), most African women in common face a variety of legal, economic and social constraints involving in global activities. Most Tanzanian woman has always being active in agriculture, trade, and informal sector and in low paid jobs. Changing economic and social situation of women in Tanzania will increase women capabilities and their abilities towards gender balance.

It is from these facts that the president of United Republic of Tanzania His excellence Jakaya Mrisho Kikwete in 2006 came up with the idea of providing soft loans to the lower capital business groups across Tanzania by assigning 20 billions and I billion to Tanzania mainland and Zanzibar respectively. The loans extremely known as JK billions was aimed at empowering SMEs grow bigger to both Tanzanians to increase their levels of income and enable them participate effectively in building the national economy.

### Limitations of Micro Finance Institutions in Relation to Women empowerment

Most Micro finance Institutions provide soft loans on collateral bases. Women are deprived from owning means of production such that they cannot easily access these loans. Social attitudes to women are responsible for gender differences in both system of labor, training and education. There is a discrimination against woman and the judicial system does not provide adequate protection for women and children, inadequate capacity of the public law enforcement Institutions, low awareness of civil rights, ambiguity of law and limited options for redress (WB 1988).

In addition, most poor people have few <u>assets</u> that can be secured by a bank as <u>collateral</u>. As documented extensively by <u>Hernando de Soto</u> and others, even if they happen to own land in the <u>developing world</u>, they may not have effective <u>title</u> to it. This means that the bank will have little recourse against <u>defaulting</u> borrowers. Although much progress has been made, the problem has not been solved yet, and the overwhelming majority of people who earn less than \$1 a day, especially in the rural areas, continue to have no practical access to formal sector finance.

Women experience the highest degree of deprivation from means of production that results to them having low economical status in the community. If we compare the lives of the inhabitants of poorest communities across the world especially third world countries, women are the poorest followed by children. This has been evidenced by women facing cases like malnutrition, AIDS, less access to primary health care, clean water, education, less government seats and informal productive activities followed by having low capital and poor technology which are hidden by ignorance, illiteracy and their potentiality in the society (NSGRP, 2002).

ATRCW (1986), hooding (1987), lack heed and Garman (1987), Byrne (1988), Ankara Hein (1995) and light –Doyle (1991) both explain some factors that limit woman perception in equity with male to be prejudices about woman abilities and attitudes, their roles, their behavior and aspirations, culture, political and society, absence of role models, parental expectations, beliefs, cultural, tradition, teachers altitude and behavior, career guidance, employer altitude, lack of education and training, families, lack of quotes, lack of exposure to technically oriented subjects, group pressure at home and at school, interactions between girls and boys, lack of school books and resources, materials and lack of confidence to try new things. This list requires to be defined to find out exactly which factors are the most and which are the least in relation to how women suffer legal, economic and social constraints.



Mr. <u>Kofi Annan</u>, former UN Secretary General (in the above picture) addressed the need for financial services by the poor as: "The great challenge before us is to address the constraints that exclude people from full participation in the

financial sector... Together, we can and must build inclusive financial sectors that help people improve their lives". All in all the main issue here is setting enabling environment for the provision of micro financial services that will enhance the poor get rid of poverty.

### **Overview of conceptual framework**

The conceptual framework of this study is based on the assumption that women seeking soft loans from PRIDE TANZANIA are a result of being in a state of poverty, unemployment and low income earners. Hence it is expected that most women would heavily rely on other variables like loan conditions, motives for acquiring loans, impact of loan interest rate and attitudes towards women economic empowerment so as to inculcate the state of poverty to a better life among Tanzanian women.



Figure 19: Conceptual framework of the study

Source: Researcher's own Construct 2010

#### Sample size and area of the study

The study was conducted at PRIDE TANZANIA in Arusha branch because the topic is relevant to the selected organization and is where the researchers have the access to conduct the study. Also the financial constraints have influenced researchers to choose Arusha region so that data collection process is less cost full. The population sample comprised of 100 respondents who participate in taking soft loans from PRIDE TANZANIA in Arusha branch. The sample was proposed to be used because was feasible and practical to obtain information required from different clients of PRIDE TANZANIA in Arusha Region.

#### Methods of data collection and analysis

Both primary and secondary data were used by researchers to investigate the problem. Primary data was collected from questionnaires, interviews and observation whereby Secondary data were obtained from different sources including books, journals, research reports, news papers, dissertation stations and Inter-net website. Responses from respondents were coded and analyzed by using statistical tool of data analysis (SPSS). Results of the analysis were presented descriptively in a tabular form followed by narrative description of the results.

### III. RESULTS

#### Level of education

Table 1 below analyses respondents' level of education. Results shows that 73.0% of respondents (women getting loans from PRIDE TANZANIA) are primary school leavers, 27(27.0%) of them are secondary school leavers and none of them are graduates of higher learning educations.

# Table 1: Below provides a summary of loan recipients' level of education

Level of education	Frequency	Percent
Primary education	73	73.0
Secondary education	27	27.0
Higher learning	0	0
education		
Not applicable	0	0
Total	100	100.0
Source: Field survey 2010		

From the basis of the above analysis it is clear that the majority of women seeking loans from PRIDE TANZANIA are primary school leavers who don't have other income apart from the loans provided by Pride Tanzania and poor basic business skills.

### Sex of respondents

Table 2 shows that out of a total of 100 respondents 88(88.0%) respondents among loan applicants from PRIDE TANZANIA are females and 12(12.0%) were males. This implies that most respondents seeking loans from PRIDE

TANZANIA are females, this is due to the fact that most women are poor, unemployed and have low incomes.

# Table 2 below provides a summary of Sex of Pride Tanzania Customers

Sex of the customer	Frequency	Percent
Female	88	88.0
Male	12	12.0
Total	100	100.0
Source: Field survey 2010	0	

#### **Marital Status**

The analysis in Table 3 indicates that out of a total of 100 respondents, 51(51.0%) respondents were widows, 23(23.0%) were divorced, 15(15.0%) were single and 11(11.0%) were married.

The findings below indicate clearly that the majority of women seeking loans from Pride Tanzania are widows. This is because widows have to take the responsibilities of caring for the family, sending their children to school, ensuring that there is enough food for the family, health care since they have no husbands to assist them.

# Table 3 below provides a summary of marital status of Pride Tanzania Customers

Marital Status	Frequency	Percent
Single	15	15.0
Married	11	23.0
Divorced	23	11.0
Widow	51	51.0
Total	100	100.0
Source: Field survey 2	010	

#### Employment

Table 4 shows that out of a total of 100 respondents, 29 (29.0%) respondents among women getting loans from PRIDE TANZANIA are formally employed and 71(71.0%) of them are self employed. This means the majority of women seeking loans from PRIDE TANZANIA are self employed.

# Table 4 below provides a summary of employment status of Pride Tanzania Customers

Occupation	Frequency	Percent
Yes	29	29.0
No	71	71.0
Total	100	100.0
Source: Field survey 2	010	

#### Residence

From the analysis below we find that outl of 100 respondents, 14(14.0%) respondents among women getting loans from PRIDE TANZANIA live in their own houses and 86(86.0%) of them live in rented houses. It can be concluded in this part that the majority of women seeking loans from PRIDE TANZANIA live in rented houses. It was learnt from the

findings that 97% of respondents were widows who are living in rented houses after the death of their husbands and 13% are single. It was further found that all 100(100%) respondents live within Arusha Municipality. This indicates women from rural areas have no access to PRIDE TANZANIA loans.

# Table 5 below provides a summary to show the Residential status of Pride Tanzania Customers

Own house or rented	Frequency	Percent
Own house	14	14.0
Rented house	86	86.0
Total	100	100.0
Source: Field survey 2010	1	

# Motives for opting Pride Tanzania loans:

Table 6 shows that out of 100 respondents, 73(73.0%) of them said that the loans are easily accessible while 27(27.0%) of the respondents said that they opted PRIDE TANZANIA loans because of low interest rate. It is evidenced from the table 6 below that many women seek loans from Pride Tanzania because they are easily accessible. It was further learnt that some women seek loans from Pride Tanzania because the loan conditions are fair.

# Table 6 below provides a summary to show why they have decided to take Pride Tanzania loans:

Reasons for opting Pride Tanzania loans	Frequency	Percent
Low interest rate	27	27.0
Easy to access the loans	73	73.0
Total	100	100.0
Source: Field survey 2010		

# Procedure for processing loans

Table 7 shows that out of a total of 100 respondents 93(93.0%) respondents among women getting loans from Pride Tanzania said that it is not difficult to process Pride loans while 7(7%) said it is very difficult to process PRIDE TANZANIA loans. The above table reveals that a big number of women seek loans from Pride Tanzania because it is easy to process the loans and it doesn't' take long time .

### Table 7 below provides a summary to examine the procedure of processing Pride Tanzania loans:

Procedures processing Pride loa	for ans	Frequency	Percent
Not difficult		93	93.0
Very difficult		7	7.0
Total		100	100.0
Source: Field survey	2010		

However, it was observed from the study that provision of loans is through enterprise groups of five (5) members. Enterprise groups meet once every week. If a loan applicant is not from any enterprise group is not qualifying to get loan. This finding is in line with Anand (2005) who found in his study that the role of Self Support Help Groups (SHG) in empowering poor women in Kerala, India have great potential in alleviating poverty and empowering women, provided partisan, politics and vested interests are kept at bay. Also he found that provision of credit alone may not produce the desired impact, support services and structures through which credit is delivered ranging from group information and training to awareness raising and wide range of other supporting measures are critical to making measures felt.

### The motives behind for women to acquire loans

The analysis below proves that out of 100 respondents, 70(70.0%) of them said that the got the information from their relatives, 17(17.0%) get information from Pride Customers and 13(13.0%) respondents among women getting loans from Pride Tanzania said that they got information about the loans from their neighbors. The findings suggest that most of women seeking loans from Pride Tanzania got information about the loans from their neighbors from Pride Tanzania got information about the loans from their neighbors.

### Table 8 below provides a summary to show where they got information about Pride Tanzania loans

Source of information about Pride loans?	Frequency	Percent
My neighbor	13	13.0
My relative	70	70.0
Mass media	0	00.0
Pride customers	17	17.0
Total	100	100.0
Source: Field survey 2010		

# Period when started receiving Pride Tanzania loans

From the table 9 below we can argue that out of a total of 100 respondents, 72(72.0%) respondents among women who are getting loans from Pride Tanzania said that they started taking the loans before 2006 and 18(18.0%) of them said that they started taking the loans from 2007 to date. Therefore it is observed from the above table that the majority of women started taking Pride Tanzania loans before 2006. This also reveals that these PRIDE TANZANIA clients are benefiting from the loans given and are satisfied by the service given by the institution that is why they continue taking loans.

### Table 9 below provides a summary to show the time when they started receiving Pride Tanzania loans:

Period when started taking Pride loans	Frequency	Percent
Before 2006	72	72.0
From 2007 to date	18	18.0
From 2008 to date	0	00.0
From 2009 to date	0	00.0
Total	100	100.0
Source: Field survey 2010		

### Loan amounts received from Pride Tanzania

Table 10 shows that out of a total of 100 respondents all 85(85.0%) respondents among women getting loans from Pride Tanzania said that they are getting the loans above 300,000 and 15(15.0%) between Shs. 200,000 and 300,000. This implies that the majority of women seeking loans from Pride Tanzania receive the loan amounts above Shs. 300,000.

# Table 10 below provides a summary of loan amount received from Pride Tanzania:

Loan amount received	Frequency	Percent
Below Sh. 100,000	0	00.0
Between Shs. 100,000	0	00.0
and 200,000		
Between Shs. 100,000	0	00.0
and 200,000		
Between Shs. 200,000	15	15.0
and 300,000		
Above Shs. 300, 000	85	85.0
Total	100	100.0
Source: Field survey 2010		

### **Uses of Loans Received**

Table 11 shows that out of a total of 100 respondents, 83(83.0%) respondents said they invest in business, 13(13.0) said they use part of the loan in meeting family needs and 4(4.0%) said they used to spend the loan received in social life From the analysis below it implies that most PRIDE TANZANIA loan beneficiaries invest the loan received in business.

# Table 11 below provides a summary on the uses of loans they receive from Pride Tanzania:

Uses of loans received	Frequency	Percent
Invest in business	83	83.0
Increase the number of	0	00.0
family members		
partly meet family needs	13	13.0
Spend in social life	4	4.0
Total	100	100.0
Source: Field survey 2010		

### Use of profits generated from Pride Tanzania loans

Table 12 shows that out of a total of 100 respondents, 65(65.0%) respondents among women getting loans from Pride Tanzania said that they used to meet family needs and 35(35.0%) of them said that they used to reinvest in business. On the basis of the above analysis the majority of loan beneficiaries use the profits generated from Pride Tanzania to meet family needs.

# Table 12 below provides a summary on use of profitsgenerated from Pride Tanzania loans:

<i>Use of profits generated from the loans</i>	Frequency	Percent
Reinvest in my business	35	35.0
Increase the number of	0	00.0
family members		

Meet family needs	65 0	65.0 00.0	
Others	0	00.0	
Total	100	100.0	
Source: Field survey 2010			

# Changes experienced in life style after receiving Pride Tanzania Loans

Table 13 shows that, 68(68.0%) respondents said that they have managed to improve their standard of living after receiving Pride loans and 32(32.0%) of the respondents said that they have experienced an increase in consumption as evidenced in the below analysis.

# Table 13 below provides a summary on the changes in lifestyle after receiving Pride loans:

Changes experienced in life style after receiving loans	Frequency	Percent
Manage to improve the standard of life	68	68.0
Increase the number of family members	0	00.0
Increase in consumption	32	32.0
Total	100	100
Source: Field survey 2010		

Ms. Rozi Mushi aka Manka, a resident of Sakina area in Arusha Municipality had the following while responding to our interview with her: "I used to live with my friends in a ghetto with lots of life difficulties as I had no place to shelter myself, no close relative to assist me and always uncertain of what to eat in a day. My relative informed me about Pride loans, we decided to form a group of five people and went for the loan. After joining Pride Tanzania loan scheme I real feel very proud, things changed very quickly. I can now buy food for myself; I have rented two rooms within Arusha Municipality and I managed to buy enough furniture to support my life. Thanks God"!

### Assisting their husbands in meeting home need

Table 14 shows that out of a total of 100 respondents, 87(87.0%) respondents among women getting loans from PRIDE TANZANIA said that they used to assist their husbands to meet home needs and 13(13.0%) of them said that they don't assist their husbands in meeting home needs.

# Table 14 below provides a summary on how women assist their husbands in meeting home needs:

Assisting their husbands in home needs	Frequency	Percent
Yes	87	87.0
No	13	13.0
Total	100	100.0
Source: Field survey 2010		

It is clear from the above analysis that the majority of women taking loans from Pride Tanzania used to assist their husbands in meeting home needs. This was further evidenced by Mama Laizer, a primary school teacher within the Arusha Municipality at Sanawari area, who responded as follows during the interviews: "We used to depend on our little salaries with my husband to support our life and sent to school our 10 children in our family. Life was very biting and difficult as we could not manage to send all of our children to schools in time. Sometimes we ended up drinking porridge in a day. We put on used clothes. That was our normal life. Life changed after joining Pride Tanzania loan scheme. You can not believe it. We now have our own house, we are able to pay for school fees for our children in time and we are able to buy food for all of us. She considers the move as God's miracles"!

### Difficulties faced by women in running their business

Table 15 shows that out of a total of 100 respondents, 55(55.0%) respondents among women getting loans from Pride Tanzania said that they don't face any difficulties in running their business and 45(45.0%) said that they face some difficulties in running their business. Basing on below analysis it is revealed that most loan beneficiaries of PRIDE TANZANIA face no difficulties in running their business.

# Table 15 below provides a summary on the difficulties women face in running their business:

Difficulties faced running business	in	Frequency	Percent
No		55	55.0
Yes		45	45.0
Total		100	100.0
Source: Field survey 20	10		

However, it was observed from the findings that 75% out of those respondents who used to face difficulties in running their business due to lack of market for their products and the remaining 25% joined recently with Pride loan scheme. They said that they face difficulties simply because they don't have specific area far selling their products. Sometimes they are chased by the council soldiers.

### Affordability of loan interest

It is evidenced from table 16 that out of 100 respondents, 84(84.0%) respondents among women getting loans from Pride Tanzania said that Pride loans interest rate is affordable and 16(16.0%) said the loan interest is not affordable. The analysis below converses that the PRIDE TANZANIA interest rates are affordable.

# Table 16 below provides a summary on affordability of Pride Tanzania loans interest:

Affordability interest	of	loan	Frequency	Percent
Yes			84	84.0
No			16	16.0

Total	100	100.0
Source: Field survey 2010		

#### Affordability of loan repayment in time

Table 17 shows that out of a total of 100 respondents, 90(90.0%) respondents among women getting loans from Pride Tanzania agreed that they manage to make loan repayment in time and 10(10.0%) said they don't manage to repay the loan in time. The analysis shows that most loan beneficiaries of Pride Tanzania manage to make loan repayment in time. However, it was observed from the study that provision of loans is through enterprise groups of five (5) members. Enterprise groups meet once every week. The findings revealed that when an enterprise group member fails to make loan repayment in time, the rest in the enterprise group are required to find her otherwise the defaulter's properties will be seized for auction to recover the loan taken. In case an enterprise group member is not found the rest will carry the burden of paying the defaulters loan.

# Table 17 below provides a summary on affordability of PrideTanzania loans repayment in time:

Affordability of repayment in time	f loan	Frequency	Percent
Yes		90	90.0
No		10	10.0
Total		100	100.0
Source: Field survey	y July , 20	010	

### IV. CONCLUSION

The study findings conclude that majority of PRIDE TANZANIA loans beneficiaries are primary school leavers and married unemployed women who live in rented houses within the urban areas of Arusha Municipality. It is also leant that the Loan conditions provided by PRIDE TANZANIA are fair, easily accessible, and easy to process them. The study also found that the motives behind for women to acquire loans from PRIDE TANZANIA are to invest in business undertakings. The majority of them started taking loans before 2006 to date and they have been receiving the loan beyond Tshs. 300,000. Furthermore, this study evident that women involved in taking loans from PRIDE TANZANIA, their economic status in the community changed from living in difficulties to a better life because most of them have managed to meet their daily needs. Moreover, result revealed that PRIDE TANZANIA loan interest and repayment procedure are affordable and beneficiaries can manage to repay the loan in time. This make them run their business with little difficulties. However, it is observed from the study that provision of loans is through enterprise groups of five (5) and when an enterprise group member fails to make loan repayment in time, the rest in the enterprise group are required to find her otherwise the defaulter's properties will be seized for auction to recover the loan taken. In case an enterprise group member is not found the rest will carry the burden of paying the defaulter's loan.

#### V. RECOMMENDATIONS

- (i) The study recommends to PRIDE TANZANIA extended more small soft loans to as many women as possible, to enable millions of poor Tanzanian's women pull themselves out of poverty.
- (ii) This study has revealed that Pride Tanzania is a microfinance institution which is engaged in the provision of small soft loans to the poor people get out of poverty in urban areas leaving the rural areas unsaved. It is recommended here that it is high time for PRIDE TANZANIA extend its service to rural areas where the majority of poor communities are living.
- (iii) It is further recommended that the Government should make attracting environments to investors in micro finance who wish to make such investments in the rural areas where the poor peasants are living to enable them defeat poverty through Rural Micro Finance Operations.

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#### AUTHORS

**First Author**: Tiberius Mlowosa: Masters of Science in Finance, Advance Diploma in Accounts, Email:

tiberiusmlowosa@yahoo.com

Second Author: Natalia Kalimang`asi – Master of Business Administration (Finance), Bachelor of Science in Agricultural Economics and Agribusiness, Email: <u>mwaseu@yahoo.com</u> **Third Author:** Bundala Dodo Mathias – Master of Business Administration (Agribusiness), Bachelor of Education (Mathematics), Email: <u>dodobm@yahoo.com</u>

**Correspondence Author**: Tiberius Mlowosa - Email: tiberiusmlowosa@yahoo.com +255 767 284 988

# The impacts of truancy in academic performance among secondary school students: A case study of Kigamboni Ward in Temeke Municipality

# Tiberius P. Mlowosa<sup>\*</sup>, Natalia Kalimang'asi<sup>\*\*</sup>, and Bundala Dodo Mathias<sup>\*\*</sup>

\*Mwalimu Nyerere Institute of Management and Administration (MNIMA) – Dar es Salaam- Tanzania \*\*Local Government Training Institute (LGTI) – Dodoma - Tanzania

Abstract- Truancy is any intentional unauthorized absence from compulsory schooling. This refers to absences caused by students of their own free will and not caused by poor medical conditions. also refer to students who attend school but do not go to classes (Wikipedia, the free encyclopedia). Truancy is the serious problem in Tanzania especially in cities. The Ministry of Education and Vocational Training reported that in 2009/10 Form II has the highest number of student drop outs which stands at 9,627 per annum and the main reasons for drop out were 36.2 % and pregnancies 20.4 % (URT, 2011). truancy Although some studies have been done on the matter, many have been focusing on the causes, without putting into consideration the impacts in academic performance. Therefore this study intended to investigate the impacts of truancy in academic performance among secondary school students.

The research findings indicated that 51.7% of the respondents agreed that truancy is a latent base for poor academic performance among secondary school students in Kigamboni ward. Then a wake-up call for government and society to redefine the effectiveness of the current education curriculum and education policies is needed. In contrary, poor performance in Tanzania secondary schools is not only caused by attendance characteristics alone but other factors such as like poverty, earl child pregnancy, drug abuse, poor parental guide, peer groups and lack of seriousness in classroom, also cause poor performance

From views expressed by respondents in the field, this research recommends that education stakeholders together with the government in collaboration with Ward Executive Officers and Village Executive Officers should make sure that every school age individual attends school. Those parents and guardians whom their children do not attend classes regularly should be arrested and the rule of law to play its role. The study further recommends that parents should educate their children the dangers of early pregnancies and marriages, children should be given sexual education, the school laws related to pregnancies should be strengthened as well as the government should consider alternative means of ensuring that those children who have lost their parents attend school and are handled accordingly.

Index Terms- Truancy, education, child pregnancy, peer groups

### I. INTRODUCTION

Truancy is the serious problem in Tanzania especially in cities. According to the Basic Education Statistics report of 2009/10 released by the Ministry of Education and Vocational Training recently, Form Two has the highest number of student drop outs which stands at 9,627. The report also indicates that the main reasons that prompt students to drop out of school is truancy 36.2 %. The report shows that drop outs due to truancy decreased from 68.7 % in 2008 to 36.2 % in the following year. However, the situation has been attributed to truancy, the tendency, which diminishes student's performance.

Education can be defined as the transmission of the values and accumulation of knowledge of a society; it is designed to guide students in learning a culture, molding behavior in the ways of adulthood, and directing them toward eventual role in society. Education is there to help people become useful members of the society, should also help them to develop an appreciation of their cultural heritage and live more satisfying lives.

A study titled causes and impacts of truancy among primary school pupils in Tanzania conducted in 2002 reveals that parents are child's first and perhaps most important teachers as they teach their children attitudes, habits and values that help to shape their character and remain with them throughout their life, but few parents have neither time nor ability to teach their children everything they need to know. They turn over to many educators; thus, it is too difficult to afford life without education since education is the foundation of human life, (Restuta Shirima 2002) however truancy is the big problem hindering academic performance among secondary school students in Tanzania, Kigamboni ward in Dar es Salaam inclusive.

The term knowledge refers to the information, understanding and skills that you gain through education or experience. (Oxford Advanced Learner's Dictionary 6th ed)

The term training refers to the acquisition of knowledge, skills, and competencies as a result of the teaching of vocational or practical skills and knowledge that relate to useful competencies. It forms specific the core of apprenticeships and provides the backbone of content at institutes of technology. (Wikipedia, the free encyclopedia)

Education attainment is an important determinant of ones better life in all aspects, if some missed education he or she can not think further than what he or she just sees, mostly people with no education have got few chances or opportunities of getting job keeping in mind the level of unemployment is increasing year after year. Also a person with no education lives in isolation where he or she isolates himself or herself because she or he can not match with today's world, developments, for example developments in communication where people are communicating through e-mails, Skype, all these requires one to have some sort of education. If you want to compete for a post in government leadership you should be educated at least be a degree holder for higher posts like Member of Parliament.

A 1990 study by Obondo and Dhadphale reported that about 10 % of school non attendance by children in Kenya was due to truancy. Ollay studied 169 street youths in Ibadan, Nigeria and about 47% of these had a history of truancy. These studies suggest an association between truancy and being on the streets as well as that truancy is an important contributor of nonattendance at school.

According to Rozumah Bahamdin (2003), movement of students from one class to another class provides some of the students the opportunity not to go to the class and these movements from one class to another class make them dare to play truant.

Truancy has been labeled one of the top ten major problems in this country's schools, negatively affecting the future of the youth. In fact, absentee rates have reached as high as 30 percent in some cities. In New York City, about 150,000 out of 1,000,000 students are absent daily. The Los Angels Unified School District reports that 10 percent of its students are absent each day. (Azizi Yahya et al 2010)

Tanzania's state education system is under performing and excludes a range of children, primarily those who are poor, those from difficulty family backgrounds, and those who have special education needs. Children in such circumstances are particularly at risk of non enrolment, exclusion, truancy and dropping out from school. According to the Basic Education Statistics report of 2009/10 released by the Ministry of Education and Vocational Training recently, Form Two has the highest number of student drop outs which stands at 9,627. The report also indicates that the main reasons that prompt students to drop out of school is truancy (36.2 per cent) followed by pregnancies (20.4 per cent).

### II. APPLIED METHODOLOGY

### Theory of Truancy and its impacts

Education attainment is a crucial predictor of several healthrelated lifestyles and premature mortality. However truant behaviors have potential to curtail possibilities of meaningful academic achievement. Truancy is a predictor of multiple health risk behaviors among adolescents. Truant adolescents have been reported to engage in risky sexual practices, illicit drug use, alcohol drinking and cigarette smoking. Henry suggested that the unsupervised time that adolescents have when they are truant allows them to initiate and maintain unhealthy behaviors. (Azizi Yahya et al 2010)

Truancy in childhood may be associated with adverse social and health outcome later in life. Studies have reported that adults who were truant as adolescents were more likely to experience marital or job instability and psychological maladjustment when compared to their counterparts who were not truant as adolescents. (Azizi Yahya et al 2010) The students' notoriousness are not only confined to smoking cigarettes, fighting with each other or behaving obscenely but also involving dumping babies, running away from home, free sex and mingling. According to Belthelheim (1950), now they even dare to commit serious criminal acts such as joining bad syndicate and become gangsters, murder, with or without firearms burglar, rape, prostitution, gambling, vandalism, drug abuse, alcoholic, and pornography.

Absenteeism is detrimental to student's achievement, promotion, graduation, self-esteem and employment potential. Clearly, students who miss school fall behind their peers in the classroom. This, in turn leads to low self-esteem and increase the likelihood that at-risk students will drop out of school. (Azizi Yahya et al 2010)

In longitudinal study of African-American males, Robins and Retcliff (1978) found that of those students who were often truant in high school and primary 75% failed to graduate. Failure to graduate, in turn, is associated with diminished earning potential in adulthood and other poor outcome.

About 3,210 secondary school students in Mtwara Region are not attending classes regularly due to lack of basic needs. Data from region education office show that 3,208 missed regular class lessons in the region. However, the situation has been attributed to truancy, the tendency, which diminishes student's performance. Pass rate in secondary schools in Mtwara dropped from 60.4% in 2009 to 29% last year. (The Citizen 19th October 2011)

The Ziwani Secondary School headmaster, Mr. Abdallah Kombo, said truancy is one of the challenges hindering student's academic performance. About 40 students, including girls, failed to complete their secondary education at the school in the year 2011 due to truancy among other factors. "We enrolled 106 students in 2008, but only 67, out of them are 49 boys and 18 girls completed Form Four while 39 students, including 13 boys, failed to graduate due to truancy, pregnancy and transfer," the headmaster said. (The Citizen, 19th October, 2011)

Related studies about truancy based on education were done, according to the Encyclopedia vol.VI E pp 87-103. Most countries spend a large amount of time and money to provide formal education for their citizens. The school system of all modern nations provides both general education and vocational training. Most countries also provide special education programs for disabled or gifted children. The book explains that effective classroom is one in which a warm relationship exists between teachers and students as the teacher selects contents and instructional strategies and use skills for better instructions and classroom management to improve students achievement.

There is significant evidence that such an environment leads to higher understanding and transfer of terming (Hunter 1982, comings 1985). When this mutual respect and cooperation are absent, tension builds up between individuals and problems of discipline soon emerge.

Most parents do not visit school except in response to problems. Parents' involvement in the school activities is likely to be related to their own educational levels, and hence many illiterate parents may need encouragement to become involved in the running of schools. Parent attitudes towards education particularly not encouraging girls to acquire good education are also critical to students' performance. Potentiality exists for academic based parents in all schools possibly at close of the term before the June breaks, Restuta Shirima (2002).

Absenteeism is a serious problem for most schools in Tanzania. In most schools, attendance deteriorates in the higher classes i.e. form III and IV girls absenteeism is lower than boys who are perceived as having less desire to learn more and likely to be involved in petty trade. The most common reason for absenteeism is illness followed by death occurring in the family. Indeed illness is a recurring factor which contributes strongly to absenteeism, dropout and non-enrolment. (Basic education statistics report 2009/10).

Drug abuse is a complex health and social problem which affect both developed and developing countries. It is sometimes referred to as substance or chemical abuse. Drug abuse among students has increased and has now become a source of public concern specifically among parents or guardians and teachers. Many students engage in drug abuse due to peer pressure, home environment, drug access, smoking habits, living in areas and family members influence. Children adopting to parents' character this result into the increase of school dropouts, unwanted pregnancies and death related due to drug abuse which has caused serious threat to national health and welfare, Restuta Shirima 2002.

According to the basic Education Statistics report 2009/10, student dropout rate in secondary schools is much higher in Ordinary Level and lower in Advanced Level classrooms in the country. Form Two has the highest number of student dropouts which stands at 9,627.

## Sample size, area of the study and selection procedure

This study used simple random sampling. Data were obtained from the random list (the sampling frame or sampling list) which included the ward education officers, head teachers, parents and students themselves. Both had a chance to participate in the study. The study was conducted in Temeke municipality particularly the Kigamboni ward. The study area was chosen as it suited the researchers in terms of resources (time and cost) and social – geographical familiarity which were instrumental in getting reliable information. A sample of 60 respondents comprising of 30 male respondents and 30 female respondents was chosen. Employed sampling technique proved feasible and practical for obtaining information required from different respondents within Kigamboni ward in Temeke municipality.

### **Data collection**

A closed and open – ended structured questionnaire were used in collecting primary data. The questionnaires were administered in English while Kiswahili language was used to facilitate communication and avoiding communication barriers. The researchers carried self administered questionnaires and supplemented information by secondary data which were extracted from official sources.

### Data analysis

The analysis of data was done using SPSS (Statistical Package for Social Scientists). The study employed regression analysis to explore the extent with which truancy leads to poor academic performance among secondary school students. Correlation coefficient was used to measure how strong or weak the variables in consideration are related. In data analysis, relationships or differences between variables are subjected to statistical tests of significance existing among data. Data analysis involves three phases including the data preparation, descriptive analysis and the hypothesis testing.

Data preparation was performed immediately after the completion of data collection. The aim was to make data as error free as possible (Amin, 2005 p. 306). This phase involved activities such as editing, coding, computer data entry and the verification of the accuracy of the data to be entered onto the computer so that they are amenable to analysis.

The description analysis was the second phase of data analysis aiming at describing characteristics of the sample (Amin, 2005). The respondent's demographic characteristics were analyzed and presented in tables. Testing of hypothesis using SPSS to check the relationship between variables in the study ended the last phase of data analysis.

### III. FINDINGS

# Truancy and academic performance among secondary school students

The result in Table 1 below revealed that out of 60 respondents, 31(51.7%) respondents strongly agreed that poor academic performance among secondary school students is due to truancy, 23(38.3%) respondents agreed that poor academic performance among secondary school students is due to truancy. This signifies that poor academic performance among secondary school students are not attending classes at the end of the day knows nothing to answer when in exams.

Table 1:	Truancy and	l academic p	performance	among secondar	y school students:	(N=60)
				0		· · · · ·

Responses	Frequencies	Percent	Cumulative percent
Strongly agree	31	51.7	51.7
Agree	23	38.3	90.0
Undecided	4	6.7	96.7
Strongly disagree	2	3.3	100.0
Total	60	100.0	

Source: Field survey 2012

# The number of days a student is likely to attend to school in a month period

The information presented in table 2 below suggests that, majority of the respondents of which are students attends school

for at least 20 days a month which culminates to 55.0%. Parents do go to school once in a while when there is a need to.

Table 2:	Number	of days a	student is	likely to	attend t	o school in a	ı month p	eriod: (I	N=60)
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Days	Frequencies	Percent	Cumulative percent
5	8	13.3	13.3
10	73	11.7	25.0
20	33	55.0	80.0
30	12	20.0	100.0
Total	60	100.0	

Source: Field survey 2012

# The other possible contributing factors to poor academic performance

Respondents were asked to rank the most contributing factor to poor academic performance among secondary school students. They were provided five factors as options including; drug abuse, truancy, peer groups, early child pregnancy, and lack of seriousness in classroom.

From table 3 below, it is revealed that lack of seriousness is the major factor that contributes to poor academic performance among secondary schools. 25(41.7%) of respondents reported lack of seriousness in classroom to be the most contributing factor that leads to poor performance, 14(23.3%) said poor academic performance is due to truancy, 9(15%) said it is due to drug abuse, 8(13.3%) said is due to peer groups while 4(6.7%) believes that poor academic performance is caused by early child pregnancy.

Table 3: The other	possible contributing	g factors to pool	r academic per	formance: (N = 60)
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Responses	Frequencies	Percent	Cumulative percent
Drug abuse	9	15.0	15.0
Truancy	14	23.3	38.3
Peer groups	8	13.3	51.7
Early child pregnancy	4	6.7	58.3
Lack of seriousness in	25	41.7	100.0
classroom			
Total	60	100.0	

Source: Field survey 2012

### The relationship between poor parental guide and truancy

Table 4 below represents the respondent responses on the relationship between poor parental guide and truancy. 35(58.3%) strongly agreed that truancy is due to poor parental guide,

21(35%) agreed, 3(5%) were undecided while 1(1.7%) disagreed. The majority of respondents agreed on the statement that poor parental guide influences truancy among secondary school students.

Table 4:	The relationship	between	poor parental	l guide and	truancy	(N =	60)
					•/		

Responses	Frequencies	Percent	Cumulative percent
Strongly agree	35	58.3	58.3
Agree	21	35.0	93.3
Undecided	3	5.0	98.3
Disagree	1	1.7	100.0
Total	60	100.0	

Source: Field survey 2012

# Correlation between drug abuse and poor academic performance

Table 5 below illustrates on the correlation between drug abuse and poor performance. The field results reveal that 51.7% of the respondents agreed on the positivity between drug abuse

and poor performance among secondary school students in Kigamboni ward.

Responses	Frequencies	Percent	Cumulative percent
Strongly agree	31	51.7	51.7
Agree	18	30.0	81.7
Undecided	4	6.7	88.3
Disagree	5	8.3	96.7
Strongly disagree	2	3.3	100.0
Total	60	100.0	

Table 5: Correlation between drug abuse and poor academic performance

Source: Field survey 2012

#### IV. CONCLUSIONS

The result from the study has revealed that poor academic performance is a problem and it has been growing. 51.7% of the respondents has agreed that truancy is a latent base for poor academic performance among secondary school students in Kigamboni ward. This number is alarming and therefore there should be a wake-up call for government and society to redefine the effectiveness of the current education curriculum and education policies. In contrary poor performance in Tanzania secondary schools is not only caused by attendance characteristics alone but there are other factors which also cause poor performance like poverty, earl child pregnancy, drug abuse, peer groups and lack of seriousness in classroom

#### V. POLICY RECOMMENDATIONS

- i. Education stakeholders together with the government in collaboration with Ward Executive Officers and Village Executive Officers should make sure that every school age individual attends school as education curricular, parents and guardians who their children do not attend classes regularly should be arrested and the rule of law to play its role.
- ii. Parents should educate their children of the dangers of pregnancies and early marriages, also children should be given sexual education and the school laws related to pregnancies should be strengthened.
- iii. The government should consider alternative means of ensuring that those children who have lost their parents attend school and are handled accordingly.

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#### AUTHORS

**First Author:** Tiberius Mlowosa: Masters of Science in Finance, Advance Diploma in Accounts, Email:

tiberiusmlowosa@yahoo.com

Second Author: Natalia Kalimang`asi – Master of Business Administration (Finance), Bachelor of Science in Agricultural Economics and Agribusiness, Email: mwaseu@yahoo.com Third Author: Bundala Dodo Mathias – Master of Business Administration (Agribusiness), Bachelor of Education (Mathematics), Email: dodobm@yahoo.com

**Correspondence Author:** Tiberius Mlowosa - Email: tiberiusmlowosa@yahoo.com +255 767 284 988

# Measuring Contributions of Information Technology on Bank's Service Offering: The Case of National Microfinance Bank (NMB) Ltd Tanzania

Natalia Kalimang'asi<sup>\*</sup>, Bundala Dodo Mathias<sup>\*</sup> and Tiberius Philip Mlowosa<sup>\*\*</sup>

\*Local Government Training Institute (LGTI) - Dodoma \*\*Mwalimu Nyerere Institute of Management and Administration (MNIMA) – Dar es Salaam

Abstract- Increasing uses of information technology (IT) helps to solve problems of efficiency, speed and prompt services. This study aimed at measuring contributions of IT on bank services delivery and customer satisfaction (CS), specifically to assess whether customers are satisfied with operations, to determine major service quality (SQ) determinants and identify its relationship between these determinants and SO as well as CS. This study adapted SERVQUAL instrument model developed by Parasuraman and others (1990) to gather information. Descriptive statistics (frequencies, means), multiple regressions and correlation analyses were used. Study found that customers were dissatisfied with service rendered, there are six factors that determine SQ and among those, service delivery system has strong influence on CS, there is strong positive multiple correlations between SQ determinants and CS as well as SQ itself. Likewise there was significant weak negative correlation between SQ and time of being a customer as well as insignificant weak positive correlation between SQ and reasons of shifting bank. Also all SO determinants showed differences of less than one (P-E), indicating some improvement on service rendered. Full automation of Bank's services, carrying out a regular and thorough study of customer behavior, increase communication between top manager and customer-contact personnel were recommended to solve existing problems. Further, this study recommends that Bank of Tanzania should develop among others, rules and regulations that would enforce use of modern IT.

*Index Terms*- Information Technology, Consumer Satisfaction, Service quality

### I. INTRODUCTION

For several decades in Tanzania, the structure of the banking environment has provided banks with clearly defined spheres of activity. Over time, key players like the National Bank of Commerce (NBC) and other commercial banks that were state owned have become comfortable with the status quo and the profitability of their businesses (Chijoriga, 1997). Increased competition, new technologies and shift in power from the provider to the customer have put pressure on financial services' institutions. Owing to ever increasing competition within banking services, in terms of both costs and banking products, overall customer satisfaction is playing a vital role in marketing management, since it is widely assumed and assessed to determine repeat sales, positive word of mouth recommendations and most importantly customer brand loyalty (Bearden and Teel, 1993). In such competitive environment, quality of services is critical to corporate successes. Lovelock (1996) comments that delivering high quality service is closely linked with profits, cost savings and market share. Therefore, issues associated with quality cannot be ignored.

The result is an increased competitive banking environment, which is demanding significant changes in attitude on the part of the banks that wish to retain their customers and previous levels of profitability. In order to survive as profitable entities in this environment, financial institutions need to use all available tools to capture these aspects. This situation has put pressure on commercial and other banks in a series of forms, like technological advancement with use of computers in banks' services, use of electronic banking that provides the customer with an incentive to use the bank that provides services through new technology such as ATM and plastic cards. Banks are now dealing with more sophisticated customers than was the case five years ago (Hassan, 1998). National Microfinance Bank Limited (NMB) is among the Microfinance banks in Tanzania. The bank has positive attitudes towards automated teller machine (NMB System manager). Therefore NMB is a bank that uses semiautomated system to date. Although IT has been in use in Tanzanian business organization for more than 30 years, IT as a business tool is still at rudimentary stage and much more is expected from IT in terms of tangible gains in the Tanzania environment (Juma, 1997).

Parasuraman and others (1988) argue that service firms' executives may not always understand what features connote high quality to consumers, what attributes a service must have in order to meet consumers' needs, and what level of performance those features are necessary to deliver high quality services. In today's increasingly competitive environment, quality service is critical to customer satisfaction. One of the major ways to differentiate a service firm is to deliver consistently higher quality services than its competitors (Kotler, 2003). Banking as a service industry is also concerned with marketing of its services. Banks must always make sure that the quality of the services rendered to customers is intended to satisfy the needs of its customers. Hence, issues like efficiency, prompt and courteous services rank among the very important aspects of a bank. However, some of these operational aspects are not adhered to by most banks in Tanzania (Mbaga, 1989). Such a phenomenon is more evident by delayed services at most of the counters of several banks in Tanzania (Kavura, 1990). Taking an example from NMB Ltd, which covers most parts of the country, delay of services is still an observed phenomenon (Mzalendo, 2005; informal survey with some branches). In addition, there are a good number of complaints from customers regarding waiting time, time taken to clear their cheques and response rate to their concerns. In view of the above, there is a need to research on how IT helps to improve service quality in semi automated banking institutions taking NMB Ltd Tanzania as a case of study.

#### II. METHODS AND MATERIALS

#### Area of Study

The study was limited to National Micro Finance Bank (NMB Ltd). The study was carried out in branches found in Dar es Salaam since this is the center of the business and the effect can be observed. This place was selected because of data access, availability of data to meet objectives specified since the bank has branches scattered in almost all districts in Tanzania. NMB Ltd was thought to be a good representative of banks' services that are semi- automated, economically convenient to the researchers to easily collect data with less time constraints. Also the place have good information about the research since most customers are aware of ATMs, hence, could provide required information about expected and perceived services quality.

### **Data Collection**

Primary data for the study was obtained using survey of customers from selected branches. There are many methods of data collection such observation methods, interview and questionnaire methods. The study used questionnaire to collect information from a sample. This study collected only Primary data from individual's customers. The researchers administered face-to-face interview using a total of 120 questionnaires for data collection.

# **Research Model**

The research adopted service quality model determinants from Parasuraman and others (1991), which are categorized into 5 dimensions. This includes tangibility, reliability, responsiveness, assurance and empathy. The relationship of service quality and customer satisfaction was adopted from Taylor and Cronin, 1992. This led researchers to include variables that were useful in measuring service quality in marketplace.

### **Study Variables**

The six dimensions were the independent variable and service quality was dependent variables. A linear multiple regressions were used to assess the relationship between the independent variables and dependent variable. Theoretically, customers' satisfaction was found to be the function of service quality and the service quality comprised the quality determinants. Mathematical representation of the research model was:

 $\begin{aligned} &SQ = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \epsilon \text{ and} \\ &CS = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \epsilon \end{aligned}$ 

Where SQ= service quality in semi-automated bank CS= Customer Satisfaction in semi automated bank X1 = Service delivery system

- X2 = Tangible
- X3 = Reliability
- X4 = Responsiveness X5 = Assurance
- X5 = AssuranceX6 = Empathy
- $\varepsilon = \text{Error term of equation}$

 $\beta 1,\,\beta 2,\,\beta 3,\,\beta 4,\,\beta 5,\,and\,\beta 6$  are constant terms (coefficient of variables)

Interpretation of the regression coefficients

 $\alpha$  and  $\beta$  are called regression coefficient and have the following interpretations:

 $\alpha$  - (Constant term/ y- intercept)-shows value the dependent variable (SQ or CS) can take without any impact of service quality determinants (Xs).

On the other hand,  $\beta$  (slope) has two interpretations. First, it shows the direction of the relationship. If its value is positive, then we say that there is a positive relationship between the regressed variables. Conversely, if the value of the slope is negative, then we understand that the two variables are negatively related. The second interpretation is that, it shows the amount by which dependent variable (SQ or CS) will change by increasing one unit of service quality determinants (Xs).

### Instrumentation

Service quality measurement in banking industry is an area of growing interest to the researchers and Managers. Hence the research employed the SERVQUAL instrument developed by Parasuraman and others (1990) and made some changes in order to fit into research objectives in determining the service quality determinants. Procedure of obtaining Servqual score;

### Servqual Score= P-E score

To obtain an overall weighted Servqual score that takes into account the relative importance of the dimension for each customer it involves five steps.

- i. Computing the difference between ratings customers assign to the paired expectation-perceived statements.
- ii. Computing the average Servqual score for each of the five dimensions by adding Servqual scores on the statements pertaining to dimensions and dividing the sum by the number of statements making up the dimension.
- iii. Multiplying the Servqual score for each in (ii) by the importance weight assigned by the customers to that dimension (the importance weight being the points the customer allocates to the dimension divided by 100)
- Adding the weighted Servqual scores (obtained in step (iii) across all five dimensions to obtain a combined weighted Servqual score)
- v. Adding the scores obtained in step (iv) across all N customers and dividing the total by N

This gives an overall measure of the bank's services quality as assigned by all customers surveyed.

### **Data Analysis**

Data was analyzed at 95 percent and 99 percent levels of significant. The sample size of 120 customers was drawn from total population. Statistical package for social sciences (SPSS) was used to make the analysis and to test the hypotheses stated. Frequencies and percentages of various qualitative and quantitative variables were used to show proportion of customers as well as factors affecting customer satisfaction. Factors that determine service quality was analyzed through the SERVQUAL instruments. Correlation analysis was employed to assess which determinants of service have strong relationship with service quality and customers' satisfaction, regression analysis was used to show the degree of relationship between variables.

### Data Analysis for each Hypothesis

H1: Services quality does not have a direct relationship with Customer satisfaction.

Correlation analysis was used to test this hypothesis specifically Karl Pearson's coefficient of correlation.

H2: Service quality does not have direct influence on customer loyalty. The same applied to this hypothesis Correlation analysis was used for analysis

H3: Service quality determinants do not have direct relationship to service quality and have strong influence on

customer satisfaction. Multiple regression analysis was used to analyze this. As described above method show the functional relationships (causal analysis) between variable.

H4: There is no relationship between service quality determinant and customers' satisfaction. The same applied to this hypothesis correlation analysis was used to make analysis.

#### III. RESULTS AND DISCUSSION

#### **Sample Profile**

Table 1 represents individual customer's profile. This includes gender, age, education, current occupations as well as sector of work. From table 1 more than three quarters of respondents were educated, with qualifications above secondary education. Among those respondents interviewed more than half were males whereas females were less than half. Those respondents grouped (year zero to 30 years of age) as youth were one third, whereas those in middle age were more than half. This however might influence some variables such as customer satisfactions, since a certain age group as well as education level might have certain things that satisfy them.

Characteristics	RESPONSES	Total no. of Respondents				
Gender	Male	Female		120		
	71(59.2%)	49(40.8%)				
Age	Less than 20	20-30	31-40	41 and above		120
	1(0.8%)	48(40.0%)	70(58.4%)	1 ( 0.8%)		
Education	Primary	Secondary	Diploma	Bachelor degree	Post graduate	120
	5(4.3%)	22(18.3%)	4(3.3%)	70(58.3%)	19(15.8%)	
Sector	Public	Private	Self employed	Other	Other	
	60(50.0%)	23(19.2%)	14(11.6%)	23(19.2%)		
Current occupation	Professional	Administrati ve	Business person	students		120
	54(45.0%)	23(19.2%)	20(16.6%)	23(19.2%)		]

**Table 1: Individual Customer's Profile** 

### Source: Research data, 2005

#### Test of Validity and Reliability

The study made questionnaire pre-testing in order to measure content validity of the instruments. Table 2 presents measures of reliability for statements of perceived service quality, customer satisfactions as well as customers' loyalty. Table 2 shows perceived quality and customer satisfactions statements have alpha that is above the minimum level, hence show reliability of information while customers' loyalty statements do not.

Components	No of items	Alpha
Perceived quality statements	23	0.9293
Customers satisfactions	4	0.8380
Customers loyalty	2	0.1883
Overall reliability	29	0.9030

Table 2: Measure of Reliability

#### Source: Research Data, 2005

In the process of checking sampling adequacy, Kaiser-Meyer- Olkin (KMO) and Bartlett's test measure of sample adequacy was used. The sample had the value of +0.839 with significant Bartlett's test of Sphericity (approximate Chi-Square) of 2812.177.

#### **Measure of Service Quality**

Table 3 indicates the score from SERVQUAL instruments. Gap score was obtained by subtracting expected (E) from perceived (P) from each statement pertained in SERVQUAL instrument. Adding gap score for each of the statements that constitute the dimension and dividing the sum by the number of statements making up the dimension obtained an average gap score for each dimension (see table 6 for more details). Dimensions were given the same important weight (20%) hence the average gap score for each dimension was multiplied by these important weights in order to obtain weighted score for each one (refer table 3). Finally the average of these weights gave the weighted SERVQUAL score, which is a measure of the service quality as provided by pioneers of the SERVQUAL instruments. If consumer's expectations do not match perceived level of service received, a gap definitely exists (negative or positive). Negative gap shows customers dissatisfactions. According to studies by Sonnenberg (1989), more than forty percent of all customers' surveyed listed poor service as the number one reason for switching to a competitor.

Generally table 3 indicates that more dimensions show the average gap score that is above -1.5, which is a bit high. Probably customers gave more weight on these dimensions when they were judging service quality. Again from these results one would say that services provided by this bank were not as good as the customers' expectation.

Dimensions (determinants)	Average g	gap	Important weight (I)	Product (I*A)
	score (A)			
Tangible	-1.55833		0.2	-0.31167
Reliability	-1.896666		0.2	-0.37933
Responsiveness	-1.8666675		0.2	-0.37333
Assurance	-1.03542		0.2	-0.20708
Empathy	-1.688334		0.2	-0.33767
Sum				-1.60908
Average Servqual scores (unwe	-1.6090835			

#### Table 3: Weighted SERVQUAL score

Source: Research data, 2005

#### **Model Testing**

This section presents the empirical findings and tests of the research model. The model was tested using the actual field data. Table 4 indicates service quality model summary. From the model summary, multiple linear regressions summarized that almost sixty percent of variability of the service quality can be explained by variables included in the model (That is service delivery system, tangible, reliability, responsiveness, assurance and empathy) as can be deduced from the coefficient of determination ( $r^2 = 0.595$ ). However, taking into account standard deviation of overstating, adjusted R-square were 0.499, indicating that this model can account for whole 49.9 percent of variation in service quality.

Regression ANOVA (F tests for slope = 6.144) and it is significant, this implies that at five percent level of significant,

there is some linear relationship between service quality determinants and service quality (statistical significant does exist). There is positive multiple correlations (r = 0.772) between service quality and service quality determinants, indicating that when service determinants were improved, service quality would improve too. Further, the standard error of estimate obtained is 0.543 indicating variability around the fitted line of regression. This measures the vertical distance from line of regression to the actual points. It measures how the level service quality said by individual respondent deviate from average service quality level.

Therefore in Table 4 it can be deduced that there is positive relationship between service quality determinants and service quality, regression ANOVA represents that there is significant relationship between explanatory variable (service quality determinants) and dependent variable (service quality).

Table 4: SQ Model Summary

Variables	Value	F	Sig.
Multiple correlation coefficient (R)	0.772		
R square (coefficient of determination)	0.595		
Adjusted R square	0.499		
Std. Error of the Estimate	0.543		
Regression ANOVA		6.144	.000

### Source: Research data, 2005

Table 5 indicates coefficients of the SQ model. From the previous specified model:

 $SQ = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \epsilon$ 

This model can be replaced as follows:- SQ=0.673+0.2X1+ (-0.0  $X2+0.0227X3+0.0364X4+0.0176X5+0.0629X6+\epsilon$ 

(-0.0104)

Model 1 Coefficients		ts	Std t Sig		Sig.	Sig. 95% confidence In	
	β	Beta	error			Lower Bound	Upper
							Bound
Constant	0.673		0.295	2.285	0.025	0.088	1.258
Tangible	0.0104	-0.0185	0.086	-0.069	0.558	-0.18	0.159
Reliability	0.0227	0.0278	0.084	0.303	0.362	-0.144	0.189
Responsiveness	0.0364	0.0643	0.091	0.1093	0.560	-0.145	0.217
Assurance	0.0176	0.0275	0.080	0.325	0.330	-0.140	0.176
Empathy	0.0629	0.0902	0.078	0.9226	0.174	-0.046	0.218
Service delivery	0.200	0.272	0.067	2.983	0.004	0.067	0.333
system							

#### Table 5: Coefficients of Service Quality Determinants in relation to SQ Model 1

**Source: Research data, 2005**\*\*\*Note: Dependent Variable: How would you rate the quality of service provided by NMB?  $\beta$  – Un-standardized coefficients and Beta- Standardized coefficients

The above equation shows the extent to which service quality can be predicted from these six variables. From the equation, five coefficients show positive relationship with service quality (that is service delivery system, reliability, responsiveness, assurance and empathy) and tangible with negative relationship. Among those with positive relationship, service delivery system has more influence on service quality as it has higher coefficient compared to the rest. This study is in agreement with studies done by Bateson (1984) when customers freely use IT as a form of service delivery, the impact is high in terms of quality attributes (that is efficiency and speed). In view of this it can be said that in the eyes of customers, quality service was judged more on how service was delivered.

At five percent confidence interval, results show that there is a significant (0.004) relationship between service delivery system and service quality as well as statistical significant relationship between service quality and non-included explanatory variable. This can be deduced from the constant term 0.673 with 0.025level of significance.

Moreover all coefficients lie between the lower and upper bounds of the confidence interval, thus at 5 percent confidence interval it can be concluded that the explanatory variables (independent variables) best fit to explain variability of the service quality. Hence there is sufficient statistical evidence in the sample to indicate that service quality is related to these predetermined service quality determinants.

Where  $\alpha = 0.673$  is constant term (Y-intercept)

(independent variables) and (-error term)

 $\beta 1 = 0.2, \beta 2 = -0.0104, \beta 3 = 0.0227, \beta 4 = 0.0364, \beta 5 = 0.0176,$ 

 $\beta 6= 0.0629$  are coefficients of service quality determinants

The t- statistics for the parameters are shown in table 5 above, with p<0.05. The 95 percent confidence intervals (95% CI) for the estimates are also included in table 5. Based on these results it can be concluded that five explanatory variables have positive influence on service quality and tangible has negative influence on service quality. As stated earlier, standard error of the estimate measures how the level service quality said by individual respondent deviate from average service quality level. Table 5 indicates that each determinant of service quality deviates from predicted average level of service quality by less than ten percent (range from 0.067 to 0.091), indicating unbiased estimator hence it is reliable.

Furthermore, it can be deduced that there were factors other than those specified in the model, which could have effects on the service quality. These factors are the ones that have resulted to the above constant of 0.673. Also these can be revealed from the coefficient of determination ( $r^2 = 0.595$ ) of the model, which indicates that specified independent variables explain almost sixty percent of the observed variability in factors influencing service quality (See table 5 for details).

Table 6 below gives CS model summary. From this table, results indicate that there is strong positive correlation (multiple correlation coefficients (r) = 0.869) between service quality determinants and customer satisfaction. This implies that as service quality determinants are improved, customer's satisfaction increases in the same direction. Coefficient of determination of explanatory variable (r2 = 0.755) took into account that the regression model fitted particular data, which was developed for. The above model therefore, fitted the regression line by 75.5 percent, indicating that explanatory variable (service quality determinants) can explain and predict customer satisfaction by 75.5 percent. The remaining 25 percent, of customer satisfaction can be explained by other factors not included in that model (constant term) as explained above.

However, taking into account standard deviation of overstating, adjusted R-square were 0.697, indications are that this model can account for whole 69.7% of variation in customers' satisfactions. Further regression ANOVA (F tests for slope = 12.889) which is significant, implies that at five percent level of significant, there is some linear relationship between service quality determinants and customers' satisfaction (statistical significant does exist). Furthermore, the standard error of the estimate obtained is 0.516 indicating variability around the fitted line of regression. This measures the vertical distance from line of regression to the actual points. It measures how the level of customer satisfaction given by individual respondent deviate from average level of customers' satisfaction.

#### Table 6: CS Model Summary

Variables	Value	F	Sig.
Multiple correlation coefficient (R)	0.869		
R square (coefficient of determination)	0.755		
Adjusted R square	0.697		
Std. Error of the Estimate	0.516		
Regression ANOVA		12.889	.000

Source: Research data, 2005

Table 7 gives the CS coeff	icients.					
The specified regression equation						
$CS = \alpha + (\beta 1X1) + (\beta 2X2) + (\beta 3X3) + (\beta 4X4) + (\beta 5X5 + (\beta 6X6) + \epsilon)$						
Would be represented as						
CS=0.385+0.495X1+	(0.02946)	X2+	(-0.021324)			
X3+0.11257X4+						

(-0.0259) X5+0.0816X6 + ε

 $\alpha = 0.385$  is constant term (Y- intercept)

 $\beta 1 = 0.495, \ \beta 2 = (-0.02946), \ \beta 3 = (-0.021324), \ \beta 4 = 0.11257, \ \beta 5 = (-0.0259) \ \beta 6 = 0.0816$  are coefficients of customer satisfaction and ( is error term)

Table 7:	Coefficient	of service	quality in	relation to	o customer	Satisfaction
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Model 1	Coefficients		Std. Error	t	Sig.	95% Confidence Interval for $\beta$	
	β	Beta					
						Lower Bound	Upper Bound
Constant	.385		.280	1.372	.173	172	.941
Tangible	0.0285	-0.041	.081	-0.319	.450	-0.191	0.131
Reliability	-0.0213	-0.033	.240	-0.279	.217	-0.180	0.137
Responsiveness	0.11257	0.159	.087	1.408	.341	-0.060	0.285
Assurance	-0.0259	-0.002	.229	-0.248	.472	-0.176	0.124
Empathy	0.0816	0.106	.074	1.136	.362	-0.066	0.2292
Service delivery system	0.495	0.550	.064	7.753	.000	0.368	0.621

**Source:** Research data, 2005 \*\*\*\*\* Dependent Variable: In summary, how are you satisfied with the system of operation of NMB bank?  $\beta$  -Unstandardized coefficients and Beta- Standardized coefficients

From the above CS equation, it can be deduced that there is a positive relationship between customer satisfaction and service delivery system (semi automated delivery system), responsiveness as well as empathy. Furthermore it has the negative relationship with the tangible, reliability and assurance. This indicates that customer satisfaction changes in the same direction as service delivery system, responsiveness as well as empathy.

At five percent confidence interval, results show that there is a significant (0.000) relationship between service delivery system and customers satisfaction. Thus it can be deduced that statistical evidence shows significant relationship between service delivery systems and customer satisfaction. Further, it can be deduced that there were factors other than those specified in the model, which could have influence on customer's satisfactions. These factors are the ones that have resulted to the above constant of 0.385.

From the model summary tables, both equation SQ and CS have multiple correlation coefficients (R) that are 0.772 and 0.869 respectively. Also each equation had coefficient of determination, which were above fifty percent. Thus it can be concluded that the predictive power of the multiple linear regression equations are strongly positive. In both table 5 and 7 coefficients of the model equations laid between their bounds implying best fit of explanatory variable to these specified models. However, from constant terms, it can be deduced that both equations could have other factors that might influence these models.

### Hypotheses Tested

This research had four hypotheses. First hypothesis dealt with the relationships between service quality and customer satisfactions. The next hypothesis was developed in order to capture information that would show a relationship between service quality and customer loyalty. The third one was developed in order to observe relationship between service quality determinants, service quality and customer satisfaction. Lastly was developed, as there is some relationship between service quality determinant and customer satisfaction.

### **Test of Hypothesis (H1)**

H0: Services quality does not have a direct relationship with Customer satisfaction.

H1: Services quality has a direct relationship with Customer satisfaction.

To test relationship between service quality and customer satisfaction, correlation analysis was used. Overall service quality was crosschecked with overall customer satisfaction. Table 8 indicates correlation results between service quality and customers' satisfactions. Results indicate that there is a significant positive correlation coefficient (r = 0.586) between service quality and the customers' satisfactions. A study done by Jayawardhena (2004) showed that improving quality service over the Internet assures customer satisfaction. Therefore at 99 percent confidence interval, results indicate that when service quality is increased or improved, the more customer satisfactions would be. Generally at 99 percent confidence interval, this

research rejects the null hypothesis that there is direct relationship between service quality and customer satisfaction.

### **Table 8: Pearson's Correlations**

Criteria	Over all service quality
Overall satisfaction	0.586
Sig. (2-tailed)	0.000
Total of respondents	120

**Source:** Research Data, 2005: Correlation is significant at the 0.01 level (2-tailed).

### **Test of Hypothesis (H2)**

H0: Service quality does not have direct influence on customer loyalty

H1: Service quality has direct influence on customer loyalty

Table 9 gives results that were used to test this relationship. To test this hypothesis the correlation analysis was used. When overall service quality crosschecked with reasons of changing/shifting bank, results show that there is a insignificant positive correlation between customer loyalties and overall service quality with correlation coefficient 0.071. At 99 percent confidence interval results suggest that being a customer at NMB bank does not depend on service quality. There might be other factors that make customers not to change or shift banks. Probably, customers seem not to change because their salaries are processed through this bank, especially civil servants. This can be supported by looking at the correlation between overall service quality and periods being a customer of the bank. Results show that there is significant negative correlation coefficient (-0.339) between these two constructs (see table 9). At 99 percent the result is significant, thus it can be deduced that service quality is not a determinant to time of being an esteemed customer of the bank. Thus, it agreed that customer loyalty is not caused by service quality, but there were other factors that made them be loyal to the bank.

From table 9 and hypothesis, decision rule, at 99 percent confidence interval do not accept null hypothesis that Service quality has direct influence on customer loyalty.

Variables	Reasons of changing or	How long have you been
	shifting banks	using banking services with
	-	NMB?
How would you rate the quality of service	0.071	-0.339
provided by NMB?		
Sig. (2 -tailed)	0.405	0.000
N	101	120

Table 9: Pearson's correlation coefficient

Source: Research data, 2005

### **Test of Hypothesis (H3)**

H0: Service quality determinants do not have direct relationship to service quality and have strong influence on customer satisfaction

H1: Service quality determinants have direct relationship to service quality and have strong influence on customer satisfaction

Results from tables 4, 5, 6 and 7 were used to assess this hypothesis. Multiple linear regressions were used. From table 5 results show that there is negative relationship between service quality and tangible determinant, but the rest show the positive relationships. However both have linear relationship with service quality, service delivery system has showed significant positive relationship with service quality (coefficient = 0.200). Further multiple correlations coefficient (0.772) showed that there is positive correlation between service quality and service quality determinants. Thus at 95 percent confidence interval, decision rule do not reject the null hypothesis that there is strong relationship between service quality determinant and customer satisfaction.

#### **Test of Hypothesis (H4)**

H0: There is no relationship between service quality determinant and customers' satisfaction.

H1: There is some relationship between service quality determinant and customers' satisfaction.

Table 10 indicates that at 99 percent confidence interval do not reject null hypothesis, that there is statistical significant to show some relationship between service quality determinant and customer satisfaction.

SQ determinant	Pearson Correlation	Sig. (2-tailed)
	coefficient	Precision (0.01)
Tangible	0.3705	0.005
Reliability	0.4054	0.000
Responsiveness	0.481	0.000
Assurance	0.3615	0.001
Empathy	0.4306	0.007
Service delivery	0.612	0.000
system		

### Table 10: Relationship between Service quality determinants and customer satisfaction

Source: Research date, 2005

### IV. CONCLUSION

Information technology/system have been considered as an important tool for improving organizations efficiency, improving service quality as well as one of the current driving forces in competitive environments. This study assessed the role played by information technology in service quality determinants, service delivery system and customers' satisfaction. Results indicated that customers were not satisfied with the semi automated service delivery systems, service quality determinants showed service quality inadequacy. Therefore NMB bank has not yet fully exploited potentials of information technology (especially the use of ATM) as weapons of competitions in banking services. Generally the analysis of the hypotheses showed that there was significant positive correlation coefficient between service quality and the customer satisfaction; insignificant positive correlation between reasons of changing/shifting bank and overall service quality and strong relationship between service quality determinant and customer satisfaction.

#### V. RECOMMENDATIONS

Based on findings, this research recommends that NMB should increase investment in modern technology in order to improve service delivery systems because customers are aware of modernized ways of service delivery system (ATMs). This could help to reduce the problem of long queues as well as delayed services.

Further, this study recommends that Bank of Tanzania should develop among others, rules and regulations that would enforce use of modern IT.

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#### AUTHORS

First Author: Natalia Kalimang`asi – Master of Business Administration (Finance), Bachelor of Science in Agricultural Economics and Agribusiness, Email: <u>mwaseu@yahoo.com</u> Second Author: Bundala Dodo Mathias – Master of Business Administration (Agribusiness), Bachelor of Education (Mathematics), Email: <u>dodobm@yahoo.com</u> Third Author: Tiberius Mlowosa: Masters of Science in Finance, Advance Diploma in Accounts, Email: <u>tiberiusmlowosa@yahoo.com</u>

**Correspondence Author**: Natalia Kalimang`asi- Email: <u>mwaseu@yahoo.com</u> +255 787 577 082

# Clustering Based Routing Protocols for Wireless Sensor Networks: A Survey

# Vivek pandiya raj<sup>\*</sup>, B.Gunasundari<sup>\*\*</sup>, S.Athinarayanan<sup>\*\*\*</sup>

\*PG Scholar, PITAM, Anna University, Chennai, Tamil Nadu. \*\*Assistant Professor, PITAM, Anna University, Chennai, Tamil Nadu.

Abstract- Due to the wide range of application of Wireless Sensor Networks (WSN)[1] the past few years have witnessed the potential use of it and also become a hot research area now a days. One the main degradation of WSN is that sensor nodes are battery powered and deployed in harsh environment so it is not possible to recharge or replace the batteries all the time the node fails or dead. WSN are used in various applications like environment monitoring, health care, military, industrial control units and in various other environments. Routing protocols developed for various other adhoc networks such as MANET, VANET etc can't apply directly in WSN due to energy constrains of nodes. It is proved that sensor nodes require much energy to transmit data rather than sensing thus routing protocol developed for WSN should be efficient so that the network lifetime can be prolonged. In this paper, a survey on various Clustering routing protocols has been done indicating their merits and de-merits.

*Index Terms*- Wireless sensor networks, Hierarchical, Routing, LEACH.

### I. INTRODUCTION

Due to recent technological advancement and availability of low cost sensors made WSN an affordable one. Sensors are tiny devices that Sense physical quantities and convert them in to electrical signals. The word wireless denotes that the communication takes place through a wireless medium were as network signifies that these sensors can communicate among themselves. Thus a WSN consist of hundreds of sensor nodes that can sense data and communicate among them or to the sink (external base station). **Figure1** [3] shows the structural view of a sensor network. It mainly consists of four components:

- Sensor Unit
- Central Processing Unit (CPU)
- Power Unit
- Communication Unit

All are assigned with different tasks. The sensor unit consists of sensor and an Analog to Digital Converter (ADC), the sensor unit sense the data and returns the sensed analog data to ADC which is been converted into digital data and informs the CPU what data is been sensed. Communication unit receives the sensed data and transmit the data to rest of the sensors in the network. CPU controls the power, process, compute next hop to the sink, etc. Power unit's main task is to supply power to sensor unit, processing unit and communication unit. Each node may consist of two optional components namely Location finding system and Mobilizer.



Figure 1: Structural view of sensor network [3]

Routing protocols for WSNs can be classified [4] mainly into two categories depending on the Network Structure:

- Flat Routing Protocol
- Clustering/Hierarchical Routing Protocol

Flat routing is effective only to small-scale networks and not suitable for large-scale networks. On the other hand in Clustering routing protocol nodes are in cluster formations. Each cluster consists of two types of node:

Cluster Head: Every cluster would have a leader, often referred to as the Cluster Head (CH). CH is just one of the sensor with richer resources.CH may be elected by the sensors in the cluster or pre-assigned by the network designer. One cluster consists of only one CH at a time.

Member Nodes: These are the remaining nodes in the cluster with lower resources. Once the CH fails these remaining member nodes in the cluster may get the chance to become the CH.

Mainly two types of communication are performed in clustering protocols:

- INTER-CLUSTER: The communication which takes among the clusters.
- INTRA-CLUSTER: The communication among the nodes present in the clusters.

The remaining of the paper is organized as follows: section 2 outlines the advantages of Clustering routing protocol. Section 3 provides an overview of various Clustering routing protocols. Section 4 summarizes the clustering protocols. Finally, section 5 concludes the paper.

### II. ADVANTAGES OF CLUSTERING ROUTING PROTOCOL

Routing in WSN consist various challenging issues such as power supply, scalability, processing capability, transmission bandwidth, global address, frequent topology changes, data aggregation, data redundancy, etc.

Clustering routing protocols try to overcome few of these challenges some of them are listed below:

- Load Balancing: Load balancing can be done by even distribution of nodes in the cluster and the data fusion at the cluster head before inter-cluster transmission. CH is responsible for load balancing within the cluster.
- Fault Tolerance: In WSN nodes are deployed in harsh environment and thus nodes are usually exposed to risk of malfunction and damage. Tolerating the failure of nodes or CH is necessary in such conditions. Whenever a CH fails re-electing of CH will not be efficient rather than we can assign a backup CH. Rotating the role of CH among the nodes in the cluster is also a solution for CH failure.
- **Data Processing:** Data redundancy can be reduced by aggregating the packets send by various nodes in the cluster to the CH. Thus various redundant data can be removed during this process.
- Energy Efficient: Data aggregation at CH reduces data transmission and thus saves energy. Whereas intercluster communication helps in less energy consumption.
- **Robust:** WSN like wired network doesn't have any fixed topology thus addition of new node, node mobility, node failure, etc has to be maintained by the individual cluster not by the entire network. CHs rotate among the entire sensors node to avoid single point of failure.
- **Network Lifetime:** Clustering routing protocol helps in energy-efficient routing thus the overall network lifetime is increased.

#### III. CLUSTERING PROTOCOLS FOR WSN

# **3.1 ENERGY EFFICIENT HIERARCHICAL CLUSTERING (EEHC):**

It is a distributed, randomized clustering algorithm for WSNs. EEHC [5] is based on two stages

**Initial**: In the initial stage, each node announces itself as a CH with probability p to the neighboring nodes within the communication range. These announcements are done by direct communication or by forwarding. These CHs are named as the *volunteer* CHs. The nodes which receives the announcement and is not itself a CH becomes the member of the cluster. The node which doesn't received the announcements within a time interval t that is calculated based on the duration for a packet to reach a node becomes a *forced* CH.

**Extended**: Multi-level clustering is performed in this stage. CHs at the level-1 transmit aggregated data to the level-2 CHs and so on. At the top level CHs transmit the aggregated data to the base station.

# **3.2 LOW ENERGY ADAPTIVE CLUSTERING HIERARCHY (LEACH):**

LEACH [6] [7] is one of most popular clustering algorithm for WSN. It forms the cluster based on the received signal strength and uses the CH nodes as routers to communicate with the sink. Cluster formation in LEACH is done using a distributed algorithm, where each node makes decision without any centralized control.

The operation of LEACH is divided into two phases namely:

Setup Phase: It is an advertisement phase in which nodes uses CSMA MAC protocol to advertise their status, CSMA MAC protocols main task is to prevent two advertisement messages from colliding with each other. Thus, all non-cluster head nodes must keep their receiver ON during the setup phase to receive the message. Initially a node decides to a CH with a probability pand broadcasts its decision. Each non-CH node determines its cluster by choosing the CH that can be reached using the least energy. CH is been rotated periodically among the nodes of the cluster to balance load. The rotation is performed by getting each node to choose a random number "T" between 0 and 1. A node becomes the CH for the current round if the number is less than the following threshold:

$$T(n) = \begin{cases} \frac{p}{(1 - p\left(r - mod\left(\frac{1}{p}\right)\right))} & , if \ n \in G\\ 0 & , otherwise \end{cases}$$

Where p is the desire percentage of the CH nodes in the sensor population, r is the current round number, and G is the set of nodes that have not been CHs in the last 1/p rounds.

**Steady-State Phase**: Once the network is divided into clusters, CH uses TDMA schedule for its sensors to send the data. Data sent by the nodes in the cluster is aggregated at the CH and compresses the aggregated data before sending it to the sink. After the compression of data is done it is been send to the sink. Though LEACH is an energy-efficient routing protocol still it has some drawbacks:

• It is only suitable for small networks and suitable for network deployed in large area.

- TDMA schedule wastes the bandwidth because some nodes might not have data to send.
- Large amount of energy is wasted if the CH is located away from the sink.
- If the CH fails due to some reason between the processes the whole process has to be repeated again which leads to wastage of energy.

#### 3.3 LEACH-CENTRALIZED (LEACH-C):

It is a centralized clustering algorithm developed as an improvement over LEACH. In LEACH-C [8] [9] [10] the nodes in the network sends their location and energy information to the base station. Location information may be sent using some location identifying devices imported on the sensors like GPS etc. On the basis of this information the base station forms clusters, select CH and the members of clusters. In this way the setup phase is completed. The steady-state phase is same as that of LEACH. It is costlier due to the use of location finding devices and less reliable due to single point of failure.

# **3.4 HYBRID ENERGY-EFFICIENR DISTRIBUTED** CLUSTERING (HEED):

It is a distributed clustering algorithm developed as an improvement over LEACH. The enhancement is done in the CH selection method. HEED [11] selects CH on the basis of energy as well as communication cost. In HEED, each node is mapped to exactly one cluster. It is divided into three phases:

**Initialization Phase**: Each sensor node sets the probability C<sub>prob</sub> of becoming a CH as follows:

$$CH_{prob} = C_{prob} \cdot \frac{E_{residual}}{E_{max}}$$

Where  $C_{prob}$  is the initial percentage of CH required in the network,  $E_{residual}$  is the current energy of the node and  $E_{max}$  is the maximum energy of the fully charged battery.

**Repetition Phase**: This is an iterative phase in which each node repeats the same process until it find a CH to which it can transmit with least cost. If any node finds no such CH, the elects itself to be a CH and sends the announcement message to its neighbors. Initially sensor node become *tentative* CH, it changes its status later if it finds a lower cost CH. The sensor node becomes permanent CH if its CH<sub>prob</sub> has reached 1.

**Finalization Phase**: In this phase nodes either picks the least cost CH or itself becomes a CH.

Though it is an improvement over LEACH still it has some disadvantages like more CH are generated than expected and it is not aware of heterogeneity.

# **3.5 THERSHOLD SENSITIVE ENERGY-EFFICIENT SENSOR NETWORK PROTOCOL (TEEN):**

TEEN [12] is a clustering routing protocol, which groups nodes into cluster with each led by a CH. Once the cluster is formed CH broadcast two types of threshold values to the nodes in the cluster namely *hard threshold value* and *soft threshold value*. The parameters in the attribute set of the node reaches its *hard threshold value*, the node switches on its transmitter and sends its data if the sensed attribute is greater than the *head threshold*, and the current value of the sensed attribute differs from sensed value by an amount equal to or greater than the *soft threshold*.

The main drawback of TEEN is that if the threshold values are not reached, the node will never communicate. And not even come to know if the entire nodes are alive or dead.

# **3.6 ADAPTIVE PERIODIC THRESHOLD SENSITIVE ENERGY EFFICIENT SENSOR NETWORK PROTOCOL (APTEEN):**

APTEEN is an improvement over TEEN. APTEEN [13] is a clustering routing protocol that allows its nodes to send the sensed data periodically and react to any sudden changes in the value of the sensed data by reporting it to the CHs. Architecture of APTEEN is similar to that of TEEN.

APTEEN supports three types of queries namely:

Historic Query: To analyze past data value.

One Time Query: To view the whole network.

Persistent Query: To monitor an event for a period of time.

APTEEN guarantees energy efficiency and larger number of sensor alive.

# **3.7 ENERGY EFFICIENT INTER-CLUSTER COORDINATION PROTOCOL (EEICCP):**

EEICCP [14] is a clustering routing protocol. In existing protocols CH send data directly to the sink, it is found that direct transmission dissipates lots of energy. EEICCP proposes a multi hop approach for the CHs to transmit data. It consists of two phases:

**Election Phase**: In this phase layers of clusters have been formed so there is always one cluster coordinator for every lowest cluster. The division of cluster is done from top to bottom. EEICCP starts the election phase in which CH are elected on the basis of received signal strength (RSS). Number of clusters is fixed. Then the CHs elects the cluster coordinator, cluster id is assigned to both CH as well as the coordinator. The id is transmitted to each node in the cluster by advertisement message.

**Transmission Phase**: In this phase data is collected by the CH of the cluster which has data to send and in next iteration the data is passed to the base station with the help of the cluster coordinators. The path for data transmission is set with the help of the cluster coordinators ids.

EEICCP [14] shows remarkable improvement over LEACH and HCR protocol in terms of reliability and stability.

# IV. COMPARISSION OF ROUTING PROTOCOLS

ROUTING PROTOCOLS	CLUSTER STABILITY	ENERGY EFFICIENCY	NODE DEPLOYMENT (RANDOM/UNIFORM)	MULTIPATH	SCALABILITY
ЕЕНС	MEDIUM	POOR	RANDOM	NO	LIMITED
LEACH	MEDIUM	POOR	RANDOM	NO	LIMITED
LEACH-C	MEDIUM	MEDIUM	RANDOM	NO	LIMITED
HEED	HIGH	MEDIUM	RANDOM	YES	LIMITED
TEEN	HIGH	VERY HIGH	RANDOM	NO	GOOD
APTEEN	HIGH	HIGH	RANDOM	NO	GOOD
EEICCP	MEDIUM	HIGH	RANDOM	YES	LIMITED

Table 1: Comparison of clustering based routing protocols in wireless sensor networks

#### CONCLUSION

Routing in sensor networks is a new area of research, with a limited, but rapidly growing set of research results. In this paper, we presented a comprehensive survey of clustering based routing techniques in wireless sensor networks which have been presented in the section 3. They have the common objective of trying to extend the lifetime of the sensor network, while not compromising data delivery. Although many of these routing techniques look promising, there are still many challenges that need to be solved in the sensor networks. We highlighted those challenges and pinpoint future research directions in this regard.

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#### AUTHORS

**First Author** – Vivek pandiya raj, PG Scholar, PITAM, Anna University, Chennai, Tamil Nadu.

**Second Author** – B.Gunasundari, Assistant Professor, PITAM, Anna University, Chennai, Tamil Nadu.

Anna University, Chennar, Tanni Nadu.

**Third Author** – S.Athinarayanan, Professor, PITAM, Anna University, Chennai, Tamil Nadu.

# Effects of Sublethal Temperature Stresses on the Culturability and Percentage Injury of *Escherichia coli* grown in the Laboratory Medium

Mohd Nizam Lani<sup>1</sup>, Jasmin Mohamad<sup>1</sup> and Zaiton Hassan<sup>2</sup>

<sup>1</sup>School of Food Science and Technology, Universiti Malaysia Terengganu (UMT), 21030 Kuala Terengganu, Terengganu, MALAYSIA. <sup>2</sup>Faculty of Food Science and Technology, Universiti Sains Islam Malaysia (USIM), Bandar Baru Nilai, 71800 Nilai, Negeri Sembilan, MALAYSIA.

Abstract- Microorganism may adapt with environmental stresses by altering metabolisms and structures of their physiology. Temperature is a major environmental factor that can be used to inhibit microorganisms. However, sublethal temperature stress will not kill microorganism effectively and yet microorganisms are injured. The objectives of the present study were to determine the culturability and percentage injury of Escherichia coli ATCC 25922 grown in the laboratory medium when shifting from 37°C to sublethal temperature stresses temperatures of 45°C, 40°C and 20°C at log and stationary phases. Initially, the E. coli culture was grown in Tryptic Soy Broth at 37°C for 6 hours and 18 hours to reach log phase and stationary phase, respectively before the culture was transferred to three sublethal temperature stresses and culturability were determined by using two-plating systems; TSA with and without 4% NaCl (TSAS). Results showed that cells of E. coli at stationary phase were more resistant compared to log phase at both temperatures of 40°C and 45°C, however, stationary phase cells of E. coli at 20°C was less resistant compared to log phase. At log phase, the percentage of injured cells of *E. coli* at three sublethal temperatures of 45°C, 40°C and 20°C were ranged between 9.43%-20.40%, 0.95%-19.66% and 1.42%-7.83%, whereas the percentage injuries of E. coli at stationary phase for 45°C, 40°C and 20°C were ranged between 3.57%-25.65%, 0.36%-11.16% and 3.16%-13.54%, respectively. Results concluded that the culturability and injury of E. coli were affected by the type of sublethal temperature stress and its bacterial phase.

*Index Terms*- culturability, *Escherichia coli*, laboratory medium, percentage injury, temperature stress

### I. INTRODUCTION

All living microorganisms are exposed to variety of environmental stress conditions and their responses and adaptation are much influenced by the severity of the environmental stress exposures. The changes of organisms through stress adaptation may affect the ability of these pathogens to survive in foods [1].

*Escherichia coli* was first isolated by Theodor Escherich in 1884. It is one of five recognised species of *Escherichia* and the member of family *Enterobacteriaceae*. *E. coli* is a Gramnegative rod which can ferment lactose within 48 hours and also can produce metallic green sheen on agar such EMB agar [2]. The natural habitat of *E. coli* is the large intestine of animals

including humans which is in temperature  $37^{\circ}$ C. The presence of *E. coli* in environment is considered as contaminant because many fecal-borne microorganisms are pathogenic in animals and humans. It can contribute to human diseases such as infant diarrhea and infections of the urinary tracts [3].

Temperature is one of the most influential environmental factors among microorganisms and it is used to control the growth of microorganism in foods and enhances the storage life and safety of food products. Temperature stress strongly influences the potential for survival and rate of growth of bacteria [4]. All *E. coli* strains can grow at a wide range of temperature between 8°C to 48°C [2].

Foodborne bacteria are exposed to variety of stresses in environment. Following exposure to a sublethal stress, a bacterial population have three different physiology which are uninjured or normal cells, sublethally injured cells (or injured cells) and lethally injured cells (or dead cells) [5]. Cell injury is defined as any damage to the components of cells itself by any stresses which weaken the ability of cells to survive or multiply and will increase the sensitivity of cells to any harmful factors [6]. One of the characteristics which show that the cells injured are they increased in sensitivity to many compounds where many normal cells are resistant. When expose and keep the cells at critical environment, the injured cells can not multiply and eventually die. In a non-selective and nutritionally medium, the cells are able to repair their injury which can extend 1 hour to 6 hour depending on the nature of stress and degree of injury. After repair, the cells will regain their normal characteristics and initiate multiplication [7].

When cells are exposed to stress, there are some cell components are damaged or injured but there are also some components which could be harmful due to specific stresses only. Some structural and components which are identified to be damaged or injured by sublethal stresses are the cell wall (or outer membrane), cytoplasmic membrane (or inner membrane), ribosomal RNA (rRNA) and DNA including some enzymes. The damages in the cell wall and cytoplasmic membrane usually because of freezing and drying while injured in ribosomal RNA are caused of heat treatment whereas damaging in DNA following the radiation of cells [7].

Bacteria are considered to be injured when treated with sublethal stress if they are not able to grow and produce colonies when plated on agar media containing selective agents [8]. Selective agents such as bile salts, organic dyes, antibiotics and surfactants are often used in media which may kill the injured cells [7] by inhibiting the repair process of injured cells. But, on non-selective agars such as Tryptic Soy Agar (TSA), both injured and non-injured cells can grow and form colonies. For this study, the selecting agent used is sodium chloride, NaCl. Therefore, by plating agar containing NaCl (4%) which added to TSA, the percentage injury of cells can be measured.

The aim of this study was to determine the effects of E. coli when exposed to selected temperature stresses (20°C, 40°C and 45°C). The growth of bacteria at 20°C was selected because it was slightly below ambient temperature (lower optimal temperature). Temperature of 40°C was chosen because it is a mild heat treatment for most of microorganisms and it is reflected the temperature abuse during food handling or storage. Whereas,  $45^{\circ}$ C is considered as severe temperature stress for *E*. coli as it is near to the maximum limit for its growth.

Therefore, this study was conducted to determine the culturability and percentage injury of E. coli when exposed to sublethal temperature stresses after grown at optimal temperature. The finding of this study would provide new scientific evidence on microbial adaptation of E. coli under environmental stress conditions. This information is important to improve understanding about how stress can be implemented as preservation strategy.

### II. EXPERIMENTAL METHOD

### A. Source of Microorganism

Escherichia coli (ATCC 25922) used in this study was obtained from American Type Culture Collection (ATCC) which provided by the School of Food Science and Technology, Universiti Malaysia Terengganu (UMT).

# **B.** Culture Media

The bacteriological media which used on this study were Tryptic Soy Broth (MERCK, Germany), Tryptic Soy Agar (MERCK, Germany), Tryptic Soy Agar with 4% NaCl, 0.1% Peptone water (OXOID, UK). The media were prepared and sterilized using an autoclave as specified on manufacturer's direction. The prepared agars were poured in sterile Petri dishes and were leaved and cooled before they were used for the analysis.

# C. Confirmation of E. coli Isolate

Morphological and biochemical tests were performed to confirm the purity of E. coli that was used during this study. On IMViC tests, positive results of E. coli were showed on Indole Test and Methyl Red tests whereby negative result were determined on Voges-Proskauer and citrate tests. Isolates that showed positive result on lactose fermentation, motility, glucose fermentation, arabinose, glycerol, maltose, mannitol, rhamnose, xylose and negative result on oxidase, grew in the presence of potassium cyanide (KCN) was considered E. coli [2]. The strain also was confirmed using API 20E (BioMérieux, France).

# D. Comparison between Static versus Agitated Cultivation Method for E. coli

Preparation of test suspension began with inoculum from a stock culture of *E. coli* strain. The inoculum was streaked onto Tryptic Soy Agar (TSA) and the plate was incubated at 37°C for 24 hours in order to obtain the single colony. After incubation. the fresh isolated single colony of the strain was picked off using a sterile loop and dispersed into a flask containing 100 ml of sterile TSB. Following incubation at 37°C for 30 minutes, 1 ml was transferred into 300 ml of TSB. The procedure provided an initial cell concentration of approximately  $1 \ge 10^3$  CFU/ml. The flask containing E. coli in 300 ml Tryptic Soy Broth (TSB) was incubated in a static incubator or in a shaker incubator. 1 ml of bacterial culture on the flask was diluted with 9 ml of 0.1 % peptone water and the 0.1 ml of desired dilution factor was transferred into TSA plates for a spread plate method in duplicates. Then, the plates were incubated for 24 hours at 37°C. The plates were enumerated and transformed to log<sub>10</sub> CFU/ml and growth curve was constructed. The growth curve of E. coli at 37°C was established under agitated and static cultivation methods.

#### E. Survival and culturability of E. coli under temperature stresses

After incubation for 24 hour at 37°C, a single isolated colony on Tryptic Soy Agar (TSA) was transferred in 100 ml sterile Tryptic Soy Broth (TSB) in conical flask which later was incubated at 37°C for 30 minutes for an initial growth. After that, 1 ml of broth was taken and was transferred to 300 ml sterile TSB. The bacterium was grown at 37°C until it reached middle log phase (6 hours) and middle stationary phase (18 hours) before subjected to the selected temperature stresses (20°C, 40°C and 45°C). The samplings of bacterial culture shifted from 37°C to 20°C, 40°C and 45°C were done for every 1 hour for 9 hours at sublethal temperature stresses by duplicate the plates on TSA (without 4% NaCl) and TSAS (with 4% NaCl). After the samples were serial diluted at the desired serial dilution, 0.1 ml dilution from 9 ml of 0.1 % of peptone water was transferred to TSA and TSAS by using spread plate method. All plates were incubated for 24 hours at 37°C.

# F. Determination of Percentage Injury of E. coli

Tryptic Soy Agar is a non-selective medium that support the growth of both injured and uninjured E. coli, whereas TSAS is a selective medium that support the growth of uninjured cells. The results from the culturability of cells on plate were used to determine the percentage injury of E. coli. The percentage injury (%) of cell was calculated by using the equation below [8]: Percentage Injury (%) =

1 - 
$$\left( \frac{\text{Count on selective media (TSAS)}}{\text{Count on non selective media (TSA)}} \times 100 \right)$$

# **III. RESULTS AND DISCUSSIONS**

## A. Agitation Versus Static Cultivation method for E. coli

Figure 1 shows the growth curve of *E. coli* at 37°C using static and agitated cultivation methods when logarithmic of bacterial population was plotted against time. Although the agitated and static cultivation methods were not significantly different, the static cultivation method was chosen to grow E. coli in order to mimic the growth culture of E. coli in food which is static.

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Figure 1: Growth curve of *E. coli* at 37°C using static and agitated cultivation method

From the growth curve of *E. coli*, the time for log and stationary phase were obtained. The results showed that the time taken for log and stationary phase of *E. coli* were 6 and 18 hour respectively. The time for stationary phase was similar with the previous study by [9], where the *E. coli* was grown for 18 hour indicated the stationary phase cells of *E. coli*.

#### B. Survival and culturability of E. coli under temperature stress

The exposure of the culture that was grown at  $37^{\circ}$ C to the sublethal temperature stresses (20°C, 40°C, and 45°C) by using TSA media at log phase is shown in Figure 2.



Figure 2: Survival curve of *E. coli* on exposure to temperature stresses at log phase using TSA media.

For the log phase, the cells were grown first at  $37^{\circ}$ C until reached log phase for 8 hours and it was then shifted to  $20^{\circ}$ C,  $40^{\circ}$ C and  $45^{\circ}$ C. During log phase, the population growth at  $40^{\circ}$ C was more resistant compared to the other two temperatures ( $20^{\circ}$ C and  $45^{\circ}$ C). This is because since  $40^{\circ}$ C is near to the optimum temperature, the population growth was not exactly influenced by sudden shifting of temperature where the cells still can easily adapt the new temperature ( $40^{\circ}$ C).

In Figure 2, results clearly demonstrated that sudden shifting of *E. coli* from 37°C to 20°C reduced the growth rate of *E. coli*. The growth was inhibited for the first 3 hours where cells of *E. coli* were adapted to a new temperature of 20°C and slowly after that *E. coli* was gradually increased the growth with one  $\log_{10}$  lower than cells grown at 40°C. During cell growth at 45°C, at the first hour the growth of *E. coli* was decreased because the bacterium was still adapting with the new temperature (45°C) but after the second hour, the cells started to grow and adapted with

temperature of  $45^{\circ}$ C until 6 hour before started to decline. The decline of *E. coli* at  $45^{\circ}$ C after 6 hours was due to the limitations of nutrient in the broth and due to exposure of high temperature at  $45^{\circ}$ C continuously.



Figure 3: Survival curve of *E. coli* on exposure to temperature stresses at stationary phase using TSA media

The exposures of the culture that were grown at 37°C to the sublethal temperature stresses (20°C, 40°C, and 45°C) by using TSA media at stationary phases were shown in Figure 3. Cells were grown first at 37°C until reached stationary phase for 18 hours and it was then shifted separately at  $20^{\circ}$ C,  $40^{\circ}$ C and  $45^{\circ}$ C. From Figure 3, the population growth at 45°C is more resistant compared to viable cells at 40°C and 20°C. At 45°C, the cells grew rapidly between 1 to 3 hours while the two temperatures of 20°C and 40°C were still adjusting with the new environment and the developments of cells were continued increasingly until 7<sup>th</sup> hours before the cells started to decline. The ability of cells to delay the multiplication in a new environment illustrates the resistances of cells towards stresses. Meanwhile, the population growth at 20°C was more susceptible compared to the other two stresses temperature and it reduced the growth of E. coli. This is due to the lack of growth of E. coli cells compared to the growth at 40°C and 45°C. Mild cold shifted from 37°C to 20°C caused a significant decrease in the growth rate of E. coli cells [10].

From the Figures 2 and 3, it is concluded that the population growths of *E. coli* at stationary phase were more resistant compare to the log phase. For microorganisms like *Salmonella* and *E. coli*, cells in exponential are more sensitive to the variety of stresses compare to the cells at stationary phase because at this stage the cells are rapidly dividing. The differentiation in resistance between two phases can be explained by the differential expression of biosynthetic pathways, gene regulators and associated enzyme systems that supply an adaptive advantage to the stationary phase cells [11]. Cells at stationary phase are more resistant to numerous of stresses including heat [7]. This is due to the production of alternative sigma factor,  $\sigma^{s}$  or *RpoS* where these sigma factors is induced in early stationary phase and thus influence the growth of population cells at this phase [7].

#### C. Percentage Injury of E. coli

The effects of sublethal temperature stresses on sublethal injury for each hour are shown in Tables 1 and 2 for log and stationary phases, respectively. From Table 1, the percentage of injured cells at log phase at three different sublethal temperature  $45^{\circ}$ C,  $40^{\circ}$ C and  $20^{\circ}$ C were ranged between 9.43%-20.40%,

0.95%-19.66% and 1.42%-7.83%. The percentage injury cells at  $45^{\circ}$ C are the highest at log phase due to the severe temperature because  $45^{\circ}$ C is near to the maximum temperature of *E. coli*. However, the slowest rate of injury developed at 20°C because 20°C is still in the range of growth of *E. coli*. Therefore, temperature 20°C is not effective to inhibit *E. coli*. The fluctuation of injury was caused by the presences of injured and uninjured cells in the broth were not consistent because the lag duration was varied and the temperatures used were different.

Meanwhile, the percentage injuries (%) at stationary phase for  $45^{\circ}$ C,  $40^{\circ}$ C and  $20^{\circ}$ C were ranged between 3.57%-25.65%, 0.36%-11.16% and 3.16%-13.54% respectively. The highest rate for injured cells in stationary was at  $45^{\circ}$ C and the slowest rate was at  $40^{\circ}$ C. The slowest rate at  $40^{\circ}$ C can be justified because this temperature is near to the optimum temperature which is  $37^{\circ}$ C where the population of normal cells is high and thus the rate of injury are low. At  $45^{\circ}$ C, the percentage injury was higher compared to the other two temperatures ( $20^{\circ}$ C and  $40^{\circ}$ C) with the highest value 25.65% at 9<sup>th</sup> hour.

Table 1: Percentage sublethal injury cells of E. coli at log
phase under different temperature stresses

Time (h)	45°C Log	40°C Log	20°C Log
0	0.0%	0.0%	0.0%
1	0.420/	0.640/	<b>5.</b> 400/
1	9.43%	2.64%	5.48%
2	10.69%	4.90%	2.30%
2	16 760/	4 1 4 04	1 690/
3	10.70%	4.14%	1.00%
4	14.57%	6.76%	1.42%
5	18.09%	7.89%	2.72%
6	20.40%	19 66%	1 61%
0	20.4070	17.0070	1.01/0
7	12.81%	6.00%	6.04%
8	17.62%	0.95%	5.50%
9	10.00%	9.22%	7.83%

 Table 2: Percentage sublethal injury cells of *E. coli* at stationary phase under different temperature stresses

Time (h)	45°C Stat	40°C Stat	20°C Stat
0	0.0%	0.0%	0.0%
1	8.04%	9.85%	8.54%
2	17.61%	3.35%	6.70%
3	18.05%	11.16%	4.17%
4	13.76%	2.72%	10.55%
5	14.45%	2.20%	12.62%
6	3.57%	4.77%	6.91%
7	13.14%	0.36%	7.69%
8	13.87%	5.00%	7.28%
9	25.65%	8.93%	13.54%

The results showed that sublethal injury cells at 40°C and 45°C were developed rapidly at log phase than in stationary phase. Expression of specific proteins was higher at stationary phase, and thus, it might influence the susceptibility of cells in log phase which the cells suffer greater damages due to the active

metabolism at this phase [12]. That is why the injured cells were higher in log phase compared to stationary phase.

The percentage injuries (%) for *E. coli* cells subjected to  $45^{\circ}$ C were the highest both in exponential and stationary phases. The study also demonstrated that there were distinct differentiations between  $45^{\circ}$ C and  $20^{\circ}$ C or  $40^{\circ}$ C. Since  $45^{\circ}$ C is a highest temperature for the growth of *E. coli* and known as severe temperature for this bacterium, the percentage injuries of *E. coli* were higher. Maybe most of the cells that form the colony on TSA not only injured but were poorly recovered on the selective media (TSA + 4% NaCl).

But, it was different with the survival of *E. coli* at 20°C, where the percentage injury log phase is lower than in stationary phase. At log phase for temperature below than 20°C, *E. coli* expresses a number of proteins which are higher compare to the cells that are growing at advanced temperature [13]. The expression of proteins will increase the resistances of cells through stresses [12] and the percentage of injury in cells became lower. For the stationary phase, the lack expression of protein will raise the susceptibility of cells on stresses. Thus, the percentage injury for stationary phase was lower compared to log phase with average 4.013 % at log and 8.116 % at stationary phase. The results suggested that the percentage injury were affected by the bacteria phase and the formation of Heat Shock Proteins (*HSPs*).

#### IV. CONCLUSIONS

It was found that when shifting *E. coli* from optimal temperature to three sublethal temperature stresses (20°C, 40°C and 45°C), stationary phase of *E. coli* was more resistant to the sublethal temperature stress compared to the population growth of *E. coli* at log phase. Higher percentage injury was obtained during the log phase for 40°C and 45°C. But for 20°C, the higher percentage injury was obtained during stationary phase. Further study is required to investigate the mechanism of stress adaptation by foodborne pathogenic bacteria.

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#### AUTHORS

**First Author** – Mohd Nizam Lani, PhD, Senior Lecturer in School of Food Science and Technology, Universiti Malaysia Terengganu (UMT), 21030 Kuala Terengganu, Terengganu, MALAYSIA and email: nizamlani@umt.edu.my

**Second Author** – Jasmin Mohamad, B. Sc. Food Science (Food Service and Nutrition), First degree graduated from School of Food Science and Technology, Universiti Malaysia Terengganu (UMT), 21030 Kuala Terengganu, Terengganu, MALAYSIA and email: purplish\_gal87@yahoo.com

**Third Author** – Zaiton Hassan, PhD, Assoc. Prof. in Faculty of Food Science and Technology, Universiti Sains Islam Malaysia (USIM), Bandar Baru Nilai, 71800 Nilai, Negeri Sembilan, MALAYSIA and email: drzaiton@usim.edu.my

#### Correspondence Author – Mohd Nizam Lani,

nizamlani@umt.edu.my, or nizamlani@gmail.com

# **Supercapacitor Using a Liquid Dielectric Material**

# Syed Faraaz Hussain, Subramaniam T.G, Sandeep S, Anup L and Samita Maitra

Department of Chemical Engineering, BMS College of Engineering, Bangalore-560019, India

Abstract- A supercapacitor stores energy electrostatically by polarizing an electrolytic solution. Though it is an electrochemical device there are no chemical reactions involved in its energy storage mechanism. This mechanism is highly reversible, allowing the supercapacitor to be charged and discharged hundreds of thousands to even millions of times. Recent advances in this field have been in developing solid state supercapacitors. In this paper, a low temperature synthesis of PZT by sol-gel route is achieved which is made into a homogeneous solution using Diethylene Glycol. The resulting solution is used as a liquid dielectric in a supercapacitor fabricated using common available plastic containers of different form factors and their electrical properties were measured. The average time taken to charge and discharge the supercapacitor was noted. It was also tested for lowered temperature conditions. The future prospects and applications of this technology are also discussed in this paper.

*Index Terms*- Supercapacitor, PZT, Ferroelectric materials, solgel method, liquid dielectrics.

### I. INTRODUCTION

The current research and development efforts on electrochemical power sources are generally focused on fuel cells, batteries and electrochemical capacitors and are directed towards achieving high energy density, high power density and long cycle life at relatively low costs. Yet there is a need for a new class of systems that prevent electrochemical reactions that damage electrodes in normal cells, and avoid a cell balancing requirement in a multicell battery while still providing low manufacturing costs. This has led to a need for reliable electrical energy storage systems. <sup>[3,5,12]</sup>

A new technology, the supercapacitor <sup>[5,7]</sup>, has emerged with the potential to enable major advances in energy storage. Supercapacitors are governed by the same fundamental equations as conventional capacitors, but utilize higher surface area electrodes and thinner dielectrics to achieve greater capacitances. This allows for energy densities greater than those of conventional capacitors and power densities greater than those of batteries. As a result, supercapacitors may become an attractive power solution for an increasing number of applications.

Most research and development done so far in this field is on solid state supercapacitors. In other words, the dielectric used is a solid which is generally made by forming thin films of the dielectric. But this method is found to have certain disadvantages such as 1) Achieving high energy density supercapacitors is not possible without hybrid systems

2) In multicell systems, the cell balancing is required to avoid failure and damage of the cells, in addition to having high reliability.

3) Most of the solid state supercapacitors are based on liquid electrolyte in gel form, coated over thin film supercapacitor material. These systems are normally associated with the wellknown disadvantages of corrosion, self-discharge, and low energy density.

4) Attaining high packing density of solid state supercapacitors is always a big task.

In an attempt to eliminate these disadvantages, we make use of a liquid composite dielectric material. The term "liquid composite" refers to a material containing two phases: a dispersed solid phase in a continuous liquid phase. The solid phase is PZT powder which was synthesized using a low temperature sol-gel method. It is dispersed in an organic liquid phase Diethylene Glycol. Ferroelectric lead zirconate titanate ceramics, such as  $PbZr_xTi_{1-x}O_3$  (PZT), are largely used in the sensing, actuating and energy storage applications due to their remarkable piezoelectric and dielectric properties <sup>[6,9]</sup>, and hence was of significant interest for this project.

#### II. EXPERIMENTAL DETAILS

#### 2.1 Synthesis of LCDM

PbZr<sub>0.52</sub>Ti<sub>0.48</sub>O<sub>3</sub> (PZT) was easily synthesized in powder form by an acid based sol gel route [2] starting from Lead Nitrate (Pb(NO<sub>3</sub>)<sub>2</sub>), Zirconium Oxychloride (ZrOCl<sub>2</sub>.8H<sub>2</sub>O) and Titanium (IV) isopropoxide ( $TiC_{12}H_{28}O_4$ ). 1 g of Citric acid was added to 100 ml de-ionized water and stirred for 15 minutes. The aforementioned raw materials, along with 5 ml HNO<sub>3</sub>, are dissolved in this acidic de-ionized water and this solution was stirred for 30 minutes. It was then refluxed for about 2 hours. The refluxed solution was placed in an oven at 100°C for 2 more hours which initiates the gel formation. The obtained precursor was calcined at 600°C for 3 hours and the powder thus formed was grounded. The powder was again heated at slightly higher temperature of 750°C for 3 hours to get the final PZT powders. Figure 1 shows the detailed procedure in a flow chart. Three different batches of powders were made with varying concentrations. However, in each sample the ratio of P:Z:T was maintained in the atomic ratio of 1:0.52:0.48.<sup>[2]</sup>



Figure 20: Flow chart of preparation of PZT powders by sol-gel route



Figure 21: Sample 1

Figure 3: Sample 2



Figure 4: Sample 3

To make the dielectric, 2 wt% of the PZT powders was dispersed in diethylene glycol and stirred with heating to obtain a homogenous solution for about 2 hours at a bath temperature of  $50^{\circ}$ C. The solution was homogenized using a homogenizer and subjecting it to ultrasonic vibrations.

# 2.2 Characterization of PZT

2.2.1 X-Ray Diffraction

X-ray diffraction of the three samples of PZT was carried out and the results were compared to the standard XRD pattern of PZT composite obtained from other methods.


Comparison of XRD pattern of sample PZT and standard PZT

Of the three samples, sample 1 showed the closest resemblance to the standard pattern. The figures are shown above (Figure 5 & Figure 6). As you can see, the XRD patterns are very similar. Thus, it can be concluded that the low temperature synthesis of PZT was successful in producing the same powder which is otherwise obtained by more expensive methods and at higher temperatures.

#### 2.2.2 Scanning Electron Microscopy (SEM)

The SEM images show particle sizes of around 500 nm. It was found that this PZT powder formed a colloidal solution with Diethylene Glycol (DEG) and if left for a day, some of the powder settled. To avoid this, a particle size of a smaller diameter was required.



Figure 7: SEM image of PZT sample

The powder was mixed with a non-dissolving liquid, namely acetone and then crushed in a simple mortar and pestle. The particle size was reduced to 100-200nm. 2 wt% of this powder was dissolved in DEG. It was homogenized and further subjected to ultrasonic vibrations to give a clear homogeneous solution.

### 2.3 Fabrication of the Supercapacitor

The Liquid dielectric was placed in sample holders of different shapes and sizes which would give us a good understanding of its effects on the performance of supercapacitors.

#### 2.3.1 Supercapacitor 1



Figure 8: Supercapacitor 1

The sample holder in figure 8 was made of plastic. It was completely filled with the dielectric. The diameter is 1.2 cm and the height is 3.6 cm. Simple copper wires were used as the anode and cathode. It was held in place and sealed using a water resistant sealant. The cap denotes the positive terminal.

#### 2.3.2 Supercapacitor 2



Figure 9: Supercapacitor 2

The sample holder in figure 9, also made of plastic, was filled up completely with the dielectric. This holder is larger than the supercapacitor 1. The diameter of the holder was 3 cm and the height was 4.5 cm. Similar copper wires were used as the electrodes. It was tightly sealed using a sealant as done in the previous one. The cap denotes the positive terminal of the supercapacitor.

#### 2.3.3 Supercapacitor 3



Figure 10: Supercapacitor 3

This sample holder is different from the other two. The diameter is larger at 3.9 cm, and the height is much smaller at 1.4 cm.

The case was insulated thoroughly to prevent any leakage. Similar copper wires were used as electrodes.

#### III. RESULTS AND DISCUSSIONS

## 3.1 Capacitance

The capacitance was found using an LCR meter. It was measured for all the supercapacitors which yielded the results as shown in Table 1.

**Table 1: Capacitance** 

Form factor	capacitance
Supercapacitor 1	17 pF
Supercapacitor 2	35 pF
Supercapacitor 3	253 pF

The sharp increase in the capacitance of supercapacitor 3 can be attributed to the fact that C is directly proportional to A/d as seen from equation (1).

```
C = E^*(A/d) .....(1)
```

Where,

C=capacitance of the capacitor

 $\mathcal{E}$ = Dielectric permittivity

d=Distance between the electrodes

The capacitance can be further increased by arranging similar such capacitors in parallel. When capacitors are kept in parallel, their effective capacitance is given by,  $C_{eff} = C_1 + C_2 + C_3....$  and so on .....(2)

Combining supercapacitors in series or parallel has an advantage over regular batteries as it does not require cell balancing. Hence, a supercapacitor of any desired capacitance and voltage can be attained by simply arranging them in parallel.

Another way of increasing the capacitance of the supercapacitor is by varying the dimensions of the sample holder. From equation (1), we see that increasing the area of the electrodes and reducing the length between the electrodes can increase the capacitance by a big margin. Thus, the use of carbon electrode instead of copper electrodes would result in a far more superior capacitance. It is said that the surface area of 1 gram of carbon is equivalent to the area of a tennis court.

#### 3.2 Relative permittivity

The relative permittivity of the dielectric was calculated using the following formula:

 $\mathcal{E}_{r} = (C^{*}d)/(\mathcal{E}_{o}^{*}A) \qquad ....(3)$ Where, C= Capacitance of the capacitor d= Distance between the electrodes A= Surface area of electrode =  $\pi * d * l$ =  $\pi * (0.0008) * (1)_{=0.0025} m^{2} \qquad ....(4)$ 

 $\varepsilon_0$ =Electric constant=8.854\*10<sup>-12</sup> Fm<sup>-1</sup>

Thus, the relative permittivity  $E_r$  was found to be 7078 which is high when compared to a capacitor.

#### 3.3 Voltage

The maximum voltage of the supercapacitors was found using a multimeter after being charged completely. The voltage was recorded and displayed in table 2.

Table 2: Maximum Voltage

Form factor	Voltage (volts)
Supercapacitor 1	0.3
Supercapacitor 2	0.66
Supercapacitor 3	0.5

As you can see, the voltage is the largest for Supercapacitor 2 and least for supercapacitor 1. Comparing the volumes of the liquid dielectric held by each of these supercapacitors, we notice that the voltage is directly proportional to it. Thus, more the volume of dielectric, more is the voltage. Since supercapacitor 2 has the largest volume of the dielectric among the three, it shows the highest voltage rating. Hence we can conclude that the voltage can be increased by using more of the liquid dielectric.

#### 3.4 Energy stored, W<sub>stored</sub>

The maximum energy that can be stored was calculated using the formula

$$W_{\text{stored}} = C^*(V)^2 / 2 \tag{5}$$

Where, C= capacitance in Farads

V= voltage in Volts

#### Table 3: Maximum energy storage capacity

Form factor	W <sub>stored</sub> (J)
Supercapacitor 1	$7.65 * 10^{-13}$
Supercapacitor 2	$7.623 * 10^{-12}$
Supercapacitor 3	3.1625*10 <sup>-11</sup>

Clearly the 3<sup>rd</sup> supercapacitor has a much higher energy storage capacity due to the superior capacitance.

#### **Charge & Discharge**

The time taken for all the 3 supercapacitors to reach its full charge is about 2 minutes. This is much faster than a conventional battery which requires to be charged for hours. But consequently, the discharge rate is much faster when compared to a battery. Also, supercapacitors self-discharge to some extent if not used.

#### IV. APPLICATIONS

There are numerous applications that could use the proposed technology. For instance, small size supercapacitors can be widely used as maintenance-free power sources for IC memories and microcomputers. Among applications for large size supercapacitors are load leveling in electric and hybrid vehicles as well as in the traction domain, the starting of engines, applications in the telecommunication and power quality and reliability requirements for uninterruptable power supply (UPS) installations [1]. Supercapacitors, owing to their high power capability, allow new opportunities for power electronics. Applications where short time power peaks are required can be provided by supercapacitors. Typical examples where a big current is required during a short time are the fast energy management in hybrid vehicles or the starting of heavy diesel engines. Supercapacitors may supply the power to the electrical vehicle required to meet the city road traffic conditions. Additional applications may be found in elevators, cranes or pallet trucks in the electric transportation domain, hand tools, flashlights, radars and torpedoes in the military domain, defibrillators and cardiac pacemakers in the medicinal domain, pulsed laser and welding in the industry and memory supplies in phones or computers.

### V. CONCLUSIONS

Thus, from the above study it can be concluded that the supercapacitor made using a Liquid Composite as the dielectric is a viable and stable alternative to solid state supercapacitors. There are some advantages which support this fact. For example, the dielectric permittivity can be easily tuned by increasing the weight percentage of PZT in DEG or by varying the particle size. The particle size, in turn, can be changed by just varying the calcination temperature. Usage of the PZT powder is very less; 2 wt% to be precise. Thus the Dielectric can be made with relatively low costs. Also, the material is non-corrosive and is inert to any electrode material. So other electrodes like carbon or Ag can also be used. Since the dielectric is in liquid state, the final product can take any shape to suit the needs of different applications.

So as we can see, the future of LCDM supercapacitors is looking very bright and there is immense scope to carry out further research and improve this technology, which could perhaps lead to replacement of Lead acid or any other harmful form of batteries in the future. We intend on continuing our research further on this topic and hope to acquire some more useful data.

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#### AUTHORS

First Author – Syed Faraaz Hussain, BE Chemical Engineering, B.M.S College of Engineering, <u>faraaz.28@gmail.com</u>
Second Author – Subramaniam TG, BE Chemical Engineering, B.M.S College of Engineering, <u>tgskarthik@gmail.com</u>
Third Author – Sandeep S, BE Chemical Engineering, B.M.S College of Engineering, <u>sandeepsailesh@gmail.com</u>
Fourth Author – Anup L, BE Chemical Engineering, B.M.S College of Engineering, <u>anuplakshminarasaiah@gmail.com</u>
Fifth Author – Samita Maitra, PhD Chemical Engineering, B.M.S College of Engineering, <u>samita.maitra@gmail.com</u>

**Correspondence Author** – Syed Faraaz Hussain, <u>faraaz.28@gmail.com</u>, contact number: +91 9731887156

# **American Sign Language Detection**

Kiratey Patil, Gayatri Pendharkar, Prof. G. N. Gaikwad

E&TC Department, STES's Sinhgad College of Engineering, Vadgaon(BK.), Pune-41. Savitribai Phule Pune University.

Abstract-Sign language: a natural, linguistically complete and a primary medium for the humans to interact. Nowadays, this language is prevalent amongst the deaf, dumb or blind individuals. However, with the conventional sign language not known to the signers, it adversely affects their interpersonal relationships in the society. There is a need of much more sophisticated method than communication through interpreters or writing. Our aim is to design a system in which sensor glove is used to capture the signs of the American Sign Language (ASL) and translate them to English displayed on a LCD.

*Index Terms*- American Sign Language (ASL), sensor glove, Flex sensors, gesture recognition.

# I. INTRODUCTION

T his system results from a walkthrough in different areas; a rudimentary notion developed into a full-fledged scheme.

"American Sign Language Detection" is a project implementation for designing a system in which sensor glove is used to capture the signs of American Sign Language performed by a user. The glove comprises flex sensors which detect the position of each finger by monitoring the bending of the flex sensors mounted on them. The sensor circuit output is then sent to Microcontroller through ADC. The pre-stored database of letters is then activated and displayed on the LCD as and when making the hand gestures. These data will provide a medium for normal as well as deaf people to communicate more easily in the society.

The sign language used or detection is the American Sign Language (ASL) which is considered as the standard for communication among deaf/dumb people. The gestures are displayed in text format (English) which is easily accessible to a major group of normal people.

# II. RESEARCH AND COLLECT IDEA

The preliminary stature of the research arouses from several different ideas clubbed together to fashion a system which can be devised into practical applications. The sensor gloves were previously used in gaming, constructed using different types of gloves made from different materials.

The American Sign Language (ASL) is a standard convention for communication amongst the deaf/dumb. A gesture for each alphabet is pre-decided. The Figure 1 shows the ASL.



Figure 1: American Sign Language

A paper referred has been published based on sensor glove. It examines the possibility of recognizing sign language gestures using sensor gloves. Previously sensor gloves are used in applications with custom gestures. This paper explores their use in Sign Language recognition which is done by implementing a project called "Talking Hands"[1].

Sensor gloves for measurements of finger movements are a promising tool for objective assessments of kinematic parameters and new rehabilitation strategies. Here, a novel lowcost sensor glove equipped with resistive bend sensors is described and evaluated. This paper, "Development and evaluation of a low-cost sensor glove for assessment of human finger movements" examines the above mentioned aspects [2].

While working on the specified topic, several components like sensors, controllers were studied which are the building blocks of the system.

# **III. PLATFORM AND LANGUAGE STUDY**

The platform study deals with the kind of hardware and software used in the system. The software used in the proposed system consists the software used for PCB designing, micro-controller programming and circuit simulation. Here, the software used for PCB designing is "Express PCB". The software used as Editor and debugger is "AVR STUDIO" and that used for burning the program is "SINAPROG". The language supported International Journal of Scientific and Research Publications, Volume 4, Issue 11, November 2014 ISSN 2250-3153

by the Microcontroller Atmega-16 is "Embedded-C". Additionally, PROTEUS was used to carry out certain simulations.

The Microcontroller used is ATMEGA-16. Five Flex sensors are used which are used to detect the specific gestures of the fingers produced by the glove.

The language studied for usage in the proposed system is the "Embedded-C language". Embedded C is a set of language extensions which is used for the C Programming language for different embedded systems.

# IV. BLOCK DIAGRAM



Figure 2: Block diagram representation

Every single block explanation in detail with its working in the project along with detailed flow of each block is described with the help of the Block diagram representation.

.The block diagram in Figure 2 of the proposed system mainly contains the following blocks:

- Microcontroller (Atmega-16)
- Sensor Glove

The detailed description of the components is given as follows,

#### • Microcontroller Unit (MCU)

The MCU Atmega-16 is a 40 pin IC by Atmel family supporting Embedded-C Language. A small on-chip computer which has a processor core, memory and, programmable input/output peripherals with 16K Bytes of In-System Self-Programmable Flash ROM memory and 1KB of internal SRAM. It also has an inbuilt ADC of 8-channel, 10-bit resolution i.e. each analog input is converted to its 10 bit equivalent output.

#### Sensor Glove

A Sensor glove is prepared with a flex sensor mounted on each finger as shown in the Figure 3 below. The material of the glove is latex which is non-conducting. It detects the position of each finger by monitoring the bending of the flex sensors on it. Accordingly, depending upon its output, gesture of the hand will be recognised and will be displayed on the screen.



Figure 3: Sensor glove

#### V. SIMULATIONS

The software used for circuit simulation is PROTEUS 7.7. As the sensors can't be shown over here, two switches are used to represent them by providing three different sorts of inputs as three different gestures as shown in the following Figures 4-6. The two switches SW1 and SW2 provide inputs for three gestures A, B and C as:

- □ A (VCC, VCC, VCC, GND, GND)
- □ B (VCC, VCC, GND, GND, GND)
- □ C (VCC, GND, GND, GND, GND)





Figure 4: Simulation results for gesture A

Figure 6: Simulation results for gesture C



While simulating, random input values are fed to the input port pins of the microcontroller (Port A). The analog inputs are fed here. This analog data is converted to equivalent 10-bit digital data by the A/D converter of ATMEGA-16. The digital output is calculated as an example for 'A' as,

Digital output = (Analog input\*1023) / (VREF)

For VCC (5V), D (1) = (5V\*1023) / 5V = 1023.

For GND (0V), D (0) = (0V\*1023) / 5V = 0.

Therefore, for 'A', the final output is '1023' digital value for first three fingers and '0' for last two fingers. This input / output values are random, concerned with simulation only and not related to actual gestures.

Similarly, the values for B and C are calculated.

Figure 5: Simulation results for gesture B

#### VI. FLOWCHART

This section, Flowchart explains the basic working of the system in a simple way. Initially, the gestures from the gloves are accepted. This analog output is then converted to equivalent 10-bit digital output by the ADC of the micro- controller ATMEGA-16.

This output is then compared to the previously stored data of letters for the corresponding gestures and it is checked for validity. If the gestured value matches any of the pre-stored value, the corresponding value from database is displayed on the LCD or else it goes back in the loop. The figure 7 below illustrates the Flowchart of the system.



Figure 7: Flowchart

#### VII. SYSTEM OVERVIEW

The proposed system, "American Sign Language Detection" is the prototype for establishing easy communication between deaf/dumb people and normal people. The conventional sign language, widely used over the world for communication by signers is known only by a handful amount of the normal people. Due to this, they face a communication gap in the society as their gestures cannot be interpreted. To overcome this problem, this system has been implemented. By implementing this, the redundant factors like need of a mediator for dumb/deaf people can be eliminated. This will surely help them to be independent and confidently express them. As the prototype is compact and portable, it can be carried to almost anywhere they go.

Initially, for the implementation of the glove, a glove of latex (surgical glove) is used. It being tight, serves the purpose of proper alignment of the sensors on the fingers. Gestures, stated in Figure 1, are captured from the sensor glove. Each finger is associated with one flex sensor. The change in resistance of the flex sensor with respect to bend is captured and data is fed to the MCU. These five analog values from five fingers each, are given to five different pins of Port-A (PA0-PA4) of the MCU. Then, the MCU converts each analog input to its digital equivalent, and average of all the digital values is taken. This will give a value corresponding to the gesture made giving each gesture a unique value. Values for all the MCU. This will create a database of the 26 alphabets and an additional gesture for 'space'.

For a better and sophisticated implementation, a matrix technique has been implemented. Here, each sensor bend is divided in three distinct parts, viz. Complete Bend (CB), Partial bend (PB) and Straight (S). Range of values, associated with each bend of the respective sensor is calculated and its digital equivalent is found out. Table 1 below, depicts the Bend characteristics corresponding to each of the five fingers, viz. thumb, index, middle, ring and little. Though the corresponding values are not same for all the sensors, it illustrates the general concept behind the idea of the matrix technique. The CB, PB and S values for each sensor are calculated and the range is specified.

Table	1:	Bend	characteristics
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BENDS	СВ	РВ	S
1. THUMB	<=550	<=550	>550
2. INDEX	<=380	381-500	>500
3. MIDDLE	<=340	341-450	>450
4. RING	<=390	391-480	>480
5. LITTLE	<=460	461-500	>500

Then, a matrix of the corresponding alphabet as to its value for each finger is found out. Hence, bends for each gesture are carried out.

One more, extra gesture for a 'space' is added. All these min and max digital values are stored in the controller memory, and corresponding alphabets are also stored. Hence, the range in which the value falls is having one alphabet, which is to be International Journal of Scientific and Research Publications, Volume 4, Issue 11, November 2014 ISSN 2250-3153

displayed. The LCD is interfaced with the MCU which is used to display the corresponding output. The Table 2 below illustrates the matrix implementation for all the alphabets and extra gesture(s).

EDICED					
FINGER	THUMB	INDEX	MIDDLE	RING	LITTLE
LETTERS					
A	S	СВ	СВ	СВ	СВ
В	В	S	S	S	S
С	S	PB	PB	PB	PB
D	В	S	СВ	СВ	СВ
Е	В	PB	PB	PB	PB
F	В	СВ	S	S	S
G	В	S	СВ	S	СВ
Н	В	S	S	СВ	CB
Ι	В	СВ	СВ	СВ	S
J	В	СВ	СВ	СВ	PB
K	S	S	S	СВ	СВ
L	S	S	СВ	СВ	СВ
М	В	PB	PB	PB	СВ
N	В	PB	PB	СВ	CB
0	В	PB	PB	PB	S
Р	S	S	PB	СВ	CB
Q	S	S	СВ	СВ	S
R	В	S	PB	CB	СВ
S	В	СВ	СВ	СВ	СВ
Т	S	PB	СВ	CB	СВ
U	В	PB	S	СВ	CB
V	S	PB	PB	CB	СВ
W	В	S	S	S	СВ
L					

Х	В	PB	СВ	CB	СВ
Y	S	СВ	СВ	CB	S
Z	В	S	S	СВ	S
Space	S	S	S	СВ	S

These implementations give a thorough idea of the system. In the Proteus 7.7, certain simulations for the gestures for the alphabets A, B and C are carried out. Similarly, using the sensor glove, the practical implementations are carried out. The Figure 8 shows the implementation of an alphabet 'A'.



Figure 8: Gesture for A

The following Figure 9 shows the final System.



Figure 9: System

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# VIII. CONCLUSION

A full-fledged system for communication between the deaf/dumb and normal people is developed. Simply by monitoring the hand movements, the respective data fed to the microcontroller is compared and the designated output is displayed. LCD serves the purpose of displaying. From this system we have achieved communication with the help of finger gestures. It exhibits a fluent communication mode between normal and deaf/dumb people. The gesture glove prototype is used for such purpose and experimented successfully.

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# AUTHORS

FirstAuthor-Kiratey Patil, B.E. (E&TC), STES's Sinhgad College of Engineering, Vadgaon (BK.), Pune-41 kiratey@gmail.com.
SecondAuthor-Gayatri Pendharkar, B.E. (E&TC), STES's Sinhgad College of Engineering, Vadgaon (BK.), Pune-41 gayatri.pendharkar21@gmail.com.
ThirdAuthor-Prof. G. N. Gaikwad, M.E. (E&TC), Assistant Professor at Department of E&TC, STES's Sinhgad College of Engineering, Vadgaon (BK.), Pune-41 gngaikwad.scoe@sinhgad.edu.

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# Survey of Various Approaches on Video Recognition Systems

# Anjitha V\*, Gnana Sheela K \*\*

<sup>\*</sup> Department of Electronics and Communication Engineering,TIST,CUSAT,Kerala,India <sup>\*\*</sup>Department of Electronics and Communication Engineering,TIST,CUSAT,Kerala,India

*Abstract*- Video-based object or face recognition services on mobile devices have recently gained significant attention. Cloud systems start to be utilized for services to analyze user data in the region of computer vision. In these services, key points are extracted from images or videos and the data is identified by machine learning with large database of cloud. Detecting Person-Of-Interest (POI), e.g., fugitives, criminals and terrorists in public spaces is a critical requirement of many law enforcers and police officers. Face recognition applications for airport security and surveillance can benefit from the collaborative coupling of mobile and cloud computing as they become widely available today.

Index Terms- Cloud Server, Key Point of Interest, Scale-Invariant Feature Transform

#### I. INTRODUCTION

Potential of a cloud system combining a smart device and cloud servers is increasing dramatically. One of the examples is "Siri" which offers a friendly web knowledge navigator based on natural language user interface. Since latest portable devices equipped not only a microphone but also a high resolution camera, this kind of cloud based framework is also promising to create various kinds of video based recognition systems.

### II. LITERATURE SURVEY

Moravec et al (1981) developed a corner detector for image matching, but it is less repeatable and is only 20% accurate. The Moravec detector was improved by Harris and Stephens (1988) to make it more repeatable for small image variations and near edges. The Harris corner detector is very sensitive to changes in image scale, so it does not provide a good basis for matching images of different sizes. Harris corner detector has been widely used for image matching tasks. While these feature detectors are usually called corner detectors, they are not selecting just corners, but rather any image location that has large gradients in all directions at a predetermined scale. The drawback of this system is it is very sensitive to changes in image scale and does not provide a good basis for matching images of different sizes. It is only 50% accurate.

Lowe D G et al (2004) developed a method for extracting distinctive invariant features from images that can be used to perform reliable matching between different views of an object or scene. The features are invariant to image scale and rotation, and are shown to provide robust matching across a substantial range of affine distortion, change in 3D viewpoint, addition of noise, and change in illumination. The features are highly distinctive, in the sense that a single feature can be correctly matched with high probability against a large database of features from many images. This paper describes an approach to using these features for object recognition. The recognition proceeds by matching individual features to a database of features from known objects using a fast nearest-neighbor algorithm, followed by a Hough transform to identify clusters belonging to a single object, and finally performing verification through least-squares solution for consistent pose parameters.

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This approach to recognition can robustly identify objects among clutter and occlusion while achieving near real-time performance. The described SIFT key points are particularly useful due to their distinctiveness, which enables the correct match for a key point to be selected from a large database of other key points [1]. The key points are shown to be invariant to image rotation and scale and robust across a substantial range of affine distortion, addition of noise, and change in illumination. Paul A K et al (2006) presents multiclass object classification and recognition using smart phone and cloud computing (client server) technology. The image recognition is scale and rotation invariant and the speed of operation is very fast. The response time from the server is very fast. This system can be extended for navigation applications and landmark detection, driver assistance. It is applied for recognizing two dimensional texture based object. Using SIFT the average classification rate is 84%. The computing power of the smart phone is not enough to give the prompt response.

Heinzelman et al (2011) proposed the design and implementation of face recognition applications using mobile-cloudletcloud architecture named MOCHA. This architecture is designed to minimize the overall response time of the face detection and face recognition algorithms given heterogeneous communication latencies and compute powers of cloud servers at diverse geographical placements. The obtained results are more intelligent task partitioning algorithms employed by the cloudlet permits response-time improvement by offloading work from the mobile device, 2) the response time decreases as the number of cloud servers increase and this improvement is more emphasized when cloudlets are in place, and 3) communication latencies affect the response time considerably, which can be partially coalesced when cloudlets are used as buffers. It is complex, and is only 69% accurate.

Yuan J et al (2012) proposed a method for local occupancy information based on the local 3D point cloud around each joint using fourier temporal pyramid features. The disadvantages are, it has high-ordering features and complicated learning procedures. It has 85.7% recognition rate. Jong et al (2012) describes an expert system of bio information, which is combined with the smart devices using wireless sensor network (WSN). The HRV detection parameter value is adopted the criteria and basis for the features of diabetes by using artificial neural network (ANN) algorithm. The accuracy of ANN diagnose has 87.33%A general purpose, low-cost, wide area, remote monitor, mobile and real-time analyzer is designed and implemented for investigation of the heart rate variability. Zig bee is seen that short distance communication within a care zone.

Prakash et al (2013) investigates a wearable computerized eyewear based face recognition system. This system is a portable device which can accompany a police officer during patrolling or other tasks. The eyewear is connected to a cloud based face recognition system via wireless networks. Facial images captured by the mounted camera are sent to the cloud for identity retrieval. When the system finds POI, it would alert officers via overlaying a virtual identity tag on the real POI's face on the transparent screen of the eyewear. We provide approaches to greatly minimize recognition time, including leveraging the large storage and high computational capacities provided by the cloud. The cloud enables nationwide POI database and supports parallel computing for face recognition.

Gook et al (2013) proposed a system using cloud computing, image processing, information mapping and data synchronization. The advantage of the system is better and faster method for image data synchronization. It is most efficient way with using cloud server included human tracking at the end results .Even though it has 334.033 millisecond of fastest execution time and faces several security problems. Yiannis et al (2014) propose a contextual bandit framework for learning contention and congestion conditions in object or face recognition via wireless mobile streaming and cloud-based processing .main advantages are it maximize the average recognition rate and efficiently allocating transmission settings and has highly-varying contention levels in the wireless transmission, as well as the variation in the task-scheduling congestion in the cloud .But it is complex. The recognition accuracy rate per transaction is 90 %.

Althloothi et al (2014) designed method with multi-fused features (i.e., motion of 3D joint positions and shape information) along with multiple kernel functions achieves 93.1% recognition rate. This method uses human activity recognition (HAR), depth-

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based life logging HAR system , depth imaging sensor and hidden Markov Models(HMM). The advantage of this system is that, once the life logging HAR system is trained, the system can be activated to produce life logs by recognizing the learned human activities. Performance of the proposed life-logging HAR technique, achieving mean recognition rates of 92.33%, 93.58% and 90.33% over the conventional methods having PC features as 78.42%, 77.83% and 72.25% and IC features as 82.58%, 82.25% and 78.33% in smart indoor environments.

Takahiro et al(2014) discussed low complexity SIFT (Scale-invariant feature transform) based key point extraction algorithm and its hardware engine capable of operating at full-HD 60fps video .As a technique to reduce network bandwidth, a key point of interest (KOI) detection algorithm based on spatio-temporal feature considering mutual dependency and camera motion is also discussed. The proposed algorithm achieves about 95% reduction of key points and 53% reduction of computational complexity. The reduction of descriptor data communicated with cloud systems and reduction of computational complexity of descriptor calculations are achieved .It reduces noise by comparing with states of surrounding key points.

No	Author	Year	Methodology	Advantage	Disadvantage	Result
1	Ikenaga T et al	2014	1.A low	1.Reduction of	Proposal detects	The proposed algorithm
			complexity SIFT	descriptor data	key points	achieves about 95%
			(Scale-invariant	communicated with	from only human	reduction of key points
			feature transform)	cloud Systems	which moves	and 53% reduction of
				2. Reduction of	largely and	computational
			2.Kkey point of	computational	outstanding	complexity.
			interest (KOI)	complexity of	texture whose	
			detection	descriptor	gradient is large	
			algorithm	Calculations		
			KLT tracker	3. Reduction of data		
				amount of key points		
				4. It reduces noise by		
				comparing with states		
				of surrounding key		
				points.		
2	Jalal A et al	2014	1.Human	1.Once the life	1.complex	performance of the
			activity	logging		proposed
			recognition (HAR)	HAR system is		life-logging HAR
			2.Depth-based	trained, the system		technique, achieving
			life logging HAR	can be activated to		mean recognition rates
			system	produce life logs by		of 92.33%, 93.58% and
			3. Depth imaging	recognizing the		90.33% over
			sensor	learned human		the conventional
			4.Hidden Markov	activities		methods having PC

# III. COMPARATIVE ANALYSIS Table 1. Comparative analysis of various approaches

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			Models			features as 78.42%,
						77.83% and 72.25% and
						IC features as
						82.58%, 82.25% and
						78.33% in smart indoor
						environments
3	Althloothi et al	2014	Multi-fused		1.Large-	93.1% recognition rate
			features (i.e.,		dimensionality	
			motion of 3D joint		features which	
			positions and		may be unreliable	
			shape information)		for postures with	
			along with		self-occlusion	
			multiple		2. Needs high	
			kernel functions		computational	
					times that make it	
					impractical for	
					long-term HAR	
					and real-time	
					applications.	
4	Atan O et al	2014	1.multi-user multi-	1.Maximize	1.Set of device	Same recognition
			armed bandits	the average	transmission	accuracy rate per
			2.computing	recognition rate	settings grows	transaction (90%)
			cluster	2.Efficiently	combinatorial	
				allocating	2.complex	
				transmission settings		
				3. Highly-varying		
				contention levels in		
				the wireless		
				transmission,		

5	Gook L B et al	2013	1.Cloud	1.A better and faster	1.Security	334.033 millisecond of
			Computing	method for image	problems	fastest execution time
			2.Image	data synchronization		
			Processing	2.Most efficient way		
			3.information	with using cloud		
			mapping	server included		
			4.data	human tracking at the		
			synchronization	end results		
			5. FAST Features	3. Better computation		
			Detection	speed		
			6 .SURF Features			
			Detection			
6	Wang X et al	2013	computerized-	1.Rapid detection of	1.No information on the	Recognition time is
			eyewear	POIs from a large	evaders ( <i>e.g.</i> ,	reduced from 33748ms
			POI detection	POI database	gender, race or	to only $202ms$ , i.e.,
					height)	99:4% of time is
_						saved.
1	Yuan, J et al	2012	local occupancy	efficient	1.high-ordering	85.7% recognition rate
			information based		features	
			on the local 3D		2.complicated	
			point cloud around		learning	
			each joint, Fourier		procedures,	
			feeturee			
0	Huong C H at al	2012	1 wireless	1 A gaparal purpaga	1 Training is	A courses of ANN
0	Hualig C H et al	2012	notwork (WSN)	1.A general purpose,	required for data	diagnoso
			2 ANN algorithm	area remote monitor	sets	has 87 33%
			3 heart rate	mobile and real time	5015	1103 07 . 33 /0
			variability	analyzer		
			(HRV)	2. A reference to the		
				medical staff at the		
				time of diagnosis		
1						

9	Muraleedharan R et	2011	1.Mobile-cloudlet-	1.Minimize the	1.Complex	69% face recognition
	al		cloud architecture	response	architecture	
			named MOCHA	time given diverse		
				communication		
				latencies and server		
				compute		
				powers.		
				2.Designed to		
				minimize the		
				overall response time		
				of the face detection		
				and face recognition		
				algorithms		
				3. Technically		
				feasible		
				4. cost-effective		
10	Paul A K et al	2006	1.Cloud	1.Image recognition	1.Computing	Average classification
			computing	is scale and rotation	power of the smart	rate is 84%.
			2.Scale Invariant	invariant	phone is not	
			Feature	2.Speed of operation	enough to give	
			Transforms (SIFT)	is very fast	the prompt	
				3.Response time from	response	
				the		
				server is very fast		
11	David .G Lowe et al	2004	1.SIFT( Scale	1.Distinctiveness,	1.,Major cause of	Recognition accuracy for
			Invariant Feature	2.It is invariant to	error is the initial	3D objects rotated in
			Transform )	image rotation and	location and scale	depth by 20 degrees
			2.Hough transform	scale and robust	detection.	increased from 35% for
				across a substantial		correlation
				range of affine		of gradients to 94%
				distortion, addition		
				of noise, and change		
				in illumination		
				3. computation is		
				efficient		
				4. Resistant to even		
				large amounts of		
				pixel noise,		

12	Harris et al	1988	Corner detection	1.More repeatable	1.Very sensitive to	50% accurate
				under small image	changes in image	
				variations and near	scale	
				edges	2. Does not	
				2.They are	provide a good	
				not selecting just	basis	
				corners, but rather	for matching	
				any image location	images of different	
				that has large	sizes	
				gradients in all		
				directions at a		
				predetermined		
				scale.		
13	Moravec et al	1981	corner detector	Useful for image	Less repeatable	20% accurate
				matching		

Table 1 shows comparative analysis of various recognition systems. By analyzing existing methods it is clear that proposed method is more effective.

### **IV.CONCLUSION**

This survey presented that the smart feature detection device for cloud based video recognition system is more effective than other techniques of recognition systems. Because it describes a low complexity SIFT based key point extraction algorithm and its hardware engine. It also introduces key point of interest detection algorithm based on spatio-temporal feature. Both are key to implementing a smart feature detection device and will make a great contribution to increase the potential for a cloud based video recognition system.

It's advantages are reduction of descriptor data communicated with cloud Systems, reduction of computational complexity of descriptor Calculations and reduction of data amount of key points.

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# **Political Violence: A Study of Naxal Movement in India**

# Dr. B.K. Mahakul

Faculty, Department of Political Science, Hidayatullah National Law University, Uparwara, Abhanpur, New Raipur 493661(Chhattisgarh).

Abstract- Political violence is a phenomenon that, in the past century, has been growing in alarming proportions across the world. Violence is a common method used to achieve particular ends .The turn of the century make a new goal threat .The most important cause of socio-political violence is the feelings of "Relation Deprivation." As and when people perceive or believe that injustice and frustrated, and tend to strive violently, as the last option .It may have distabiling consequences for the Sociopolitical violence, its forms, casual factors and implications for the political-systems.

Index Terms- Violence. Structural Violence. Relative Deprivation, Frustration, Inequality, political System.

## I. SOCIO-POLITICAL VIOLENCE - THE CONCEPT

Violence refers to any physical force or any damage or injury to person or property. According to Webster's New Collegiate dictionary<sup>1</sup>, violence means, "exertion of any physical force for instance: (a) Violent treatment or procedure, (b) Profanation infringement, outrage, assault, (c) strength. energy, activity displayed or exerted for vehement, forcible or destructive action or force, (d) vehemence in feeling, passion, order, furry, fervor.

According to Encyclopedia of Crime and Justice  $2^{2}$ , in a broad sense, "violence is a general term referring to all types of behaviour either threatened or actual, that result in the damage or destruction of property or injury or death of an individual.

According to Black's Law Dictionary, "violence means unjust or unwarranted use of force usually accompanied by fury, vehemence, or outrage, physical force unlawfully exercised with the intent to harm".<sup>3</sup>

The Encyclopedia of Social Sciences define violence as "the illegal employment of methods of physical coercion for personal or group ends..... , which is distinct from force or power".... a purely physical concept. It goes beyond the dictionary meaning of the term 'violence' as merely the exercise of physical force so as to inflict injury or damage to persons or property both spiritual; and non-spiritual. The 'illegality' and 'illegitimacy' of social violence will differ in situational norms and social context. There is noticed overlapping between "force' and 'violence' on the one hand, and 'discrimination' and 'oppressions' on the other hand. For all these reasons, 'Social Violence' is roughly defined as the illegal use of physical, mental and social concern or use of threats for personal or group ends reflected in the present day developmental processes.

One social psychologist Moyer<sup>5</sup> defines violence as a form of human aggression that involves inflicting physical damage on persons or property. For psychologists, violence and aggression are twin terms but with certain differences between

them. Allena  $^{6}$  uses the term aggression in both constructive and destructive senses, whereas violence is used only in destructive senses. Aggression can be sublimated in intrinsic, assertive or domineering behaviour, but violence can not be sublimated. It can only be redirected or substituted. Social psychologists have dealt with inter-personal behavioural violence. They have tried to define violence in terms of human aggression which inflicts physical injury.

A definition of aggression, acceptable to most social psychologists focuses: "Aggression is any form of behaviour directed towards the goal of harming or injuring another living

being who is motivated to avoid such treatment"<sup>7</sup> However, the concept of intentionality is important in separating aggressive behaviour from other forms of behaviour that might lead to some harm.

According to the American Heritage Dictionary  $^{8}$ , violence involves: (i) physical force exerted for the purpose of violating, damaging, or abusing, (ii) the act or an instance of violent action or behaviour, (iii) intensity or severity, as in natural phenomena, (iv) abusive or unjust exercise of power, (v) abuse or injury to meaning, content or intent, (vi) vehemence of feeling of expression.

World Health organization defined violence as the intentional use of physical force or power, threatened or actual, against a person, or against a group or community, that either results in or has a high likelihood of resulting in injury, psychological harm, mal-development or deprivation . In the above definition of violence, the inclusion of the word "Power',

in addition to the phrase "use of physical force', broadens the nature of a violent act, and expands the conventional understanding of violence to include those acts that result from a power-relationship, including threats and intimidation. The "Use of Power" also serves to include neglect or acts of omission, in addition to the more obvious violent acts of commission. This definition covers a broad range of outcomes including psychological harm, deprivation and mal-development. This reflects a growing recognition of the need to include violence that does not necessarily result in injury or death, but that nonetheless poses a substantial burden on individuals, families, communities, and health care systems.

According to Moser and Clark violence and power are intrinsically connected in a relation that involves "an uninvited but intentional or half-intentional act of physically violating the body of a person<sup>"10</sup>. Historically, violence has been expressed

through different means such as physical attack, which involves a direct aggression against an individual or a group. It is used in order to weaken in a more rapid manner the power of the other. Moser and Clark, define political violence, as "the Commission of violent acts motivated by a desire, conscious or unconscious, to obtain or maintain political power"<sup>11</sup>. Political violence is about the acquisition of power through violent acts. It is driven by desires for power that lead people to transgress others private domains.

Violence is a common method used to achieve particular ends. According to Moser and Clark, violence takes place in different domains: the public domain, usually recognized as political and social conflicts, and the private domain or domestic violence that exclusively deals with family and interpersonal conflicts. They categorize violence in three different levels: economic, social and political. Economic violence is conceptualized as "street crime, rubbery/theft, drug trafficking,

kidnapping and assaults" <sup>12</sup> Social violence represents disturbances at a more inter-personal level such as domestic violence. The political level portrays a more collective sphere manifested in "guerrilla conflict, paramilitary conflict, political assassinations, armed conflict between political parties, rape and 12

sexual abuse as political act,<sup>13</sup> These three levels of violence usually interact simultaneously, especially in developing countries where economic and social violence are triggered by the extreme conditions of deprivation and oppression in which poverty stricken and backward classes are forced to live due to the unequal distribution of wealth and material goods. Since violence is a continuum influenced by different factors and circumstances, the boundaries among social, economic and political violence are sometime diffuse and difficult to distinguish. Political violence involved in any or in all of these instances of violence share similar desires for gaining and maintaining an idealized power that allows control over others. It is in the public domain where political violence, intertwined with economic and social violence, takes place.

Political Violence is related to the large-scale social structure; it is embedded in society in the form of age-old discrimination and deprivation when privilege and opportunities are disitributed asymmetrically. Arthur Kleinman writes, "Massive political violence must work through local worlds in which social and cultural violence is already a routine part of day-to-day living". Political violence is differentiated from general violence by its specific political goal as violent action is directed toward achieving power and it has more collective rather than individual political actors. Collective political violence involves destructive/constructive attacks by groups within a political community against its regime, authorities or policies. It is expressed through different means such as physical or mental attack, which involves direct or indirect aggression against the structure, a group or an individual. Political violence is defined as the commission of violent acts motivated by a desire, consciously or unconsciously, to obtain or maintain political power. Political violence is rampant around the world at intra and interstate levels. Most of these conflicts have involved violence including homicide, arson, and destruction of property.

Sammuel P. Huntington and Ted Robert Gurr advocate that preservation of "Cultural identity" by states is the central issue of national and transnational violent politics, and that the fault -lines between civilizations are becoming primary fronts of geopolitical conflict. They further opine that in coping with identity crisis, what counts for people are blood and belief, faith and family; that people rally with those with the similar ancestry, religion, language, values and institutions, and distance themselves from those with different ones. Spurred by modernization, Huntigton says, global politics is being reconfigured along cultural lines; and that modernization and political violence are somehow connected. According to him, development is directly related to the increasing political instability and violence in Asia, Africa and Latin America after the Second World War. Similarly, Ted Robert Gurr focuses on the political fact that most of the world's populations do not share a commitment to the preservation of the state system as it is now constituted. They do not identify primarily with country or ideology but with people. What unites these people is not a government, but a sense of identity rooted in a common culture, a common history, and often a common memory or myth of conquest and oppression by outsiders.

# **1.2 CAUSAL FACTORS:**

Most of the social scientists who are concerned with the study and analysis of socio-political violence identify inequality and injustice as its basic causal factors. Historically, modern capitalist society characterized by high level of inequality and

injustice- xxx what Galtung <sup>22</sup> describes as "Structural Violence". Ted Robert Gurr, in his study of 114 countries, found deprivation to be the major cause for the magnitude of Civil Strife, and 60 country study by Muller and Seligson suggests that inequality is the major cause of Political Violence.

There may be discerned two major schools of thought that have focused on the causes of socio-political violence. Marxists (Communists) agree that unequal ownership of the mode of production is the root cause of violence. Classical doctrine of Communism states that armed struggle is necessary to overthrow Capitalism which is founded totally on exploitation. In several countries in Latin America, Africa and South Asia, violent movements have occurred on the basis of communist ideology. The motive of these movements was to establish a classless society. Violent conflict arose in those countries because of abysmal of poverty, corruption, and unequal distribution of wealth and power reflected in significant class differences. These factors contributed greatly to the emergence of organized violent rebel groups.

The other school argued that 'Identity' politics is the cause of socio-political violence. Ethno-nationalism is a collective identity which some times is sufficiently strong and exclusive to lead to genocide. Ethno-nationalist violence may be the most intense and frequent in modern days. The growing trend of ethno-nationalism over the world has sidelined the ideology and the boundaries of territory.

What leads civilians to take up arms against a state or its citizens towards some political aim? The reasons given by scholars are diverse, but it can be grouped into three basic categories: institutional, ideational and individual.

Institutions define and shape human activity; and the institutional explanations assert that their specific qualities or combination are essential to generate socio-political violence. The emphasis is on political violence, such as violence against states or regimes, economic institutions, or societal institutions, culture, or religion. It may be that institutions contain certain values or norms that implicitly or explicitly encourage such violence or that certain institutions constrain human activity, thus provoking socio-political violence. Institutional explanations can be seen as a quest for a 'root source' for violence, a necessary condition for such actions to take place.

If institutional explanations emphasize the impact of distinct organizational and patterns in fostering Socio-political violence, ideational explanations focus more on the rationale behind that violence. Ideational cause refers to ideas as may be institutionalized and rooted in some institutions such as a political organization or a religion- but often they are uninstitutionalized, with no real organizational base. The argument here is that ideas play an important role in socio political violence in the way they set out a world view, diagnose a set of problems, provide a resolution, and describe the means of attaining it. Any or all of these elements may be bound up with a justification of violence.

Finally, individual explanations center on those who carry out the violence themselves. It emphasizes the personal motivations that allow people to contemplate and carryout violence. It emphasizes psychological factors, and conditions that lead individuals towards violence. Such factors may be a function of individual experiences or they may be shaped by broader conditions in society, such as standard of living, level of human development, or gender roles. Such an approach tends to focus on how people may be driven to violence as an expression of desperation, liberation, or social solidarity. For example, some scholars who study religious violence emphasize the role of humiliation as a motivating force, a sense that one's own beliefs are actively marginalized and denigrated by society or other groups of people. Revolutionaries or terrorists, in this view, see violence as a way of restoring meaning to their lives, and may, in many ways, be largely unconcerned with whether they are

effectively achieving their goals. 24

One important element of comparison among these three explanations is the extent of will of the people who are the primary actors in socio-political violence. Institutional explanations, often, are quite deterministic as the focus is on people who are shaped and directed by larger structures that they do not control. An individual's recourse to violence is simply the final step in a much larger process. In contrast, individual explanations focus squarely on people; they are the primary makers of violence because they choose to be. Ideational explanations reside somewhere in between. Ideas are influenced by institutions but are also actively taken up and moulded by individual to cause and justify socio-political violence.

Moreover, the peculiar psychology of the individual may also pave for causation of political violence. In this context, it may be noted that Human being's vital interests go beyond those of other animals. He is a symbol-making animal and orients himself in life by loosing certain values, images, persons and institutions and considers them sacrosanct; he can not give them up as he seeks his identity in them. So, an attack on these symbols, whether these be an ideal, the tribe, the nation or the idea of honour, is considered as an attack on his life and living in both biological and social sense. It does not matter in this context whether the values or symbols he defends have some rational basis; what matters from a psychological point of view is that, for him, these are necessary in order to live and retain his mental balance and that any threat to them is a threat to his vital interests. Hence, he tries to protest them as he attempts to protect his own life.

Another aspect human nature is man's suggestibility. If leaders try to make man believe that he is or will be threatened, and if he lacks critical judgement and is prone to accept as real what his leaders tell him, he will react to the alleged threats in the same way he reacts to a real threat. It does not matter whether he is really threatened; what matters is whether he is convinced of the threat, and this depends upon the degree of his dependence on his leaders, his suggestibility and his lack of critical reasoning. This kind of aggressiveness is provoked by a real or alleged threat to vital interests of the individuals.

Another important factor which may give rise to the acts of violence and destructiveness is the incongruity between the values we profess and practise. Modernity has made an individual a being in transition. He fails to relinquish his old values and embrance the new ones suitable for modern life. There is a deep contradiction between the values we aspire for and the values we practise.

One of the most outstanding characteristics of the present day society is the perpetual competition among the individuals and groups as generated by their sense of actual or perceived deprivation. Especially, when the neglected people adopt a shortcut to achieve their goals, they take up a method which is against the normal principles of conflict resolution. Very often they adopt violence as a means due to its tactical values, because both the strong and the weak among them believe that they can attain their goals with the help of limited resources. If the genuine demands and perceived interests are not fulfilled by the existing political and legal institutions, through legitimate peaceful channels, these demands and interests – whether real or imaginary-get aggregated in a belligerent form, disrupting social peace and political stability.

Therefore, the most important cause of socio-political violence seems to be rooted is the social psychology of the people who become frustrated because of feelings of 'Relative Deprivation'. As and when they perceive or believe that injustice prevails in socio-political life, or that their cherished ideals, and values, and aspirations are not fulfilled, they feel dissatisfied and frustrated, and tend to strive violently, as the last option, at the imputed source of frustration. In this context, the subjective feelings may be termed as 'Relative Deprivation; which is defined by Ted Robert Gurr as 'The tension that develops from a discrepancy between the 'Ought' and the 'is' of collective value-

<sup>25</sup> In socio- political life, the individual as well as collectivities may value many objects such as wealth, status, power, security, equality, freedom, national self-determination etc. when they become unable to achieve their cherished values, they feel relatively deprived, dissatisfied, and tension-ridden. In the context of their sense of 'Relative Deprivation', 'ought'

refers to the conditions or values of socio-political life that they believe to be entitled, whereas 'is' refers to their subjective sense of non-achievement of the cherished values or objects, and their perception of the injustice inflicted on them. The discrepancy or the gap between the 'ought' and the 'is' of collective value-satisfaction generates in them a sense of 'Relative Deprivation' that makes them dissatisfied and frustrated, and motivates them to undertake measures for removing the cause or source of their subjective sense of deprivation and frustration, and to organize a political movement if necessary. When they become unable to get their grievances redressed through conventional channels of conflict-resolution because of indifference or incapacity of the Authority of the Political System, they do not hesitate to strike violently at the imputed source of frustration. Therefore, as scholars such as Ted 28

Robert Gurr<sup>26</sup>, Daniel Lerner<sup>27</sup>, James C. Davies, W.G. Runciman<sup>29</sup>, H.Nieberg<sup>30</sup>, and Crane Brintor W.G. Runciman<sup>29</sup> 31 , and Crane Brinton assert, the chief causal factor of 'Political Violence' and ' Political Movement' seems to be the subjective sense of 'Relative Deprivation' of the collectivities or the mass of people.

# **1.3 FORMS AND TECHNIQUE**

Socio-political violence can manifest itself in many different forms and with different technique. In this context, there may be discerned some major forms of socio-political violence.

### 1.3.1. Revolution:

Revolution refers "as an attempt by the use of force against the government legally in power to compel change in what are held to be, by those using such force, the actual purpose of the

state"  $^{32}$  It can be defined as a public seizure of the state in order to over turn the existing government and regime. There are several factors. First, revolutions involve some element of public participation. To be certain, there are typically leaders, organizers, and instigators of revolution who play a key role. In revolution, the organized people play an important role in seizing power. Second, the core leaders of the Revolution seize control of the state. This aspect distinguishes Revolution from violent acts within its groups which intend to gain local control or even seek independence but do not or cannot take over the entire state. Finally, the objective of revolution is not simply the removal of those in power but the change of the entire regime itself. Revolutions seek to fundamentally remake the institutions of politics and often economic and societal institutions as well. As a result, scholars sometimes speak of "Social Revolutions" to indicate that they are referring to events that completely reshape society.

A well documented theory of revolution is found in Ted Gurr's "Why Men Rebel". In Gurr's view, rebellion is the result of 'relative deprivation', brought about by the gap between what people expect to get (their value expectations) and what they actually get (their value capability). The greatest likelihood of revolution therefore occurs when a period of economic and social development that has produced rising expectations is abruptly reversed. This creates a gap between expectations and capabilities that can lead to revolution. The notion of relative deprivation is significant because it draws attention to the fact that people's perception of their position is more important than their objective circumstances. What is crucial is how people evaluate their condition relative either to the recent past, or to what other people have.

Revolution involves the use of violence in civil social relations. It is one special form of social change. It has for its target of attack the constitution of society in the sense of law and justice on which a society rests at any particular point of time. Aristotle, the great Greek philosopher, who wrote that we must know how people want their society to be organized, has observed:" The Universal and Chief cause of revolutionary feeling is the desire of equality, when men think that they are equal to others who have more than themselves; or, again, the desire of inequality and superiority, when conceiving themselves to be superior they think that they have not more but the same or less than their inferiors; pretensions which may or may not be just". According to Aristotle, revolutions may occur due to unequal distribution of wealth in the society, serious disputes over ideas of justice involving the society in conflicts and divisions; power seeking by the leaders of the society, and a strong desire for the achievement of a radically different social order. In fine, Aristotle was suggesting that the seeds of instability and change in a society could be found in the form of

the social structure itself. 33

The important long term causes of revolution have been identified as under: 34

- economic growth leading to dissatisfaction among certain segments of the society;
- technological innovation raising fales hopes of remedying the defects and drawbacks of the existing social and political order;
- process of democratization making the higher status groups critical of the leveling up process and the lower status group impatient about the slow speed of social change;
- process of secularization undermining the role of organized religion that had in the past upheld the legitimacy of the old regime;
- growth of modern nationalism seeking to engulf the entire society by promising, political, economic and social equality universally;
- growth of the modern state involving a painful and occasionally Jerky Process of regime changes.

Revolution is often the catalyst of formation of modern state as it happened, for instance, in the creation of the former USSR and the present day People's Republic of China. However, revolutionary leaders may seek a high degree of state power, rejecting democracy as incompatible with the sweeping goals of revolution. It is often destructive and bloody. The events that bring revolutionaries to power may themselves not claim many lives, but in the immediate aftermath, revolutionary leaders and their opponents often use violence in their struggle over the new order.

# 1.3.2. Terrorism:

Terrorism usually refers "to threats, violence, intimidation and physical manipulation of the behaviour of others by using violent methods". <sup>35</sup> It is also defined as the purposeful out and or threat of act of violence to create fear and a climate of panic or collapse, to destroy public confidence in government and security agencies or to coerce communities and others into obeying the terrorist leadership. <sup>36</sup> Terrorism is clearly a subcategory of socio-political violence. It is a pre-meditated, usually politically motivated, use or threatened use of violence, in order to induce a fear of terror in its immediate victims, usually for the purpose of influencing another, less reachable audience, such as the government. 37 Alexander defines terrorism as "the use of violence against random civilian targets in order to intimidate or to create general pervasive fear for the purpose of achieving political goals. 38 Crenshaw defines terrorism as, "the systematic use of unorthodox political violence by small

conspiratorial groups, with the purpose of manipulating political attitudes of the authority rather than physically defeating the 39 enemy. Terrorism may be defined as the use of violence by non-state actors against civilians in order to achieve a political goal.

state actors against civilians in order to achieve a political goal. Over time, the term came to be associated with non-state actors who used terrorism in part because conventional military force was not available to them. When states use violence against their own civilian populations, it is called human rights violations. There is also state-sponsored terrorism. States do sometimes sponsor non-state terrorist groups as a means to extend their power by proxy, using terrorism as an instrument of foreign policy. Definition of terrorism emphasizes that the targets of violence are civilians. Here the issue of intentionality is important. In violent conflicts, there are often civilian casualties. But terrorists specifically target civilians, believing that such actions are a more effective way to achieve their political ends than by attacking the state. Finally, there is the issue of the political goal. It is important to recognize that terrorism has some political objective; as such, it is not simply a crime or a violent act without a larger goal. Terrorism and other forms of violence can be sorted out by the primacy of political intent.

There are varieties of definitions on terrorism. The common threads of the various definitions identify the basic features of terrorism as: (i) Political:- a terrorist act is a political act or is committed with the intention to cause a political effect, (ii) Psychological- the intended results of terrorist acts cause a psychological effect. They are aimed at a target audience other than the actual victims of the act, (iii) Coercive- violence and destruction: There are used in the commission of the act to produce the desired effect, (iv) Dynamic- terrorist groups demand change, revolution or political movement, and (v) Deliberate- terrorism is an activity planned and intended to achieve particular goals.

Scholars have differently viewed the causes of terrorism. They range from demographic to socio-economic to political factors. Demographic factors may include congestion and high growth rates. Socio-economic factors may include poverty, unemployment, ethnic conflict, religious conflict, territorial conflict, access to resources, or even revenge. There are many factors which contribute to Terrorism: high population growth rates, high unemployment, lagging economies, extremism, ethnic conflict, religious conflict, territorial conflict, political frustration, identity crisis, illegitimate or corrupt governments, humiliation of the masses, soft attitude towards criminals, wrong policies of the government, deprivation of the basic human rights and poverty among the people.

Terrorist activities may be classified, as per the UN 40

Resolution into six categories

- 1. **Civil Disorders:-** A form of collective violence interfering with the peace, security and normal functioning of the community.
- 2. **Political Terrorism:-** Violent criminal behaviour designed primarily to generate fear in the community, or substantial segment of it, for political purposes.
- 3. **Non-Political Terrorism:-** Terrorism that is not aimed at political purposes but which exhibits conscious design to create and maintain high degree of fear for coercive purpose, but the end is individual or collective gain, rather than the achievement of a political objective.
- 4. **Quasi-Terrorism:-** The activities incidental to the Commission of Crimes of Violence that are similar in form and method to genuine terrorism but which nevertheless lack its essential ingredient.
- 5. Limited Political Terrorism :- It refers to acts of terrorism which have committed or ideological or political motives but not a part of a concerted campaign to capture control the state.
- 6. **Official or State Terrorism:-** It refers to nations whose rule is based upon fear and oppression of such proportions that it can be regarded as similar to terrorism.

Terrorism poses a serious challenge to the domestic population as well as the global community. It is the use or threatened use of violence for the purpose of creating fear in order to achieve a political, economic, religious or ideological goal. The targets of terrorists acts may be civilians, government officials, military personnel or people serving in the interests of government. It is being used as a method whereby any organized group or party seems to achieve it's a vowed aims chiefly through the systematic use of violence having a strategic plan.

# 2.3.3. Domestic Violence

Domestic violence refers to "Violence between members of a household, usually spouses, as assault or other violent act committed by the member of a household against another" <sup>41</sup> It has been defined as "a pattern of abusive behaviour in any relationship that is used by one partner to gain or maintain power and control over another intimate partner" <sup>42</sup> Domestic violence can be physical, sexual, emotional, economic or psychological actions or threats of actions that influence another person. This includes any behaviour that intimidate, manipulate, humiliate, isolate, frighten, terrorize, coerce, threaten, blame, hurt, injure, or wound someone. This definition adds that domestic violence "can happen to anyone regardless of race, age, caste, religion or gender". The United Kingdom in its "Domestic Violence Policy" uses domestic violence to refer to a range of violent and abusive behaviour. It defines domestic violence as: - "pattern of behaviour characterized by the misuse of power and control by one person over another who have been in an intimate relationship. It can occur in mixed gender relationships and some gender relationships and has profound consequences for the lives of children, individuals, families and communities. It may be physical, sexual, emotional and/or psychological. The latter may include intimidation, harassment, damage to property, threats and financial abuse" 43 According to the Merriam-Webster dictionary, domestic violence is "the inflicting of physical injury by one family or household member on another" 44

Domestic violence occurs in all societies and all cultures; people of all races, ethnicities, religions, and classes can be perpetrators and victims of domestic violence. Domestic violence is committed by and on, both men and women and it occurs in same-sex and opposite-sex relationships.

Domestic violence has many forms, including physical violence, sexual abuse, emotional abuse, intimidation, economic deprivation or threats of violence. There are a number of dimensions of domestic violence in terms of mode, frequency and severity. In terms of mode it may be physical, psychological or social; in terms of frequency, it may be committed occasionally or it may be chronic and in terms of severity, it may cause both psychological or physical harm involving for transitory or permanent injury, and also the extent of injury may be mild, moderate or sometimes severe, which may end in homicide.

The latest attention to domestic violence has been drawn as a result of women's movement. It is the most serious violation of all basic rights that a woman suffers in her own home at the hands of members within her own family. We may take the case of India which has passed an Act for the protection of women from domestic violence.

The Government of India has passed the Protection of Women from Domestic Violence Act, 2005. The same Act defines the expression "domestic violence" to include actual abuse or threat of abuse physical, sexual, verbal, emotional or economic violence. Section 3 of the said Act says that any Act, omission or commission or conduct of the respondent shall

45 constitute domestic violence in case it -

- a) harms or injurers or endangers the health, safety, life, limb or well-being, whether mental or physical, of the aggrieved or tends to do so and includes causing physical abuse, sexual abuse, verbal and emotional abuse and economic abuse; or
- b) harasses, harms, injures or endangers the aggrieved person with a view to coerce him or any other person related to her to meet any unlawful demand for any dowry or other property or valuable security; or
- c) has the effect of threatening the aggrieved person or any person related to her by any conduct mentioned in clause (a) or clause (b); or
- d) otherwise injures or causes harm, whether physical or mental, to the aggrieved person.

The Salient Features of the Protection from Domestic Violence Act 2005 are as follows:

- The Act seeks to cover those women who are or have been in a relationship with the abuser where both parties have lived together in a shared household and are related by consanguinity, marriage or a relationship in the nature of marriage, or adoption ; in addition relationship with family members living together as a joint family are also included. Even those women whoa re sisters, widows, mother, single women, or living with the abuser are entitled to get legal protection under the Act.
- "Domestic Violence" includes actual abuse or the threat of abuse that is physical, sexual, verbal, emotional and economic. Harassment by way of unlawful dowry demands to the women or her relatives would also be covered under this definition.
- The Act provides the power of the court to pass protection orders that prevent the abuser from aiding or committing an act of domestic violence or any other specified act, entering a workplace or any other place frequented by the abused, attempting to communicate with the abused, isolating any assets used by both the parties and causing violence to the abused her relatives and others who provides her assistance from the domestic violence.
- The Act provides for appointment of Protection Officers and NGOs to provide assistance to woman.
- The Act provides for breach of protection order or interim protection order by the respondent as a cognizable and non-bailable offence punishable with imprisonment. Similarly, non-compliance or discharge of duties by the Protection Officer is also sought to be made an offence under the Act with similar punishment.

# II. NAXAL MOVEMENT

The term "Naxalism" comes from Naxalbari, a small village in the Darjeeling district of West Bengal, where a section of the Communist Party of India (Marxist) led by Charu Majumdar and Kanu Sanyal led a violent uprising in 1967. They formed a revolutionary opposition group against the official CPI (M) leadership. On May 25, 1967, a landlord attacked a tribal who was granted by the court the right to a piece of land on the basis of tenancy rights. Revolutionary cadres of the CPI (\*M) counter-attacked the landlord, giving rise to the "Naxalbari Uprising". The uprising was spearheaded by Charu Mazumdar. Similarly, a peasant revolution was launched in an area called Srikkakulam of Telengana region of Andhra Pradesh led by C.Pulla Reddy. Both incidents were violent in nature and drew their inspiration from the success of the Communist Movement in China and Russia. The radicals comprehended the Indian situation then to be similar to that in China prior to 1949 and characterized it as essentially semi-colonial and semi-feudal. Based on this, the revolutionaries concluded that the "People's Democratic Revolution" should be launched in India by immediately resorting to an armed struggle following the Chinese lines.

In November 1967, Left wing extremists, from the whole country, gathered in Kolkata, founding the All India Coordination Committee. They concluded that India officers an excellent situation for a revolution in terms of socio-economic conditions. In May 1968 the Committee renamed the All India Co-ordination Committee of Communist Revolutionaries and declared its ideological aims: Protracted People's War in accordance with Mao's teachings, including adoption of guerrilla warfare; establishment of rural revolutionary base areas and finally encircling the cities as well as abstaining from Parliamentary elections. Inspired by the Naxalbari experience, armed struggles broke out in Uttar Pradesh, Bihar, Madhya Pradesh and Andhra Pradesh.

Violence is, mostly, based on socio-economic-political factors which in fact contribute and create conditions conducive to physical violence; particularly for the growth of Naxalism, the socio-economic-political condition prevailing in the country can be regarded as one of the major reasons. Naxal violence, both in its quality and quantum, is in fact directly related to the intensity of the feeling of people of their actual or perceived deprivation and their commitment to take revenge against those who are believed to be responsible for such denial; thus, the Naxals Wage a War of Protest against the land lords, exploiters and even government security forces and its other agencies.

Naxal violence is designed to inflict injury on a person or damage to the property. Broadly speaking , any act by the Naxalites, whether covert or overt that coerces or causes physical hurt, material loss or mental anguish or which degrades human being or which violates human rights, dignity and decency should be viewed as an act of violence and is always depicted these days as Naxal violence.

The problem of Naxalism in India has created great concern for the whole country as it has disturbed the peace of different areas. The movement in different regions has its own specific complexities. The topographical suitability for continuing their strategic advantage and the notion of lack of progress among the people of the areas seem to have encouraged the presence and growth of Naxalism in some regions. The main support for the Naxalite Movement comes from the marginalized people such as the Dalits and Adivasis, the deprived people of India. The people of the tribal areas through out the country remain outside the mainstream of socio-economic-political process and they resent their alienation.

The causes for the growth of Naxalite problem are many and varied. The slow implementation of Land reforms is the main reason for the growth of Naxalism. Landlords frequently move the court to delay implementation of these reforms. They also connive with local politicians and bureaucrats, making the land reforms process slow and cumbersome. Land reforms have failed in the end.

The social structure of society in these areas could be cited as another reason for emergence of the Naxalite problem. Invariably, wherever the Naxalite problem exists, there is a poor section of society, with no resources to meet their minimum economic requirements. Of course the caste or tribal structure may not be exclusively attributed as a reason for the problem. The poor include various castes and not any particular caste or group of castes. However, their poverty and lack of ability to improve their lot due to financial constraints for accessing education, the government machinery or even legal remedies remain an important factor to their support for the Naxalites.

More-over, the younger generation of people in the rural areas want to have the facilities that are available in urban areas, which remains a distant dream given the infrastructural problems and the failure of governments to perform.

Therefore, the failure of the government to reach out to the rural areas is another major factor that aids to the growth of Naxalism in these areas. The good governance is poor, in certain places it is non-existent. Popular schemes take long to devise but much longer to implement. Even while implementing, the benefit always reach those who are the 'Haves', and not those who are in need in reality. The failure in formulation and implementation of the right schemes at the right time, and targeting the right people is the major problem. Despite the rise of the Naxalite problem, the state has failed to tackle it effectively in undertaking the needed economic and political measures. The State has failed to perform its duties, in short, governance, or the lack of it, in these areas is a primary reason for the growth of the Naxalite problem. Furthermore, political interference has also played a significant role in the implementation of governmental schemes. Leaders have always tried to delay the projects which are promoted by opponent parties.

The Naxalite leaders take advantage of miserable socioeconomic condition of the poor and the down-trodden people, and organize Naxalite groups. The collect levies from the local population, collect funds from individuals, groups, and even government officials as commissions for letting them function in areas that are under their control. This money is used by the Naxalite groups to buy arms and recruit new members, especially from the unemployed youths in rural areas. Since the Naxalites provide a monthly salary and uniform, they have become popular amongst the unemployed youths. Thus, the growth of Naxalite movement is due to various factors.

# 2.3.4. Caste Violence

Caste based violence has been growing in India. The Harijans or Dalits are discriminated against by the caste Hindus and they are subjected to atrocities and exploitation. The present decade has witnessed the upsurge of Dalits who have also started retaliating. Thus, there have occurred violence between the forward castes and Backward castes especially in Uttar Pradesh, Delhi, Bihar, Maharastra and Tamil Nadu. Most of these conflicts have been due to atrocities against the Dalits, Land disputes, disputes over sharing of crops, payment of minimum wages, molestation and even rapes of Dalit women, prevention of Dalits from participating in local religious festivals, old enmity arising out of traditional caste feuds and rise of Dalits. Caste has been a major factor of Indian Society and Politics and it has been a source of caste conflict and violence.

The Indian Constitution has formally abolished castes. In this context, mention may be made at article 15 that prohibits discrimination on grounds of religion, race, caste, sex or place of birth, Article 17 that abolishes untouchability, Article 29, that protects the interests of minorities, and Article 46, that promotes educational and economic interest of Scheduled Castes , Scheduled Tribes and other weaker sections. Thus, the constitution of India forbids any discrimination on grounds of religion race, caste, sex or place of birth.

Following such constitutional guarantees, the Indian government has successively passed the Protection of Civil Rights Act,1955, the Bonded Labour System (Abolition) Act, 1976, the Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act 1989, and the Employment of Manual Scavenging and Construction of Dry Latrines (Prohibition) Act 1993. Despite these efforts, the effects of these and related laws have been in many cases painfully minimal, and by reaction, caste violence is on constant rise since the early 1990s, causing

# thousands of death.

It is unfortunate that in recent years the persecution of lower castes by members of some of the upper and middle castes seems to have intensified, and in some regions this oppression has taken a sharply violent form. Members of Scheduled Caste and Tribes seeking a better economic and social deal have been subjected to harassment, beating, burning of houses, and even murder. Caste riots have taken place in areas such as Bihar, Tamil Nadu, Kerala and Maharastra where a radically anti-Brahmin Movement has been strong While the offenders have been brought to justice in many cases, the preventive measures have been quite in adequate, and incidents of such violence continue to occur in different parts of India.

# 2.3.5. Communal Violence

Communal violence refers to a situation where violence is perpetrated across ethnic lines, and victims are chosen on ethnic 50

group membership.  $\frac{50}{100}$  The term is commonly used to describe those incidents where conflict between ethnic communities results in massacres. Communal conflict is violent conflict between non-state groups that are organised along a shared communal identity. Violent conflict refers to the fact that the parties use lethal violence to gain control over some disputed and perceived indivisible resources, such as a piece of land or local power. This follows a generally political accepted conceptualization of armed conflict. <sup>51</sup> The groups involved are non-state groups, meaning that neither Actor controls the state and armed forces. Finally, the groups are organized along a shared communal identity, meaning that they are not formally organized rebel groups or militias but that the confrontation takes place along the line of group identities. Communal identity is conceptualized as subjective group identification based on, a

common history, a common culture or common core value. 52

Communal violence continues to be a sad and hard reality in India. Even after the adoption of the objectives of justice, secularism, and equality of all the people, communalism continues to afflict India. The fact remains that it has been even increasing in intensity and spreading its fangs. It constitutes the biggest strain on the unity and integrity of India. The communal riots which accompanied the dawn of independence and the unfortunate partition of India greatly shook of people of India. Communalism involves the exploitation of social pluralism of Indian society by fundamental groups, oranisations and sects for securing their respective narrowly conceived political, religious and sectarian goals. Hindu-Muslim conflicts in north and south India, Hindu-Christian Communal riots in Kerala and Hindu-Sikh riots in Punjab, Delhi, Uttar Pradesh and certain other parts of north India are the examples of communal violence. For instance, after the state's intervention in Golden Temple in Amritsar in 1984 which was followed by the assassination of Mrs. Indira Gandhi, anti-Sikh riots took place in many parts. In the wake of demolition of disputed structure of Babri Masjid, the communal violence took place in different parts of the country. In 2002, communal violence took place at Godhra in Gujrat. Mostly, Hindu-Muslim Communal violence has plagued the country in both, the pre-independence and the post-independence periods.

# III. IMPLICATIONS FOR THE POLITICAL SYSTEM

Socio-political violence, both in its wake and aftermath, may have destabilizing consequences for the society and the political system as well. It originates mostly in the feelings of injustice and the perceived sense of 'Relative deprivation' of the collectivities or the mass of population, and its incidence, in the contemporary time, seems to increase by geometrical progress in mostly as a consequence of the impact of modernization of the people, and the associated process of social mobilization. As modernization involves increasing education and literacy, spread of media-communication, industrialization, and urbanization, there ensues the process of social mobilization which may be defined, in the words of Karl W. Dentsch as the process through which "major clusters of old social, economic and psychological commitments are either eroded or broken and people become available for new patterns of socialization and behaviour" It brings about significant and drastic changes in the attitudes, values, and expectations of the people from those associated with the traditional life to those of a modern life. Therefore, the traditional man, on being exposed to new styles of life, new standards of material enjoyment, and new possibilities for their satisfaction, obtain new experiences that breaks decisively the cognitive and attitudinal barriers of the traditional culture, and that generates in him new aspirations and wants to live a modern life. Thus, People become socially mobilized with new aspirations and expectations, and make huge demands on the Political system for providing opportunities and amenities for their realization. However, the traditional or transitional Political System finds itself unable to fulfil their increasing aspirations and demands owing to its lower level of economic dev elopement. Hence, when social mobilization far exceeds economic development of the society, there arises a wide gap aspirations and the governments' between people's achievements; between want-formation and want-satisfaction; and this gap generates social frustration and dissatisfaction. Moreover, people become more and more frustrated when they find themselves deprived of 'Justice' in the sense of occupational and social mobility opportunities for fulfilling their aspirations. In such a situation when social frustration far exceeds mobility opportunities, people tend to make a huge number of demands upon the Government of the Political System; and their participation in the political process becomes increasingly unruly, alienated, and aggressive. Such unconventional and anomic political participation of the people tends to challenge the prevalent constitutional order that contains the fundamental rules

of the political game. Consequently, the Political System experiences tremendous stresses involving difficulties in making and implementing public policies effectively as it 'Political institutionalization' becomes seriously undermined, and the political system lapses into a situation of political instability. Hence, when political participation for exceeds Political institutionalization, the out-come would be most likely, political instability entailing disorder and eventually dis-integration of the society. These correlations between social mobilization, sociopolitical violence, and political instability are succinctly pointed out by Samunel P. Huntington in the following formulation.

1.

Social mobilization = Social Frustration Economic development

2.

# Social frustration = Political Paprticipation [24] Max Abrams (2008): "What Terrorists Really Want", International Security, 32, 90,4, p.78. **Mobility** opportunities

3.

#### PoliticalParticipation -=PoliticalInstability Politicalinstituitonalization

Thus, socio-political violence paves for instability of the Political System, and creates a situation of intense social disorder that endangers the life and property of the people, and impedes the development of the Society as a whole. Hence, it is the onerous duty of the Political System and also of the Civil Society to enquire into its causal factors, to devise remedial measures, and to implement them effectively to nip it in the bud for attaining and ensuring socio-political stability and development.

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#### AUTHORS

**First Author** – Dr. B.K. Mahakul, Faculty, Department of Political Science, Hidayatullah National Law University, Uparwara, Abhanpur, New Raipur 493661(Chhattisgarh).

# Problem of Food Security: A brief Analysis of Tribal Area in India

# Dr. (Mrs.) Johani Xaxa

Reader, P.G. Department of Political Science and Public Administration, Sambalpur University, Jyoti Vihar: 768019 (Odisha)

#### I. INTRODUCTION

The World Food Conference convened by FAO in 1974 draw the attention of the world community, for the first time, the urgent need for finding ways and means for assuring food security to the hungry millions of the world. The conference not only recognised the food security as the responsibility of the World Community, but also gave the call that no child, women and man should be stunted by malnutrition (Acharya 1983).

Food security means not only sufficient availability of food for direct consumption, but also people's purchasing power to buy them for the consumption it may be added here that even the ability to buy food will not guarantee food security when there is an effective delivery. Therefore, it is the responsibility of the government to devise ways and means by which food is available within the country and people have the means to buy it. This, in turn would implied for the country to generate employment. The concept of food security also implies implementing policies for supplementing food and nutritional requirements for some vulnerable groups like old and infirm people, expectant mothers and young children. Food, such as is not enough, it requires the nutritional value, which is really need for keeping the body in proper health. Foods like milk, fruits, vegetables and processed and fortified foods etc. provide nutrition to the health of the people, which has important place in the philosophy of food security. Further, the efficient and right type of distribution is an integral part of any food security system. Availability of food stocks with the government will be of little use if they cannot be supplied to the people who need them at the right time. As the distribution system takes care of a very large part of the food security concept, it manages the scarcity and shortages which is the central feature of food security system of a country. Finally, Food Security depends on a stable and secure production base. In its wider context, it would include all avenues allied to agriculture, such as, horticulture, animal husbandry, dairy, poultry, fishery, etc. Nature has given enough resources to sustain food production necessary for a community. Land and water, proper cropping systems, scientific package of inputs and practices- a;; are at the command of humanity to secure its food. (Ibid).

Among the developing nations, India's achievements in reducing poverty and hunger are impressive, but there is more to be done to see a hunger-free India. Recent studies indicate that the Scheduled Caste and Scheduled Tribe groups, despite the implementation of several special programmes for their welfare, remain the poorest among the social groups. Among these groups, people belonging to agricultural labour households and casual labour households are the worst sufferers. While at the all India level, agricultural labour households accounted for 48% of the rural poor, the Scheduled Caste and Scheduled Tribe households in this category accounted for more than a quarter of the total population in rural India 1999-2000. Odisha, a tribal populated state, has been focused on the problem of effectiveness of the food security of tribal.

## II. RIGHT TO FOOD

The right to food is about freedom from hunger. The narrow meaning at hunger may be understood as the right to have two square meals a day, while in its broader meaning would include under nutrition. Therefore the right to be free from under nutrition would mean and include other entitlements such as clean water, healthcare, and even elementary education. The right to food is considered by many as the socio-economic and cultural rights which society must try to achieve over a period of time and therefore, is mainly inspirational in character. But such statement is not defendable in a society where food is available but not accessible due to severe inequality in capabilities, Realisation of the right to food, is contingent upon the right to work and property (Pradip Kishen Case, 1988). The Supreme Court has rightly taken up the cause of food insecurity by directing both Union and State governments to ensure food security including the free food to infirm, children, nutrition of women and lactating mothers. The Supreme Court opened the door of discussion at the level of legislature and executive to consider Right to Food as a fundamental right for the citizens of India.

The National Human Rights Commission of India in 2003, after consideration of starvation deaths in Kalahandi, Bolangir and Koraput brought justification for considering Right to Food as a part of the Fundamental Rights under Article 21 of the constitution (Tripathy, 2004)

Under Article 21, life means, a life with human dignity and not mere survival or existence. In the light of this, state is obliged to provide for all those minimum requirements which must be satisfied in order to live with human dignity, such as education, healthcare, just and human conditions of work, protection against exploitation etc. In the view of the Commission, the Right to Food is inherent to a life with dignity. Moreover, Article 21 should be read with Articles 39 (a) and 47 to view the nature of obligations of the state. Article 39 of the constitution, enshrined as one of the Directive Principles, is fundamental in the governance of the country, requires the State to direct its policy towards securing that the citizens, men and women equally have the right to an adequate means to livelihood. Article 47 more explicitly directs the state top raise the level of nutrition and the standard of living of its people as a primary responsibility. The reading of Article 21 together with Article 39(a) and 47, places the issue of right to food security in the correct perspective and thus, making Right to Food a guaranteed Fundamental right, which is enforceable under Article 32 (Constitutional Remedy) of the constitution. The obligation of state to provide the food security its citizens is also supported by 1996 International Covenant of the Economic, Social and Cultural Rights to which India is a party. The Covenant in Article 11 expressly recognizes the right of everyone to an adequate standard of living, including adequate food (ibid). Added to it, the continuous struggles of the poor and left political parties and efforts of Civil Society bodies, donor agencies and intervention of the judiciary (2001) and others have compelled the national, state and local governments to adopt a suitable legislation that guarantees food to the people and make it "Right to Food as Fundamental Right". Furthermore, national and international events of 2011-declining growth rate of agricultural productivity, rise of food prices, high energy prices, depreciation of US dollar, strong demand from emerging economies for agricultural products and droughts, famine and floods, also underlined the measures for ensuring food securitythat is availability of and access to sufficient safe, nutritious food to maintain a healthy and active life-linked to other notion of life like economic security, political security and environmental security ) International Food Policy Research Institute ( IFPRI, 2011). All these factors indicate the various aspects of Food Security Policies of India.

### III. FOOD SECURITY PROGRAMMES IN INDIA

The main objectives of the Food Security Programmes in India have been maintaining price stability, increasing welfare facilities for the poor, providing access to basic foods at reasonable prices to poor people, rationing during situations of scarcity and keeping a check as private trade and domestic prices. The food policy of India must also look into the factors like availability of food in the public distribution system and market, provide subsidized food to the families below poverty like schemes to support the lactate mother growing children expected mothers, provision far protected drinking water, primary healthcare and sanitation. To ensure the above provisions for people, the government time to time initiating measures to promote growth of producitio0n through producerfriendly food price policy, technological inputs, subsidies to farmers, organized interventions in the food system by procuring, maintaining of buffer stock and distribution of subsidised food and introduced regulations and control of private trade practices through regulated markets and essential legal measures (Ramulu, 2013). The country's present response to food security in terms of the Public Distribution System is dates back to the Bengal famine 1943. The first food grain policy committee was introduced all over the country. The first scheme of centralised purchase from surplus areas, and rationing for equitable distribution was introduced. Statutory price-controls and sale of rice through fair price shops was also recommended (Das, 2004).

After independence of India, the intervention in food security have been taken which can be broadly categorized into five phases (Swaminathan, M 2000). The first phase was from its origin to 1960- when imparted food grains were distributed

through Public Distribution System in the cities. The second phase from 1960 to 1978 brought a organizational changes and set up Agricultural Prices Commission and the Food Corporation of India to strengthen domestic procurement and storage. The third phase from 1978- to 1991 was marked by large-scale expansion of the Public Distribution System, supported by domestic procurement and stocks. The Fourth phase- from 1991 to 2004, in which the policy of universal Public Distribution System has been replaced by targeted policy in line with the objectives of economic liberalization. The Fifth phase from 2005 to 2011 is making food security as a Fundamental Right to the people. The continuous struggles of the poor and left parties and efforts of Civil Society bodies, donor agencies and intervention of the Judiciary (2001) and others have compelled the national, state and local government to adopt a suitable legislation that guarantees food to the people (Ramulu, 2013). At present, both the houses of Parliament (Lok Sabha and Rajya Sabha) passed the Food Security Bill. The food security bill not only strive to make the society hunger free but also would provide nutritional food. Attending to objection made by M.S.Swaminathan Research Foundation and World Food Programme 2001, if people have access to livelihood, they would in general have access to food and nutrition.

Government of India has undertaken a number of schemes to provide food security and to nutrition for poor people. Most important among them are (a) Integrated Child Development System (ICDS, 1975), (b) Targeted Public Distribution System, (TPDS, 1997), (c) Mahatma Gandhi National Rural Employment Guarantee Programme (MGNREGP, 2005), and (d) the National Food Security Bill (MFSB, 2011), as they cover large number of people and emphasis an provision of nutritional food, giving guarantee of employment and ensure right to food to the people and there by to elimination of the basic problems such as poverty, hunger and unemployment.

However, the NFSB, 2011, appears to be a strong positive step by the UPA government to improve the living conditions of marginalized sections and the others.

### IV. FOOD SECURITY IN ODISHA

Odisha is the second poorest state in India, which comprises of 4.74 per cent of India's land mass and 3.6 per cent of the country's population. Nearly 85 percent of Odisha's populations live in rural areas. The Scheduled Caste (SC) and Scheduled Tribe (ST) population comprised 18.9 and 23.6 percent respectively of the total population of the state (NSS 64<sup>th</sup> Round). About 45 percent of the geographical area of the state has been declared as Scheduled area. According to sense of Planning Commission 2008, the incidence of poverty among ST and SC was 46.4 percent compared to 27.5 percent of national ST, SC population both in rural and urban areas are poor. In rural areas, the incidence of poverty among STs was the highest in Odisha was 46.4 percent. The estimate made by the Modified Expert Group of the Planning Commission during 2004-05 has calculated that in the state of Odisha below poverty line (BPL) population is of 66.23 percent which was the highest in the country. The per capita income in Odisha is one of lowest among 17 major states (Source: Food Security Atlas of Rural Odisha). Though Food availability in Odisha is fairly comfortable, yet

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food insecurity is chronic and the state has been placed in the category of the 'Severely food insecure" regions.

As per the Economic Survey 2001-02 (Government of Odisha) 47.15 per cent of population lives below the poverty line and 52 per cent population of the state were dependent on the Public Distribution System (PDS) for the rice consumption. Hence, the Public Distribution System (PDS) was started with an objective to provide the poor and vulnerable sections of society, certain essential commodities of daily use at subsidized prices. This system, in turn, will bring about stability of market price of different essential commodities, availability of food grains and equity in distribution.

The Public Distribution System (PDS) in Odisha, like any other state in India, has a well organized network of different agencies, which are involved in various stages starting from procurement of grains till their distribution to the common man. At the apex are the departments of food and civil supplies. They are the monitoring agencies and look after various policy matters. The Food Corporation of India (FCI) is the agency looking after the procurement of food grains from producers, their storage and also the import of other food items. At the state level, as we have the food and civil supplies supervising the entire functioning. The Civil Supplies Corporation plays the same role in the state as the FCI at the centre. At the district and sub-division levels, the district administration is in charge of the Distribution System.

The primary outlet under the system is the 'Fair Price Shop (FPS) from which people buy their rations. Number of fair price shops in a locality depends on the number of people living within a particular area. The yardstick of one FPS is for two thousand persons. The officials of the Food Supply and Consumer Welfare Department along with District Administration authorities supervise the functioning of FPSs. The items supplied through the Public Distribution System (PDS) include rice, wheat, sugar, kerosene, edible oil, dal and sometime potato and onion to check the rise of price in open market. However, the rice, wheat, sugar and kerosene are supplied regularly to the people of Odisha at a subsidized rate.

The citizens those who wishing to avail services of the Department will have to get themselves enlisted in the beneficiary list under the APL, BPL, AP (Annapurna Yojana) and Antyodaya Anna Yojana ( AAY) scheme. As per the enlistment, APL, BPL, and AAY ration cards are provided to the citizen. Provisions has been made for twentyfive kg rice (Rs.2.00 per Kg) two Kg. sugar (Rs.13.50 per Kg) and four liters kerosene (Rs. 12.65 per liter) for a BPL card holder, for a APL card holder ten to fifteen Kg. wheat (Rs. 7 per Kg) four liters kerosene oil ( Rs. 12.65 per lit.). While a Antyodaya card holder provided with thirty -five Kg rice (Rs. 2 per kg), two kg.of sugar (Rs.13.50 per kg) and four liters kerosene oil (Rs. 12.65 per lit). As the APL group people do not get rice, so also the BPL groups do not get wheat and Sugar. Wheat and kerosene are much more irregular than the rice. From the year 2013 the government of Odisha supplying the rice for Re.1.00 per Kg to BPL and AAY card holder families per month. Further non-BPL i.e. APL card holders in the KBK region are to be treated as BPL and supplies the rice with subsidised rate from November 2010. This has increased the number of beneficiaries from approximately thirty to fifty-five lakhs, hence the state government reduced the quota of BPL beneficiaries to twenty-five Kg rice. But all AYY card

holders are still getting thirty-five Kg rice under this scheme at Re. 1 per Kg.

The Public Distribution System (PDS) outlets were operated by the Gram Panchayats, Private dealers and Self-help Groups. Presently, the government of Odisha abolished the dealership system and all items of Public Distribution System (PDS) except kerosene given to Panchayats.

# V. PUBLIC DISTRIBUTION SYSTEM (PDS) PROBLEMS IN TRIBAL AREAS

Nearly half of the areas in Odisha are the scheduled areas inhabited by the tribal. They are mostly living in remote and forest areas, with underdeveloped communications. The working of distribution system in those tribal areas in Odisha brings a different picture than the non-tribal areas.

Food security is a big issue in tribal region of Odisha. The average tribal have less than two acres of land, from where, they produce food for five to six months. For rest of the period they depend on forest products and the Public Distribution System (PDS) rice. From the month of May to September, the tribal don't have food. Hence, the government's Public Distribution System (PDS) plays a very significant role in saving the life of hungry tribal. But to get the food from Public Distribution System (PDS) they faced several problems. For instance, Nakkamamudi Panchayat is located in the Kudumulugumma Block of Malkangiri, one of the most impoverished districts. Most of the villages in the region are geographically inaccessible because of poor communication. The tribal inhabited scattered in the forest, could not collect the rice from fair shop in rainy and summer seasons. Again around 100 villages falling under four Panchayats are situated within the Balimela Reservoir Project on the River Sileru. During the rainy season (from July to September) these hamlets are completely cut off from the block headquarters. And almost every year all the cultivable land gets flooded, destroyed crops and leaving the already severely disadvantaged population famished. Similarly the tribal of Bonda Ghati in Malkangiri cut off from the Panchayat could not collect the rations for two months in rainy season. There are also sufficient incidents, when the tribal eat stored dry fruits and leaves, roots, led to indigestion, disease, and death. Sometime after walking of 7 to 8 kilometers to the fair shop, the dealer would say that there is no food stock. The tribal also complained that at most places rice was being distributed regularly every month, but sugar, kerosene were much more irregular. Allegations are also made that the rice bought from the fair shop are of poor quality with stone and bad smell. As the tribal are illiterate, not well informed and have no political voice, could not complain to authority. It is also seen that tribal in the BPL list do not have a ration card, and deprived from getting food through Public Distribution System (PDS)

For the food security of tribal, the government must secure their agricultural land. As the tribal mostly depend on agriculture, the land, water and forest is the main source of producing their food. Their life is revolves around these three things. Hence, the government must take steps to protect the tribal land. It has been seen that the government itself acquiring tribal land and in the name of public interest as proposed industries by private company, which makes the tribal become landless or marginal farmers. Hence, the government must save the tribal and provide all facilities for producing sufficient food for them.

Most of the tribal and rural poor in Odisha are marginal farmers, having less than one acre of land, producing food hardly for six months. For the rest of period they need to earn from outside. Therefore, the poor tribal from the different parts of Odisha (Kalahandi, Sonepur, Bolangir, Sundargarh) migrated to neighbouring states, where they are being treated inhumanly like bonded labour. The precarious condition of the tribal in Odisha is the reflection of all tribal areas in India.

However, Odisha reports that on the whole, migration rates have dropped considerably after the implementation of NREGS (National Rural Employment Guarantee Scheme) that assured income from 100 days work in a year per family. But this programme is also not achieved its target. In Odisha, the BPL and AYY beneficiaries buying per Kg. rice with one rupee only. The construction schemes for poor people now working through machines. People complained of getting twenty to twenty-five days work instead of 100 days.

Thus, majority of tribal and poor denied benefits under any targeted programme for BPL sections. The food security scheme of government is a noble step towards the development of poor but, the government needs to take some safety steps.

# VI. SUGGESTIONS

- As the government has promised food security of the poor, it must look into the proper identification of the poor as well as of the distribution of goods. The Ward member and Sarpanch should identify the BPL and APL group members, and remain responsible to higher government officials.
- The Government must have vigilance on the proper implementations of distribution of rations. The first and foremost actions should be to plug the leakages in Public Distribution System (PDS), otherwise the leakages will turnout to fail the programme. Hence, the Public Distribution System (PDS) must be streamlined and made universal.
- The Public Distribution System (PDS) alone can not supply all sorts of nutrition as well as sufficient food. Hence, the government should provide all facilities in its true spirit to grow foods locally without spending on transportation.
- The Food Security Bill 2011 has focused on the nutrition food for poor people, which is practically difficult for the government to supply. Rather, government should encourage producing locally those foods like vegetables, fruits, cereals, cease food, meat, fish, milk etc. instead of transferring money in their bank account. The people may not properly use the money for nutrition food. However, the government must bring down food inflation from current level of 12% to less than 4%.
- In the tribal areas, for food security, the traditional system of food storage must be encouraged. In the old days, each village had a "Gola Ghar" (store house of

paddy) and during the harvesting time collected the paddy and used to keep there. Who ever in need of food, were supplied from it.

- Government must provide rural employment to stop the seasonal migration of the poor people. If not possible, special identity card should be issued to them to use in migrated place and get food.
- The land is the basic needs for the food security of poor tribal. Government should not be displaced them otherwise it will reverse their economic life. If need to displace, they must be provided with same quality of land as well as houses.
- To fight against the hunger of poor people, there need a co-ordination between the policy makers, government and the beneficiaries. The potential of the Food Security Policies to a large extent depends on the community participation in evolving the policies based on the ground realities, ensuring food autonomy to the beneficiaries, storage and distribution of food grains, allocation of more budget to the agriculture and take necessary measures to increase the production. Thus people centred governance in designing, implementing monitoring and evaluation is pre-requisite for success of the programme.

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### AUTHORS

**First Author** – Dr. (Mrs.) Johani Xaxa, Reader, P.G. Department of Political Science and Public Administration, Sambalpur University, Jyoti Vihar: 768019 (Odisha)

# Trade Dependency-Inflation Relationship in Nepal (Cointegration Approach)

# Santosh Koirala

Nepal Administrative Staff College

*Abstract*- The open border between Nepal and India and trade dependency of nascent Nepalese economy with her economic giant neighbor would guide the attention of Nepalese policy-makers to consider the transmission effect of Indian Prices on Inflation in Nepal. The study employs unique variable Trade-Dependency with India as inflation transmitting variable to analyze whether Inflation in Nepal is fully home-made or does Nepal borrow [significant] portion of its inflation from India. Applying Co-Integration and VECM approach of monthly time series data from the period of 2000:01 to 2013:07, our study shows strong positive long-term relationship inflation in Nepal and trade dependency with India.

*Index Terms*- Cointegration, VECM, Cross Border Inflation Transmission, Trade Dependency

# I. BACKGROUND AND PROBLEM STATEMENT

The cost of inflation to an economy is high. It effects the efficiency with which economic exchanges works, as it distorts incentive to save, invest and work, and provides incorrect signals that alters production and work effort (Boughrara, Adel,  $2009)[^i]$ . Because of this, the accelerators of inflation and their intensities become significant to the policy makers. Inflation accelerators can be broadly categorized into three types[<sup>ii</sup>]: domestic factors ( those push or pull domestic price levels), external factors (those results because of trade-partnering nations) and global (those results from global shocks. Nepal is a nascent economy with international trade highly concentrated (65% of total trade as for July 2013)<sup>iii</sup> with her neighbor, India. Figure 1 depicts the concentration of trade, in gross and separately in imports and exports, with India and rest of the world.

Nepal share an open border of 1876 square kilometers with India and Nepalese currency is pegged with Indian currency<sup>128</sup>. As such the global factors would have little impact on the price determination in Nepal and if any, would be captured through its trade concentration with India. This provides an imperative to analyze the relative influence of domestic factors that influence inflation in Nepal and that borrowed from India.

In a domestic economy, among others, monetary policy influence price level. The study has identified Trade deficit with India as a inflation transmitting variable and has attempted to examine the impact of trade deficit with India on of Inflation in Nepal.

<sup>&</sup>lt;sup>128</sup> The exchange rate of Nepalese Currency has remained fixed (pegged) with Indian Currency since 1960 while flexible exchange rate exists among the former with the rest of the currencies. The present exchange rate of NC 1.60 per unit of IC has been in operation since February 12, 1993.(Source: *NRB, Central Bank of Nepal*)



Figure 1: Status of Exports and Imports of Nepal from July 2000 to June 2013

*XP=Export, Im=Import,TB=Trade Balance= Export-Import. Amounts expressed in million of NRs* 

## **1.1. Research Question**

• Is there long-run relationship between Inflation in Nepal and Trade Dependency with India?

## 1.2. Delimitation and Scope of Study

The study has based its findings on secondary data. Therefore, this excludes inflation transmission that doesn't come into the picture of national accounting system. Further, the author has parsimoniously excluded explanatory variables for instance, domestic inflation gearing fiscal measures, and central bank's policy on credit expansion. This can be the area of interest for future endeavors.

#### II. LITERATURE REVIEW

International transmission mechanism is a process whereby economic disturbances are spread from one country to another and this has been one of the focal empirical research areas since early 18<sup>th</sup> century (Lothian, 1992). Inflation in context has been one of the major economic disturbances that transcends boundaries and as such has global effect (Makdisi, Fattah and Limam, 2007)[<sup>iv</sup>]. However, the intensity of transmission and its impact on the vector economy depends upon several factors including trade dependence, geographical proximity and openness and currency linkages among the economies as identified by number of researches (Mohanty and Turner, 2008)[<sup>v</sup>].

The monetarist explanation of inflation operates through the <u>Quantity Theory of Money</u>,  $MV = PT^{[vi]}$  where M is Money Supply, V is Velocity of Circulation, P is Price level and T is Transactions or Output. As monetarists assume that V and T are determined, in the long run, by real variables, such as the productive capacity of the economy, there is a direct relationship between the growth of the money supply and inflation. The mechanisms by which excess money might be translated into inflation are many (Davoodi, Dixit and Pinter, 2013)[<sup>vii</sup>]. Individuals can spend their excess money balances directly on

goods and services. This has a direct impact on inflation by raising aggregate demand. Also, the increase in the demand for labor resulting from higher demands for goods and services will cause a rise in money wages and unit labor costs. The more inelastic is aggregate supply in the economy, the greater the impact on inflation. The increase in demand for goods and services may cause a rise in imports and may cause imported inflation, which is what the focus of the study is.

Since our interest of the study is to test the transmission effect of inflation from India to Nepal, additional dependent variable, trade deficit with India, that represents Net External Demands and import Prices as shown in the study of Davoodi, Dixit and Pinter, 2013.

#### III. RATIONALE IN SELECTION OF VARIABLES

Inflation in Nepal has been measured by Consumer price index[<sup>viii</sup>]. Money supply (as measured by M1, narrow money supply) has been identified as domestic variable to explain inflation. One alternative and previously studied explanatory variable to capture imported inflation was CPI<sup>129</sup> or WPI of India , which would allow us to compare the headline inflation between Nepal and India directly. However, differences in the basket of computing price level (both CPI and WPI) in and the weightage of items in the baskets in the two countries would lead us to somewhat distorted if not spurious relation. For this, I have applied unique proxy, i.e. Trade Deficit with India, that would capture inflation transmission from India to Nepal, at the same

<sup>&</sup>lt;sup>129</sup> CPI of India has been employed to analyze inflation transmission from India to Nepal in the study "Inflation In Nepal" published by NRB in 2007.

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time, is not affected by these differences in basket and itemloading<sup>130</sup> in computing price indices.

### IV. RESEARCH METHODOLOGY

The concepts of co-integration<sup>ix</sup> and Vector Error Correction Model  $(VECM)[^x][^{xi}]$  have highly been employed in macroeconomic studies across the globe over recent years. The wide application of VECM in the areas lies in the fact that it allows the researcher to embed a representation of economic equilibrium relationships within a relatively rich time-series specification. This approach overcomes the previously held dichotomy between the following two cases.

- structural models that faithfully represented macroeconomic theory but failed to fit the data, and
- time-series models that were accurately tailored to the data but difficult if not impossible to interpret in economic terms.

The basic idea of Cointegration relates closely to the concept of unit roots.

#### 1.3. Unit Root Test

The Augmented Dickey–Fuller (ADF) test<sup>xii</sup> is, the *t*-statistic on ' in the following regression:

$$\Delta y_t = \mu_t + \varphi y_{t-1} + \sum_{i=1}^p \gamma_i \Delta y_{t-i} + \varepsilon_t$$
(1)

This test statistic is probably the best-known and most widely used unit root test. It is a one-sided

test whose null hypothesis is  $\varphi = 0$  versus the alternative  $\varphi < 0$ .

#### **1.4.** Cointegration and Vector Error Correction Model

When we have a set of macroeconomic variables of interest, and we find we cannot reject the hypothesis that some of these considered individually, are variables, non-stationary. Specifically, suppose we judge that a subset of the variables are individually integrated of order 1, or I(1). That is, while they are non-stationary in their levels, their first differences are stationary. Given the statistical problems associated with the analysis of non-stationary data (for example, the threat of spurious regression), the traditional approach in this case was to take first differences of all the variables before proceeding with the analysis. But this can result in the loss of important information. It may be that while the variables in question are I(1) when taken individually, there exists a linear combination of the variables that is stationary without differencing, or I(0). Let,

$$y_{t} = \mu_{t} + A_{1}y_{t-1} + A_{2}y_{t-2} + \dots + A_{p}y_{t-p} + \varepsilon_{t}$$
(2)  
But since,  $y_{t-i} = y_{t-1} + (\Delta y_{t-1} + \Delta y_{t-2} + \dots + \Delta y_{t-i+1})$ 
(3)  
We can us write the charge of

We can re-write the above as

$$y_{t-i} = y_{t-1} + (\Delta y_{t-1} + \Delta y_{t-2} + \dots + \Delta y_{t-i})$$
(4)

$$\Delta y_t = \mu_t + \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t$$

(5)

$$\Pi = \sum_{i=1}^{p} A_i - I and \Gamma_i - \sum_{j=i+1}^{p} A_j$$
  
Where

Equation (5) is VECM representation of equation (1).

The interpretation of 4 depends crucially on r, the rank of the matrix  $\Pi$ .

- If *r* =0, the processes are all I(1) and not cointegrated.
- If r = n, then  $\Pi$  is invertible and the processes are all I(0).
- Cointegration occurs in between, when 0 < r < n and  $\Pi$  can be written as  $\alpha \beta'$ .

In this case,  $y_t$  is I(1), but the combination  $z_t = \beta' y_t$  is I(0). So, (5) can be written as

$$\Delta y_{t} = \mu_{t} + \alpha \beta' y_{t-1} + \sum_{i=1}^{p-1} \Gamma_{i} \Delta y_{t-i} + \varepsilon_{t}$$
(6)

If beta were known, then  $z_t$  would be observable and all the remaining parameters could be estimated via OLS. In practice, the procedure estimates  $\beta$  first and then the rest.

The rank of  $\Pi$  is investigated by computing the eigenvalues of a closely related matrix whose rank is the same as  $\Pi$ : however, this matrix is by construction symmetric and positive semidefinite. As a consequence, all its eigenvalues are real and non-negative, and tests on the rank of  $\Pi$  can therefore be carried out by testing how many eigenvalues are 0.

If all the eigenvalues are significantly different from 0, then all the processes are stationary. If, on the contrary, there is at least one zero eigenvalue, then the yt process is integrated, although some linear combination might be stationary. At the other extreme, if no eigenvalues are significantly different from 0, then not only is the process is non-stationary, but the same holds for any linear combination and no cointegration occurs.

#### V. DATA ANALYSIS AND DISCUSSIONS

Money Supply (M1) has increased from below Sixty thousand Million to over two hundred thirty million over the period. The study covers the time period in which price index base has been revised twice, first with base period 1995/96 and secondly with base period 2005/2006. The authors have recalibrated price index before 2005/06 to accommodate this base adjustment. With this recalibration, CPI has changed from 79.09 to 187.35 during the period of study. Similarly, Trade deficit with India has widened from below one thousand two hundred million to more than twenty eight thousand.

<sup>&</sup>lt;sup>130</sup> For the details of items in CPI in Nepal and India refer Annex5.2 (a) of publication "Inflation of Nepal" published by NRB in2007 (www.nrb.org.np)

Variable	Mean	Median	Minimum	Maximum	Std. Dev.	C.V.	Skewness
M1	106140.	84179.0	50349.8	230746.	50248.4	0.473418	0.798135
CPI	116.916	105.747	79.0861	187.350	31.9472	0.273249	0.681679
XpIn	3190.16	3283.13	1467.45	4652.00	742.330	0.232694	-0.227891
XpOth	1880.79	1765.27	1139.25	3183.70	407.569	0.216701	1.03019
ImIn	13009.1	10212.9	3504.10	32755.0	8319.30	0.639499	0.854012
ImOth	8233.96	6292.92	3529.95	17130.1	4042.90	0.491003	0.762782
ХрТ	5070.95	5010.53	3011.90	7123.20	840.707	0.165789	0.175542
ImT	21243.0	16460.0	8410.25	49885.0	12145.2	0.571724	0.810206
TrDepIn	9818.9	6844.1	1149.3	28328	7754.9	0.789	0.889

# **Table 1. Summary Statistics**

The descriptive table shown computed central tendencies and dispersion of variables using the observations 2000:01 - 2013:07. M1, XpT, XpIn, ImT and ImIn are in million of NRs. CPI is a unit less Price Index.





Figure 2 shows the status of variable under study over the period of 2000:01 - 2013:07. The primary impression of the time series of variables, there has been increase in the values monotonically over the periods.

# **1.5. Unit Root Diagnostics**

# Table2, Unit Root Test

Status	Variables	p-value	p-value		
		With Constant	With Trend and Constant		
Level of Variable	logM1	0.9989	0.1301		
	logCPI	0.9998	0.8221		
	log(TrDepIn)	0.7664	0.08398		
1 <sup>st</sup> Difference of Variable	$\Delta(\log M1)$	0.03501	0.01934		
	ΔlogCPI	0.200	0.06271		
	$\Delta \log(TrDepIn)$	0.0056	0.02668		
Level Of Integration		$\log M1 = I(1), \log C$	$\log M1 = I(1)$ , $\log CPI = I(1)$ and $\log (TrDepIn) = I(1)$		
Augmented Dickey-Fuller test for including sample size 142. Null hypothesis: Presence of Unit-root. The rejection of null hypothesis of  $1^{st}$  difference of all the three variables would indicate that they may be integrated in the order of 1. Augmented Dickey Fuller (ADF) test as shown in Table 2, has indicated that all the three variables are non stationary . However, first difference of these variables are stationary indicating that they are integrated in the order of 1 i.e. these variables are I(1).

# **1.6. Engle Granger Test Of Cointegration 1.6.1. Between logCPI and logTrDepIn**

# Table 3. Cointegration test logCPI and logTrDepIn

Step	ADF Test for Unit Root	p-value	Detection	Order	Of
				Integration	
1	logCPI	~1	Presence of	I(1)	
			Unit Root		
2	logTrDepIn	0.7275	Presence of	I(1)	
			Unit Root		
3	Residual of cointegrating regression	0.02065	No Unit Root	I(0)	

There is evidence for a cointegrating relationship if the unit-root hypothesis is not rejected for the individual variables but the unitroot hypothesis is rejected for the residuals from the cointegrating regression (logCPI~logTrDepIn)

# 1.6.2. Between logCPI, logTrDepIn and logM1

# Table 4. Cointegration test logCPI, logM1 logTrDepIn

Step	ADF Test for Unit Root	p-value	Detection	Order	Of
				Integration	
1	logCPI	~1	Presence of	I(1)	
			Unit Root		
2	logM1	0.9728	Presence of	I(1)	
			Unit Root		
3	logTrDepIn	0.7275	Presence of	I(1)	
			Unit Root		
4	Residual of cointegrating regression	0.03302	No Unit Root	I(0)	

There is evidence for a cointegrating relationship if the unit-root hypothesis is not rejected for the individual variables but the unit-root hypothesis is rejected for the residuals from the cointegrating regression (logCPI~logM1+logTrDepIn).

# 1.7. Long Term Relation Between The Variables

Inorder to enquire about the long run relation between the variables following regration has been employed.

$$\log CPI_{t} = \mu_{t} + \varphi \log TrDep_{t} + \varepsilon_{t}$$

$$\log CPI_{t} = \mu_{t} + \log M1_{t} \varphi \log TrDep_{t} + \varepsilon_{t}$$
(8)

# Table 5, Long term Relation Between Inflation and TradeDep with India

Equation		Coefficient	Std. Error	t-ratio	p-value
logTrDepIn as Independent	Constant	2.13818	0.145269	14.7188	<0.00001***
Variable	logTrDepIn	0.292873	0.0160003	18.3043	<0.00001***
logTrDepIn and logM1 as	Constant	-0.857934	0.277228	-3.0947	0.00235***
Independent Variables	logTrDepIn	0.0905408	0.0226539	3.9967	0.00010***
	logM1	0.416683	0.0402232	10.3593	< 0.00001***

Dependent Variable in logCPI. \*\*\* indicates the parameter is significant at 0.01.

Table 5 shows the results of regression equations (7) and (8). The results show that the parameter coefficients are significant. With equation (7) we can see that 100 percent points change in trade deficit with India would result 29.29 percent point change in long run price level.

Even if we take money supply as additional explanatory variable as in equation (7) (though caution should be taken for

# 1.8. Error Correction and Short-Run Disequilibrium Adjustment.

Equation		Coefficient	Std. Error	t-ratio	p-value
Equation 1: logCPI	EC1	-0.0388114	0.0039872	-9.7340	<0.00001***
Equation 2: logTrDepIn	EC2	-0.0167993	0.0667557	-0.2517	0.80165
R-square-Equation (1)	0.383993				
R-square-Equation (2)	0.000416				

#### Table 6, Error Corrrection (α)

\*\*\* indicates significant at 0.01

Table 6 shows that there is short-run disequilibrium of logCPI and hence the adjustment parameter ( $\alpha$ ) is significant. On the other hand, logTrDepIn is stable and hence dis-equilibrium coefficient is not significant. This result seems intuitive in that, the TrDepIn is causal variable, here in the study.

# VI. CONCLUSION

The analysis and discussions in the previous section confirms the existence of long run relationship between inflation in Nepal and trade deficit with India. Inflation in Nepal is not only homemade but also borrowed from India. Policy to address trade dependency with India, therefore, appears to be a matter of concern for policy makers if they aim to price stability in Nepalese economy. The actual values of logCPI versus predicted logCPI as shown in figure 7, suggests the robustness of the employed Cointegration models. Additionally, the residuals of Cointegrating and VECM regressions are normally distributed as indicated by figures 3,4, and 6 show that the residuals are normally distributed suggesting the strength of the models used and efficiency of estimated parameters.

multicollinearity as there is high positive correlation (0.9448

with p-value 0.1538 between logM1 and logCPI) the marginal impact of trade deficit variable is 0.09 percent point for every

100 percent point change in CPI. This clearly depicts that there is

long run relation (co-integration) between inflation in Nepal and

trade-deficit of Nepal with India.

#### VII. ANNEXURE

#### Table 7, Normality Of Residuals

Equation	Test Statistic ( $\chi 2$ )	p-value
logTrDepIn as Independent Variable	2.34707	0.309272
logTrDepIn and logM1as Independent Variable	1.04272	0.593711

Chi square test has been employed to detect the normality of distribution of residuals. Null hypothesis( $H_o$ ) is Residual is normally distributed.

Table 8.	OLS	. using	observations	2000:08	-2013:06	$(\mathbf{T} =$	155) D	Dependent	variable:	logCPI
Lable 09		, using	obset various	2000.00	2010.00	(	100,0	cpenaent	, at lable.	IUSCI I

	Coefficient	Std. Error	t-ratio	p-value
const	2.13818	0.145269	14.7188	< 0.00001***
logTrDepIn	0.292873	0.0160003	18.3043	< 0.00001***

Mean dependent var	4.728778	S.D. dependent var	0.260724
Sum squared resid	0.766815	S.E. of regression	0.070795
R-squared	0.926750	Adjusted R-squared	0.926271
F(1, 153)	335.0463	P-value(F)	2.24e-40
Log-likelihood	191.5070	Akaike criterion	-379.0139
Schwarz criterion	-372.9271	Hannan-Quinn	-376.5416
rho	0.834215	Durbin-Watson	0.327741

Table 9, Correlation coefficients, using the observations 2000:01 - 2013:07. 5% critical value (two-tailed) = 0.1538 for n = 163

logM1	logTrDepIn	
1.0000	0.9448	logM1
	1.0000	logTrDepIn



Figure 3, Normality of Residuals from co-integrating regression equation (7)



Figure 4, Residual plot of VECM model



Figure 5, Normality of Cointegrating Regression as given by equation 8





#### **Figure 6. Impulse Response Function**



Figure 7, Forecasted CPI based on Cointegration and VECM model

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#### AUTHORS

**First Author** – Santosh Koirala, Nepal Administrative Staff College

# Spectrum Sensing in Cognitive Radio under different fading environment

# Itilekha Podder, Monami Samajdar

Bengal College of Engineering and Technology, Durgapur West Bengal University of Technology

*Abstract-* In this Project emphasis has been laid on the study of cognitive radio technology and its spectrum sensing techniques. Here local spectrum sensing will be performed using energy detection procedure under two different kinds of environment namely-Additive White Gaussian Noise (non-fading) channel and Rayleigh Fading channel. The simulations will be done using MATLAB version 7.9.0(R2009b). From the results obtained, we will figure out the variations caused under fading environment when compared with that of non-fading environment. And thereafter the performance will be checked under collaborative spectrum sensing.

Index Terms- Cognitive radio, spectrum sensing, radio frequency, quality of service

#### 1. INTRODUCTION

Current wireless networks are characterized by a static spectrum allocation policy, where governmental agencies assign wireless spectrum to license holders on a long-term basis for large geographical regions. Recently, because of the increase in spectrum demand, this policy faces spectrum scarcity in particular spectrum bands. In contrast, a large portion of the assigned spectrum is used sporadically, leading to underutilization of a significant amount of spectrum. Hence, dynamic spectrum access techniques were recently proposed to solve these spectrum inefficiency problems.

The key enabling technology of dynamic spectrum access techniques is **cognitive radio** (**CR**) **technology**. This technology allows the unlicensed users to access the spectrum opportunistically when the spectrum is free and when primary licensed users are inactive or idle. In such technique secondary user regularly check for the primary user signal in order to avoid the interference between each other, thus leaving the spectrum as soon as primary user signal is sighted. A mechanism must be there allowing the secondary users to perfectly spot both the presence of primary user signal and its arrival if the secondary user is operating in the primary user band thus reducing the chances of interferences. The secondary user initially checks if a communication channel is not in use, and if idle it moves into that liberated empty space thus using that radio frequency without interfering with the licensed users.

CR networks are envisioned to provide high bandwidth to mobile users via heterogeneous wireless architectures and dynamic spectrum access techniques. This goal can be realized only through dynamic and efficient spectrum management techniques. CR networks, however, impose unique challenges due to the high fluctuation in the available spectrum, as well as the diverse quality of service (QoS) requirements of various applications.

In order to address these challenges, each CR user in the CR network must:

- Determine which portions of the spectrum are available
- Select the best available channel
- Coordinate access to this channel with other users
- · Vacate the channel when a licensed user is detected

Recent measurements suggest the possibility of sharing spectrum among different parties subject to interference-protection constraints. In order to enable access to unused licensed spectrum, a secondary user has to monitor licensed bands and opportunistically transmit whenever no primary signal is detected. However, detection is compromised when a user experiences shadowing or fading effects. In such cases, user cannot distinguish between an unused band and a deep fade. **Collaborative spectrum sensing** is proposed and studied as a means to combat such effects.

# 2. HISTORY OF COGNITIVE RADIO

The idea of cognitive radio was first presented officially by Joseph Mitola III in a seminar at KTH, The Royal Institute of Technology, in 1998, published later in an article by Mitola and Gerald Q. Maguire, Jr in 1999. It was a novel approach in wireless communications that Mitola later described as:

The point in which wireless personal digital assistants (PDAs) and the related networks are sufficiently computationally intelligent about radio resources and related computer-to-computer communications to detect user communications needs as a function of use context, and to provide radio resources and wireless services most appropriate to those needs.

Regulatory bodies in various countries (including the Federal Communications Commission in the United States, and Ofcom in the United Kingdom) found that most of the radio frequency spectrum was inefficiently utilized. For example, cellular network bands are overloaded in most parts of the world, but amateur radio and paging frequencies are not. Independent studies performed in some countries confirmed that observation, and concluded that spectrum utilization depends strongly on time and place. Moreover, fixed spectrum allocation prevents rarely used frequencies (those assigned to specific services) from being used by unlicensed users, even when their transmissions would not interfere at all with the assigned service. This was the reason for allowing unlicensed users to utilize licensed bands whenever it would not cause any interference (by avoiding them whenever legitimate user presence is sensed).

The first phone call over a cognitive radio network was made on Monday 11 January 2010 in Centre for Wireless Communications at University of Oulu using CWC's cognitive radio network CRAMNET (Cognitive Radio Assisted Mobile Ad Hoc Network) that has been developed solely by CWC researchers.

Today the sophistication possible in a Software Defined Radio (SDR) has now reached the level where each radio can conceivably perform beneficial tasks that help the user, help the network, and help minimize spectral congestion.

# 3. COGNITIVE RADIO TECHNOLOGY

A Cognitive Radio is defined as a radio that can change its transmitter parameters based on interaction with its environment.

From this definition, two main characteristics of cognitive radio can be defined:

• Cognitive capability: Through real-time interaction with the radio environment, the portions of the spectrum that are unused at a specific time or location can be identified.

CR enables the usage of temporally unused spectrum, referred to as spectrum hole or white space. Consequently, the best spectrum can be selected, shared with other users, and exploited with- out interference with the licensed user.

• Re-configurability: A CR can be programmed to transmit and receive on a variety of frequencies, and use different access technologies supported by its hardware design.

#### 3.1 Cognitive Radio Transceiver Architecture

The main components of a CR transceiver are-

• Radio Frequency (RF) Unit- In the RF front-end unit, the received signal is amplified, mixed, and analog to-digital (A/D) converted. In the baseband processing unit, the signal is modulated/ demodulated.

• Baseband Processing Unit- In the baseband processing unit, the signal is modulated or demodulated.

Each component can be reconfigured via a control bus to adapt to the time- varying RF environment. The block diagram for CR transceiver is shown below:



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The cognitive radio network architecture is shown in the figure given below:



#### **Network Components:**

The components of the CR network architecture can be classified as two groups: The primary network (or licensed network) is referred to as an existing network, where the primary users have a license to operate in a certain spectrum band.

If primary networks have an infrastructure, primary user activities are controlled through primary base stations. The CR network (also called the dynamic spectrum access network, secondary network, or unlicensed network) does not have a license to operate in a desired band. Hence, additional functionality is required for CR users to share the licensed spectrum band. CR networks also can be equipped with CR base stations that provide single-hop connection to CR users.

The operation types for CR networks can be classified as licensed band operation and unlicensed band operation.

• Licensed band operation: CR networks are focused mainly on the detection of primary users in this case.

• Unlicensed band operation: In the absence of primary users, CR users have the same right to access the spectrum.

#### **Network Heterogeneity:**

• CR network access: CR users can access their own CR base station, on both licensed and unlicensed spectrum bands.

• CR ad hoc access: CR users can communicate with other CR users through an ad hoc connection on both licensed and unlicensed spectrum bands.

• Primary network access: CR users can also access the primary base station through the licensed band. Unlike for other access types, CR users require an adaptive medium access control (MAC) protocol.

# 4. SPECTRUM MANAGEMENT FRAMEWORK

The spectrum management process consists of four major steps:

# 4.1 Spectrum sensing

It enables CR users to adapt to the environment by detecting spectrum holes without causing interference to the primary network. Generally, spectrum sensing techniques can be classified into three groups: primary transmitter detection, Primary receiver detection, and interference temperature management.

Primary Transmitter Detection- It is based on the detection of a weak signal from a primary transmitter through the local observations of CR users.

Three schemes are generally used for transmitter detection:

• Matched filter detection: When the information of the primary user signal is known to the CR user, the optimal detector in stationary Gaussian noise is the matched filter.

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• Energy detection: If the receiver cannot gather sufficient information about the primary user signal, the optimal detector is an energy detector.

• Feature detection: In general, modulated signals are characterized by built-in periodicity or cyclostationarity.

Primary Receiver Detection- The most efficient way to detect spectrum holes is to detect the primary users that are receiving data within the communication range of a CR user.

Interference Temperature Management-This model limits the interference at the receiver through an interference temperature limit, which is the amount of new interference the receiver could tolerate.

Spectrum Sensing Challenges-

- Interference temperature measurement
- Spectrum sensing in multi-user networks
- Spectrum-efficient sensing

# 4.2 Spectrum Decision

CR networks require the capability to decide which one is the best spectrum band among the available bands according to the QoS requirements of the applications. This notion is called spectrum decision.

After the available spectrum bands are characterized, the most appropriate spectrum band should be selected, considering the QoS requirements and spectrum characteristics. Accordingly, the transmission mode and bandwidth for the transmission can be reconfigured.

Spectrum Decision Challenges -

- Decision model
- Cooperation with reconfiguration
- Spectrum decision over heterogeneous spectrum bands

# 4.3 Spectrum Sharing

The first classification is based on the architecture, which can be centralized or distributed.

• Centralized spectrum sharing: The spectrum allocation and access procedures are controlled by a central entity.

• Distributed spectrum sharing: Spectrum allocation and access are based on local (or possibly global) policies that are performed by each node distributively.

The second classification is based on allocation behavior, where spectrum access can be cooperative or non cooperative.

• Cooperative spectrum sharing: Cooperative (or collaborative) solutions exploit the interference measurements of each node such that the effect of the communication of one node on other nodes is considered.

• Non-cooperative spectrum sharing: Only a single node is considered in non- cooperative (or non-collaborative, selfish) solutions. Because interference in other CR nodes is not considered, non-cooperative solutions may result in reduced spectrum utilization. The third classification for spectrum sharing in CR networks is based on the access technology.

• Overlay spectrum sharing: Nodes access the network using a portion of the spectrum that has not been used by licensed users.

• Underlay spectrum sharing: The spread spectrum techniques are exploited such that the transmission of a CR node is regarded as noise by licensed users.

Finally, spectrum sharing techniques are generally focused on two types of solutions: spectrum sharing inside a CR network (intra network spectrum sharing) and among multiple coexisting CR networks (internetwork spectrum sharing).

Spectrum Sharing Challenges

- Common control channel
- Dynamic radio range
- Spectrum unit
- Location information

# 4.4 Spectrum Mobility

After a CR captures the best available spectrum, primary user activity on the selected spectrum may necessitate that the user change its operating spectrum band(s), which is referred to as spectrum mobility. The purpose of the spectrum mobility management in CR networks is to ensure smooth and fast transition leading to minimum performance degradation during a spectrum handoff. An important requirement of mobility management protocols is information about the duration of a spectrum handoff. This information can be provided by the sensing algorithm.

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Spectrum Mobility Challenges

• Spectrum mobility in the time domain

• Spectrum mobility in space

# 5. PROPAGATION ENVIRONMENT

In this project, the spectrum has been sensed under following two different kinds of environment

- Additive White Gaussian Noise (AWGN) Channel
- Rayleigh Fading Channel

# 5.1 Additive White Gaussian Noise

Additive white Gaussian noise (AWGN) is a channel model in which the only impairment to communication is a linear addition of wideband or white noise with a constant spectral density and a Gaussian distribution of amplitude. The model does not account for fading, frequency selectivity, interference, nonlinearity or dispersion. However, it produces simple and tractable mathematical models which are useful for gaining insight into the underlying behaviour of a system before these other phenomena are considered.

# 5.2 Rayleigh Fading

A fading that crops up due to number of reflection in an environment is referred to as Rayleigh fading and is evaluated using various statistical methods. In urban areas plus in scenarios where diverse paths are used by a signal, to check the performance of radio wave propagation Rayleigh faded model is foremost alternative because of reflection from obstacles. A disperse signal between receiver and transmitter also demonstrate to be a good case to study Rayleigh fading as the received signal might be an arrangement of the all the signals reaching to the receiver through diverse paths and depending upon the phase they might either add or subtract from the received signal. Rayleigh fading is also referred to as non line of sight fading.

In probability theory and statistics, the Rayleigh distribution is a continuous probability distribution. A Rayleigh distribution is often observed when the overall magnitude of a vector is related to its directional components

The Rayleigh probability density function is

$$f(x;\sigma) = \frac{x}{\sigma^2} e^{-x^2/2\sigma^2}, \quad x \ge 0,$$

For parameter  $\sigma > 0$ , and cumulative distribution function

$$F(x) = 1 - e^{-x^2/2\sigma^2}$$

For  $x \in [0, \infty)$ .

# 6. SENSING TECHNIQUES FOR SPECTRUM

The most excellent exploitation of the spectrum is to identify the white spaces in the spectrum and in Cognitive radio technology an efficient approach for it is a well-known practice called opportunistic access. The likelihood to do so is completely reliant on how the cognitive radio assembles information regarding its environment of operation for which the obvious choice is careful sensing. Depending upon the consequences certain communication parameters are used, so that the adjusted parameter then helps to perform the transmission and reception in an enhanced manner. In cognitive radio technology the most obvious concern is that of sensing, while precise sensing to the highest degree improves by and large the performance of the cognitive radio network since the operation can be continued until an accurate sensing is made continuously. Due to diverse variety of modulation types and having extensive range of power schemes, primary user have diversity of choices to utilize any of these to access the band, and in such cases to properly sense the spectrum for use by the secondary user is a tricky job. The secondary user signal is incredibly tough thus leading to underutilization of the spectrum and performance hindrance due to erroneous sensing.

A binary hypothesis problem given as H0 and H1 can be in use as a testing scheme for sensing the spectrum precisely and this helps to spot the existence and nonexistence of primary user prior to using the spectrum.

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In this method H0 imply that the primary users are not in attendance and the spectrum can be used, whereas H1 signify that the primary user is in attendance on the band, and based on these testing the secondary user can sketch the conclusions whether to employ or not exploit the spectrum.

H0: {Primary User not in Attendance}

H1: {Primary User in Attendance}

# 6.1 Different Spectrum Sensing Techniques

# 6.1.1 Matched Filter Method for Detection

A matched filter is a scheme used for the discovery of primary user signal and the basic aim of this approach is to take benefit of the white spaces of the band. In this technique a linear match filer is obtained so that for a prearranged input signals, the SNR ratio is maximized and it is done when, a signal which is not known to the detector is allied with the device known signal. This technique helps to identify the presence of the acknowledged signal in the signal which is not familiar to the detector.

For the method to work the preliminary information concerning the primary user signal such as arrangement of the packet, order and shape of pulse with modulation type is obligatory but is extremely difficult, nevertheless the technique is exceedingly appropriate for sensing as it boosts the SNR in AWGN.

# 6.1.2 Energy Detection Procedure

For the reason of its simplicity energy detection is regarded as one of the finest of all the primary transmitter detection schemes and is used to detect zero mean signals. In this technique energy that have been received because of the received radio frequency is measured and an already specified threshold, which is chosen depending on the surrounding radio environment where the operation is to be done, is used as a judgment parameter which is then used to conclude whether there is a primary user signal at hand or not. A significant matter in energy detection scheme is to set the threshold which is exceptionally complicated task because in must deal with the susceptibility of the radio environment being especially flexible and might change soon.

Because of its simplicity energy detection is the main preference for spectrum sensing and there are number of factors that construct it as one of the most attractive pick, because in order to become aware of the primary user signal, the energy detection does not require any preliminary knowledge of the detected signal. The energy detection scheme for the primary user signal detection is shown below:



Fig. depicts block-diagram of an energy detector. The input band pass filter selects the centre frequency, fs, and bandwidth of interest, W. This filter is followed by a squaring device to measure the received energy and an integrator which determines the observation interval, T. Finally, output of the integrator, Y, is compared with a threshold,  $\lambda$ , to decide whether signal is present or not.

The procedure of energy detection starts when a signal is received, which is then passed through a band pass filter, so to choose only those frequencies that are preferred bypassing all other undesired frequencies. The received energy is considered by a squaring device after the filter selects the frequency and bandwidth denoted by W and then after the squaring device, there is an integrator which is used to measure the observation time over an interval T. The final output from the integrator denoted by R, is then compared with the threshold denoted by lambda which is defined on subject to the radio surroundings, and subsequent to the evaluation the results are sent to the conclusion or decision device, where based on the outcome the verdict is taken to decide whether a primary user signal is in attendance or not.

# 7. MATHEMATICAL APPROACH

# 7.1 ROC Performance Metric Curve

Receiver Operating Characteristics (ROC) is used as an analytical curve in different fields of technology and medicine for gauging the performance in terms of sensitivity.

ROC curve can as well be used for investigating the performance of the spectrum sensing by making an assessment between two probabilities i.e. the probability of false alarm signified by (Pf) and probability of detection (Pd) or probability of miss detection denoted by (Pm). This curve gives an improved understanding of how the expand in one probability have impact on other plus what are the conducts of the system under the effects of shadowing and fading and how it affects the spectrum sensing by simulating various curves.

# 7.1.1 Probability of Detection and Miss Detection:

Probability of Detection (Pd) is the probability to spot in the area of operation of a secondary user, whether there is a primary user signal in attendance or not. Larger the probability of detection the odds are that more exact will be the sensing and thus extremely little chances of intervention as secondary user will classify the existence of primary user signal and will not use the band consequently avoiding the interference.

However if the probability of detection declines then the probability of miss detection (Pm) which is in reality the inverse of probability of detection (Pd), increases indicating that there are added likelihood of missing the primary user signal which is at hand, in the area of operation and it increases the chances of interferences between the primary user and secondary user. In a non –fading environment were h(amplitude gain of the channel) is deterministic, probabilities of detection and false alarm are given by the formulae:

$$Pd = P\{Y > \lambda \mid H1\} = Qm(\sqrt{2\gamma}, \sqrt{\lambda})$$
(1)  
$$Pf = P\{Y > \lambda \mid H0\} = \frac{\Gamma(m, \frac{\lambda}{2})}{\Gamma(m)}$$
(2)

Where  $\Gamma$  (.) and  $\Gamma$  (.,.) are complete and incomplete gamma functions respectively and Qm(.,.) is the generalized Marcum Q-function defined as follows

Qm(a, b) = 
$$\int_{b}^{\infty} \frac{x^{m}}{a^{m-1}} e^{\frac{-(x^{2}+a^{2})}{2}} I_{m-1}(ax) dx$$

Where  $I_{m-1}(.)_{is the modified Bessel function of m-1th order.}$ 

So for better performance of Cognitive Radio Network the probability of detection must be evaluated.

# 7.1.2 Probability of False Alarm:

Sometimes there is a white space in the spectrum which can be utilized by the secondary users but the secondary users formulates a wrong ruling by identifying it as, already packed space of spectrum by another signal which escorts to an erroneous verdict and such a probability is known as probability of false alarm (Pf).

If the probability of false alarm (Pf) enlarges then it results in a very low utilization of spectrum as the white spaces of the band which can be use by the secondary users, are identified as all ready filled space due to erroneous sensing resulting in the performance degradation.

For an ideal system the probability of miss detection (Pm) and probability of false alarm (Pf) must be extremely low and the probability of detection (Pd) must have a higher value.

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#### 7.2 Spectrum Sensing In Fading Environment

The goal of spectrum sensing is to decide between the following two hypotheses,

$$X(t) = \begin{cases} w(t) & :H0, \\ Hs(t)+w(t) & :H1, \end{cases}$$

where x(t) is the signal received by secondary user and s(t) is primary user's transmitted signal, w(t) is the additive white Gaussian noise (AWGN) and h is the amplitude gain of the channel. We also denote by  $\gamma$  the signal-to-noise ratio (SNR).

The output of the integrator Y serves as the decision statistic and may be shown to have the following distribution:

$$Y \sim \begin{cases} (\chi 2TW) 2 & :H0, \\ (\chi 2TW) 2(2\gamma) & :H1, \end{cases}$$

Where  $(\chi 2TW)2$  and  $(\chi 2TW)2(2\gamma)$  denote central and non-central chi-square distributions respectively, each with 2TW degrees of freedom and a non-centrality parameter of  $2\gamma$  for the latter distribution. For simplicity we assume that time-bandwidth product, TW, is an integer number which we denote by m.

As expected, Pf is independent of  $\gamma$  since under H0 there is no primary signal present. On the other hand, when h is varying due to shadowing/fading, (1) gives probability of detection conditioned on the instantaneous SNR,  $\gamma$ . In this case, average probability of detection (which with an abuse of notation is denoted by Pd) may be derived by averaging (1) over fading statistics,

$$\mathrm{Pd} = \int \mathrm{x} \, \mathrm{Qm}\big(\sqrt{2\gamma}, \sqrt{\lambda}\big) f_{\gamma}(\mathrm{x}) \, \mathrm{dx}$$

Where  $f \square(x)$  is the probability distribution function (PDF) of SNR under fading.

The fundamental trade off between Pm and Pf has different implications in the context of dynamic spectrum-sharing. A high Pm would result in missing the presence of primary user with high probability which in turn increases interference to primary licensee. On the other hand, a high Pf would result in low spectrum utilization since false alarms increase number of missed opportunities (white spaces).

The probability of miss detection can be written as given in the equation below:

# Pm=1-Pd

#### 8. SIMULATION AND EXPLANATION

The simulation was done using MATLAB version 7.9.0 (R2009b). In the initial part emphasis was to show, how the energy detection works by sensing the primary user signal so to make use of the spectrum, a graphical observation of the probability of miss detection (Pm) verses probability of false alarm (Pf) was shown, plotting in the MATLAB in receiver operating curve (ROC) with all the required parameters.

A complementary ROC curve is obtained by simulating energy detection technique in occurrence of AWGN and after that on the foundation of the resulted curves conclusion regarding the performance of the energy detection is made.

#### 8.1 Rayleigh Fading Effects on Energy Detection

When a secondary user is under effect of fading then the channel gain denoted by "h" might diverge to some level depending upon what sort of phenomena it is exaggerated by, and the detection procedure in addition is also affected by this expand thus the detection probability (Pd) then depends upon that instantaneous SNR. If instantaneous SNR is the consequential of fading then the received

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SNR pursue a particular probability distribution function which is used to obtain average detection probability (Pd) given by the equation.

$$Pd = \int x Qm(\sqrt{2\gamma}, \sqrt{\lambda}) f_{\gamma}(x) dx$$

With fading being the factor for that instantaneous SNR, the probability distribution function (PDF) for that received SNR by secondary user is signified by the function  $f\square(x)$ .

Under Rayleigh fading, □ would have an exponential distribution given by

$$f(\gamma) = \left(\frac{1}{\overline{\gamma}}\right) \exp\left(-\frac{\gamma}{\overline{\gamma}}\right), \gamma \ge 0$$

And Pd can be specified by the following equation.

$$Pd = e^{-\frac{\lambda}{2}} \sum_{j=0}^{m-2} \left(\frac{1}{j!}\right) \left(\frac{\lambda}{2}\right)^{j} + \left(\frac{1+\overline{\gamma}}{\overline{\gamma}}\right)^{m-1} \times \left(e^{-\lambda/2(1+\overline{\gamma})} - e^{-\frac{\lambda}{2}} \sum_{j=0}^{m-2} \left(\frac{1}{j!}\right) \left(\frac{\lambda\overline{\gamma}}{2(1+\overline{\gamma})}\right)^{j}\right)$$

In the simulation done in this case, energy detection practice for two secondary users with average received SNR of 10 dB and time and bandwidth product of m=5 is exposed in which one of the secondary user is affected by Rayleigh fading and the other has no fading associated to it.

# 8.2 Collaborative Spectrum Sensing In Fading Environment

In case of fading and shadow of an obstacle, which causes the intensity of SNR to be extremely low, the performance of energy detector degrades and to deal with this hindrance a procedure called collaboration of secondary users is suggested. Such a sensing involving the collaboration of secondary users with each other sharing their individual information is defined as Collaborative Spectrum Sensing. In order to minimize the communication overhead, users only share their final 1-bit decisions (H0 or H1) rather than their decision statistics.

Let n denote the number of users collaborating. For simplicity we assume that all n users experience independent and identically distributed fading/shadowing with same average SNR. We assume that all users employ energy-detection and use the same decision rule (i.e. same threshold  $\lambda$ ).

A secondary user receives decisions from n-1 other users and decides H1 if any of the total n individual decisions is H1. This fusion rule is known as the OR-rule or 1-out-of-n rule. Probabilities of detection and false-alarm for the collaborative scheme denoted by Qd and Qf respectively may be written as follows

$$Qd = 1 - (1 - Pd)^n$$
  
 $Qf = 1 - (1 - Pf)^n$ 

where Pd and Pf are the individual probabilities of detection and false-alarm respectively.

# 9. **RESULTS AND DISCUSSION**





Fig1: Complementary ROC (Pd v/s Pf) under gaussian channel, AWGN is provided for comparison.

# **Inference**

This above figure provides plots of complimentary ROC curve under AWGN and Gaussian channel. When Pf > 6.67x 10-4 performance of energy detector degrades.



Fig2: Complementary ROC (Pm v/s Pf) under Rayleigh Fading

# **Inference**

We observe that Rayleigh fading degrades performance of energy-detector significantly. Particularly, achieving Pm < 10-2 entails a probability of false-alarm greater than 0.9 which in turn results in poor spectrum utilization.



Fig 3: Pf v/s Pd under Rayleigh fading channel and Gaussian channel

# **Inference**

The above figure shows the comparison between Rayleigh fading and Gaussian channel. Here, in both the channel the detection probability increases with that of the false alarm probability.

# 9.1 Collaborative Spectrum Sensing





Fig4: Complementary ROC (Pf v/s Pd) under Log Normal Shadowing for collaborative spectrum sensors

# **Inference**

From the curve, we can conclude that by increasing the number of collaborative users, the performance for spectrum sensing is improved.



Fig 5: Complementary ROC (Pf v/s Pd) under Log Normal Shadowing collaborative spectrum sensors

# **Inference**

From the curve, we can conclude that by increasing the number of collaborative users, the performance of the secondary user for sensing the spectrum improves.





Fig6: Complementary ROC (snr v/s Pd) under Rayleigh and Gaussian channel for Collaborative spectrum sensors

# **Inference**

This above figure provides plots of complementary ROC curve under Rayleigh and Gaussian channel scenarios. Here, we observe that as we increase the number of sensors, the detection probability increases which improves the performance of the energy detector.

# 10. CONCLUSION

Cognitive radio can solve the spectrum under utilization problem, using opportunistic approach to use the unused licensed bands using an efficient spectrum sensing technique. A sensing approach which provides sensing information having high probability of detection and low probability of false alarm would then not cause any intervention with the primary user signal. The technique that would be used for sensing must not be too complex and it can be incorporated in the secondary user hardware easily being cost effective.

Sensing technique such as energy detection, for detecting the primary user signal is a less complex technique and it does not require any initial know ledge about the primary users' signal, which makes it the first choice. It can also be easily incorporated into the cognitive radio hardware. Shadowing and fading are some phenomena's that causes the performance of energy detection to be degraded.

To handle problems such as fading and shadowing, collaboration between secondary users was considered to be the best option that can deal with these factors and the energy detection performance degradation was also reduce to some extent. The energy detection performance was enhanced when the number of secondary users collaborating to sense the primary user signal was increased.

All the cognitive users that are together in group effort for collaboration, sends their outcomes to the base station or band manager because it is a central entity in the network, also all the secondary user uses the similar familiar channel for sending their outcomes. However with large number of secondary users participating in the collaboration, and with limited bandwidth it is very difficult to collect the results of the entire secondary users through the common channel and also the band manager require more power for processing to make a final decision.

# **11. FUTURE WORK**

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- Collaborative spectrum sensing under Log Normal Shadowing.
  - Collaborative spectrum sensing under Spatially-Correlated Shadowing in-
    - Suburban Environment
    - Urban Environment

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#### AUTHORS

**First Author -** Itilekha Podder, Department of Electronics and Telecommunications Engineering. E-mail: itilekha19@gmail.com **Second Author** – Monami Samajar, Department of Electrical and Electronics Engineering. E-mail: monamirc@gmail.com

# Brain Drain in Africa: Stakes and Perspectives for Cameroonian Universities

Sonkeng Germain<sup>\*</sup>, Tafah Edokat<sup>\*\*</sup>, Fouda Ongodo Maurice<sup>\*\*\*</sup>, Gnignindikoup Issofa<sup>\*\*\*\*</sup>

<sup>\*</sup>Doctor in Management, University of Dschang, IUT-FV of Bandjoun, e-mail : gsonkeng2001@yahoo.fr \*\*Professor, University of Bamenda, e-mail : tafahs@yahoo.com

\*\*\*\*Associate Professor, University of Douala, e-mail : fongodo@yahoo.fr

\*\*\*\*\*Ph.D Student, University of Yaoundé e-mail : youssoufamalum@yahoo.fr

*Abstract*- This paper studies the impact of the old brain drain phenomenon in Africa and particularly in Cameroonian Universities. Through documentary researches, primary data are collected from the Department of Academic Affairs in all Cameroonian State Universities.

The results obtained show for each University institution the number of deserted lecturers per faculty (and/or training schools) and per grade over the last ten years. Assistant lecturers, who are the most concerned, are followed by Senior lecturers. On the contrary, associate professors and professors are less concerned by brain drain in Cameroonian Universities.

If there is hope that the departure of some University teachers can possibly be beneficial, the phenomenon of brain drain constitutes at the same time a source of anxiety for Cameroonian Universities.

Given that human resources are a precious capital to preserve for all organization, solutions are outlined so as to attempt reducing or simply eradicating this scourge that undermine Higher Education in Cameroon and consequently the development of the old African continent.

*Index Terms*- Desertion of competences, Human resources, Hope, Anxiety, Solutions.

#### I. INTRODUCTION

During the colonial period, it was virtually established that local elites' children had to pursue their studies abroad so as to assist or take over from the colonial administrations. Moving abroad for studies has been considered as one of the major points of development voluntarist strategies. This had to permit, at the opportune moment, the country of origin to build up a reserve of human resources sufficiently qualified and important to stimulate the development.

This phenomenon had to stop with independences and institutionalization of colonized economies. In fact, after the independences and particularly in the course of 1970 and 1980, the African educative system in particular underwent a sensitive development. This had to put an end to the departures for training purposes.

Unfortunately, the reality is extremely different. Exoduses multiplied and the concerned sectors diversified themselves. In addition to students, trained professionals in higher colleges in Africa are constantly on the move (GAILLARD et Al., 2003).

In the aide-Mémoire of the "Regional Conference on Brain Drain and Capacity Building in Africa" that took place from  $22^{nd}$  to

24<sup>th</sup> February 2000 at Addis Abeba, TAFAH (2004:41) stipulates that "Africa lost 60,000 professionals (Doctors, University lecturers, engineers, etc.) between 1985 and 1990 and has been losing an average of 20,000 annually ever since... There are more than 21,000 Nigerian doctors practicing in the USA alone whilst Nigeria's health system suffers from a cruel lack of medical practitioners; 60 per cent of the doctors and dentist, 20 per cent of university lecturers, 30 per cent of engineers and 45 per cent of surveyors in 1978 alone had gone to work abroad" (p.2).

With the phenomenon of brain drain, one ends at a double paradox: on one hand, developing countries with more and more reduced resources train executives that will go and work in developed countries; on the other hand, national diploma holders that stay back home face unemployment while projects financed by development partners recruit expensive foreigners for these projects (UNESCO, 2004).

Cameroonian Universities do not escape this reality and the phenomenon of brain drain is firmly rooted in those Universities. Hope engendered by the departure of some University teachers immediately contrasts with the fears that stems from the said departures.

Nowadays, the departure of Cameroonian University teachers considered as an indisputable reality, urges us to ask the following questions: what is the impact of the brain drain phenomenon in Cameroonian Universities? What are the possible strategies to put in place so as to help the Cameroonian University system to check the brain drain phenomenon?

The main aim of this paper is to provide answers to these questions by essentially focusing our thoughts on higher education in Cameroon. This paper mainly aims at showing the impact of the brain drain phenomenon in Cameroonian Universities in terms of the number of teachers who have abandoned their work. To achieve our goal, we will try to propose solutions that can curb the said phenomenon.

The rest of this paper is outlined as follows: the next section (section3) focuses on the elaboration of the research framework. It a matter of highlighting the theoretical framework and previous works focusing on the brain drain in general as well as the methodological approach. Section 4 presents and discusses the results. Section 5 concludes this paper by proposing solutions so as to check the university brain drain.

#### II. CONCEPTUAL AND METHODOLOGICAL FRAMEWORK

# 3.1- the conceptual framework and previous works

# **3.1.1.** The concept of brain drain

According to TAFAH (2004:45), brain drain issues are viewed in the context of human capital losses or gains. This is because human capital had long been recognized to be an important determinant of economic growth. Thus, while human capital gains will enhance economic growth, losses will generate important snags in the growth process of any nation. Despite this recognition, research attention on the international movement of economic resources paid attention to the movement of physical capital while neglecting the international movement of human capital. The international movement or migration of human capital or brain drain, as it is generally called, is perceived as a movement of talented people from one country to another in search of a better life. Generally, the issue of brain drain therefore becomes relevant in the face of the scarcity of skills and talents where migration of such skills and talents constitutes a great loss for the country in which migration takes place. As Ul Haque (2000) puts it, "it is meaningful only that requires considerable investment and therefore not easy to replace". Ul Haque goes on to say that the "term is used to describe the loss of advanced professional and technical skills such as scientists, academics, doctors, engineers and others with university training. In that sense, it really refers to the upper right tail of the skill distribution" (p.4). Also, in TAFAH's works (2004:46), it is clearly shown that another phenomenon that is emerging in less developed countries is what we can term "internal brain drain" or "brain diversion". By internal brain drain or brain diversion, we refer to those intellectuals, professionals and other talented people who have been adequately trained to apply their skills, knowledge, energies and talents in their relevant fields but who, for lack of appropriate incentives and motivation, employ their talents outside their areas of training and professions.

# 3.1.2- **Previous works: the motives of brain drain and highlighting a double responsibility**

Responsibilities on brain drain phenomenon are shared. While the South shows its repellent practices, the North constantly refines its mechanisms of attraction.

# Internal dimension: Africa as a repellent continent of competences

Man's needs are diverse and, according to MASLOW (1934) the security need is fundamental. Thus, the African continent nowadays is characterized by the increase in the number of insecurity (political, juridical, economic, sanitary, environmental, etc.)

The political insecurity is the current characteristic of most of the political regimes in Africa. It has been discussed during the recent summit of the French-speaking world that was held in the Democratic Republic of Congo (October 2010).

The social environment in Africa is also a source of brain drain. Africa is a continent where the family in conceived is its extended form and, solidarity demands are enormous. Thus, family reasons are of a paramount importance for the choice: it is the outlook the migrants have on the place where their children will have the best possibilities of life and career that get them to make the choice between the welcoming country and the country of origin (GLAZER and HABERS, 1978). Finally, it is especially for technical reasons that brain drain is firmly rooted in Africa. Consequently, for many African countries, brain drain gains fertile ground in the general context of the damage of national scientific and technical systems. Following the phase of intense and accentuated development during 1970 and 1980, the situation substantially deteriorated in most of the sub-Saharan countries (GAILLARD et AL., 2005). The state of ambient crisis is reflected by many works on the African research systems (GAILLARD et AL., 2005). Drastic reductions made on public budgets led to the degradation of infrastructures, the poor maintenance and the non renewal of equipments as well as the density and the quality of scientific personnel. Salaries, even when they are paid, do no longer suffice to earn a good living and scientific and technical professions in Africa are transformed.

For illustration, a study carried out by TAFAH (2004) shows in percentages and per grades reductions made on the salaries of Cameroonian university teachers after 1993: Assistant lecturers (35.2%); Senior lecturers (38.7%), Associate professors (42.4%), Professors (42.3%).

The deinstitutionalization and the crisis caused researchers to emphasize on expertise and consultancy. The profession is more and more practiced in the framework of interim. The deterioration of salaries and work conditions equally led to a high emigration rate of scientists and of the whole qualified personnel of the most concerned countries towards other countries or other professions. Simultaneously and due to the lack of funding, no recruitment has been virtually done in any scientific establishment and higher education in many African countries in 1990. This explains why universities and African institutes of research are currently facing a serious deficit of scientific personnel and one can therefore talked of a "lost scientific generation" in Africa (GAILLARD et AL., 2005). For these countries, the fight against brain drain is just an illusion if it does not go alongside with a coordinated action in favor of development and development of national capacities namely in the domain of research, higher education and health.

# External dimension: attractive mechanisms of western countries

Attractive practices of western countries are so many. The goal is to attract and to keep not only intelligent Africans but also those who are well-to-do.

The globalization of the market work particularly exposes the developing countries. The increase of developed countries demand in highly qualified personnel in some economy sectors has created these last years, a fertile ground for the rise of this market. For instance, the sectors of health who professionals trained in the eastern African countries are directly importable or imported by the western countries. Other sectors of economy such as the information of technology are equally concerned. These welcoming countries indulge therefore in a higher bid of encouraging measures likely to attract "brains" that fit in with their needs: putting in place selective strategies in favor of highly qualified persons (Australia, Canada, South Korea, Japan, New Zealand), determination of quotas, facilities of penetration and stay in the territory for some professional categories, granting of visas on limited periods with the intention of work research (Norway, United kingdoms); Recruitment programs of some

categories of personnel abroad (German recruitment program of information technicians). Lastly, countries fight for fiscal advantages granted to highly qualified migrants. Some countries even offer to more acceptable professional categories a noteworthy reduction of taxes (see tax exoneration) during less or more long period (Australia, Korea, France, the Netherlands, Sweden). There is therefore a new attitude that justifies the employment of qualified migrants from developing countries and renews more than never the debate on brain drain.

#### 3.2- The methodological frame work

According to PERET et Al. (2012), interpretativism tries to understand a reality. Through this study, we endeavour to better understand the brain drain phenomenon in Africa in a general framework by focusing our attention on Cameroonian universities in order to measure its impact. Firstly, we present the sampling method and secondly we dwell on the method of collection and data analysis.

#### 3.2.1. Sampling

The empirical field of our study concerns the 8 state universities in Cameroon. We do not take into account the private institute of higher education and religious universities for, more often than not, it is difficult to harmonize syllabuses and to establish equivalences as far as certificates issued are concerned. Within each university, we define the period of study and this according to the age of the institution. This is why, for recently created universities (less than 10 years of existence), we carry out a study from the year of creation till day.

On the other hand, for universities that were created 10 years ago, we limit our period from 2004 to 2013 that is the last 10 years of the existence of the institution.

At the level of each university, the study is carried out on all the Faculties and/or training schools.

#### 3.2.2. Method of collection and data analysis

In this work, we use secondary data obtained through documentary researches. Consequently, the collection consists in getting in touch with the Department of Academic Affairs and the services of teacher personnel of each State University. At this level, it is a question of taking a census for each Faculty (and possibly training colleges) of the number of deserted lecturers<sup>131</sup>. This period stretches out from 2004 to 2013.

The analysis consists in classifying for each Faculty the number of deserted lecturers according to the different grades (Assistant lecturers, senior lecturers, associate professors, professors). Subsequently, we determine the total number of departures per Faculty as well as the general total of departures for the university in question.

With the aim of clearly defining the impact of this phenomenon, we present the total number of deserted lecturers for each University during the period of the study. For a given University, the faculties which did not record any desertion of lecturer over the said period do not appear in the data.

#### III. PRESENTATION AND DISCUSSION OF RESULTS

#### 4.1- Presentation of results

The following charts present the number of deserted lecturers for each university over the period of study which goes from 2004 to 2013 (10 years). The Universities are classified in the alphabetical order and the University of Bamenda does not appear on the list for it was created just 3 years ago and has not yet registered the departure of teachers.

<sup>&</sup>lt;sup>131</sup> Lecturers absents from their post because transfer, research and other justified causes are not considered as brain drain.

Faculties or Training Colleges	Numbers of	Numbers of departures per grades					
	Assistant	Senior	Associate	Professor	departures		
	lecturer	lecturer	Professor				
Faculty of art	04	-	-	-	04		
Faculty of education	02	-	-	-	02		
Faculty of sciences	18	07	-	-	25		
Faculty of social and management	07	03	-	-	10		
sciences							
Faculty of health sciences	01	-	-	-	01		
general Total	32	10	-	-	42		

# Chart 1: Desertion of lecturers of the University of Buea

Source: Department of Academic affairs of the University of Buea

Here, desertion is made up of assistant lecturers and senior lecturers. On the contrary, associate professors and professors have not deserted over the period of study.

# Chart 2: desertion of lecturers of the University of Douala

Faculties or Training Colleges	Numbers of		Total of		
	Assistant	Senior	Associate	Professor	departures
	lecturer	lecturer	professor		
Faculty of letters	09	01	-	-	10
Faculty of law and political science	05	-	-	-	05
Faculty of science	06	02	-	-	08
University Institute of Technology	05	01	-	-	06
Ecole normale supérieure de	04	03	-	-	07
l'enseignement technique					
Advanced school of economics and	03	01	-	-	04
commerce					
Faculty of economics and applied	04	02	-	-	06
management					
General Total	36	10	-	-	46

Source: Department of Academic affairs of the University of Douala

Just as the previous chart, associate professors and professors have not deserted over the period of study.

Chart 3: desertion of lecturers of the University of Dschang

Faculties or training colleges	Numbers of departures per grades				Total of
	Assistant	Senior	Associate	Professor	departures
	Lecturer	lecturer	professor		
Faculty of letters	-	03	-	-	03
Faculty of economics and	03	-	-	-	03
management					
Faculty of science	05	08	-	-	13
Faculty of Agronomy and	02	-	-	01	03
agricultural sciences					
FOTSO Victor University Institute	03	-	-	-	03
of technology					
Faculty of law and political science	03	01	-	-	04
General Total	16	12	-	01	29

Source: Department of Academic affairs of the University of Dschang

Here, desertion is made up of assistant lecturers and senior lecturers. On the contrary, associate professors and professors have not deserted over the period of study.

Faculties ou Training Colleges	Numbers of	Numbers of departures per grades			
	Assistant	Senior	Associate	Professor	departures
	Lecturer	lecturer	professor		
Sahel higher institute	01	-	-	-	01
Higher Teachers training College	02	-	-	-	02
General Total	03	-	-	-	03

# Chart 4: desertion of lecturers of the University of Maroua<sup>132</sup>

Source: Department of Academic affairs of the University of Maroua

Here, the desertion only concerns assistant lecturers. Senior lecturers, associate professors and professors have not abandoned their post over the period of study.

Faculties or training Colleges	Numbers of		Total of		
	Assistant	Senior	Associate	Professor	departures
	lecturers	lecturers	professor		
Faculty of science	03	02	-	-	05
Faculty of law and political science	02	-	-	-	02
National advanced school of agro-	01	-	-	-	01
industrial sciences					
University Institute of technology	01	-	-	-	01
General Total	07	02	-	-	09

# Chart 5: desertion of lecturers of the University of Ngaoundéré

Source: Department of Academic affairs of the University of Maroua

General Total

Here, the desertion only concerns assistant lecturers and senior lecturers. Associate professors and professors have not abandoned their post over the period of study.

# Chart 6: desertion of lecturers of the University of Yaoundé II

Faculties or training colleges	Numbers of	Numbers of departures per grades Total o			
	Assistant	Senior	Associate	Professor	departures
	lecturer	lecturer	professor		
Faculty of sciences	04	06	-	-	10
Faculty of arts, letters and social	03	04	01	-	08
sciences					
Higher teachers training college	02	03	01	-	06
Faculty of medicine and biomedical	01	02	-	01	04
sciences					
Advanced school of polytechnique	02	01	-	-	03
General Total	12	16	02	01	31

Source: Department of Academic affairs of the University of Yaoundé I

All lecturers are involved in the departure process over the period of study.

# Chart 7: desertion of lecturers of the University of Yaoundé II

Faculties or training colleges	Numbers of	Numbers of departures per grades				
	Assistant	Senior	Maître de	Assistant	departures	
	lecturer	lecturer	conférences	lecturer	Senior	
					lecturer	
Faculty of law and political science	01	01	-	-	02	
Faculty of economics and management	03	03	-	-	06	

<sup>132</sup> The University of Maroua was created in 2008. The study therefore stretches out from 2008 to 2013 that is 6 years.

Advanced school of mass	-	01	-	-	01
communication					
Cameroon institute of international	01	-	-	-	01
relations					
Institut of demographic training and	01	-	-	-	01
research					
General Total	06	05	-	-	11

Source: Department of Academic affairs of the University of Yaoundé II

Here, the desertion only concerns assistant lecturers and senior lecturers. Associate professors and professors have not abandoned their post over the period of study.

For all the universities, the total number of departure for the entire academic grade over the period of study is estimated to 171. Clearly speaking, this number can be shared out in the following chart.

Grades	Number de departures	Percentage
Assistant Lecturer	114	66.66%
Senior Lecturer	53	31%
Associate Professor	02	1.17%
Professor	02	1.17%
Total	171	100%

Chart 8: Chart 8: sharing out of desertions per grade

Source: Our data analysis

It emerges from the chart 8 that all the grades do not undergo the phenomenon with the impact. That is why in term of proportion, this situation is better illustrated in the following diagram.



Source: Our data analysis

On the whole, assistant lecturers are more concerned with brain drain. This is so obvious that at the moment of their recruitment, some lecturers often apply in many countries and abandon their previous post as soon as they are recruited abroad. It is in this sense that low salaries constitute the major factor of these abandonments according to TAFAH (2004) who believes that the environment of work at the University meets serious problems. As a result of, we can note that 60% of lecturers do not have personal cars, 80% do not have personal houses where as 70% do not have offices.

Moreover, assistants who are young lecturers do not master the reality of the professional world, often fly high and have the propensity for resignation.

Lecturers who migrate to other jobs or other countries find in such experiences hope where as the phenomenon itself is an important motive of anxiety.

#### 4.2. Discussion of results

#### 4.2.1. Brain drain as source of hope

It constitutes a source of hope insofar as migrants expect multiform gains (technological and scientific, financial and socio-economic).

#### Technological and scientific gains

A study carried out by UNESCO and AUF in 2004 shows that for trained personnel, the search for better working and opening conditions is one of the major reasons for departure. This situation mostly concerns lecturers who face in their country of origin dilapidated and obsolete equipments of laboratories. The collection of didactic and scientific materials constitutes one of the alternatives to transform brain drain into gain. Therefore, in training schools of developed countries, scientific and didactic material is constantly renewed thanks to the rapid evolution of technology. Consequently, African emigrated executives can salvage a great part of these materials and this act can serve as a great contribution to African educational establishment totally deprived. In this sense, some emigrated lecturers organize with chairpersons of institutions in their countries the collection and sending of materials. This is more and more seen through computer science material which is cruelly lacking in educational and training establishment in Africa. For example, in Ghana, Africast Foundation is in charge of organizing this kind of collection and many other African countries follow the same line (UNESCO and AUF, 2004).

In the same sense, scientific and technical networks can favour the blossoming of scientific and technical research by encouraging talents or any trained migrant or in training to contribute to the development of his country (IBRAHIMA AMADOU DIA, 2005).

The other aspect of scientific profit of brain drain concerns what can be called centers of excellence. These centers help Africa to have viable training and research schools that correspond to high norms. The centers of excellence aim at concretely showing the necessity of complementarity through a kind repartition of scientific work within Africa and through a constant effort with a view to putting at our disposal specialized institutions or leading-edge equipments. They also aim at increasing in the number of multinational teams of research that work on programs commonly validated between many Universities. It is about regional centers namely centers of excellence that constitute a welcoming privileged framework of African scientists of the diaspora to contribute, in a milieu that offers good working and opening conditions, to the training of highly qualified African executives. Such centers which periodically welcome these scientists, offer the possibility to make them punctually participate alongside their colleagues who stay back home, to the development of human resources the African continent so much need for her development. Moreover, it should be noted that such working environments can also offer an opportunity to the sensitization of definitive return.

# - Financial and socio-economic gains

Brain drain can also be motivated by financial gains expected from the departure. This category of gains essentially concerns financial transfer and the contributions of currencies by the member of the Diaspora. From this point of view, monetary transfers are very important. These money transfers represent the first profit of migration with the total contribution to developing countries of 60 dollars billion per year (GAMMELTOFF, 2002). If one adds informal transfers, the total could be very high. Taking into account the global system of communication, even transfer emanating from banks of developing countries can be part of incomes obtained elsewhere.

The socio-economic gains appear amongst the main advantages that can take Cameroonian lecturers from brain drain phenomenon. These gains are especially perceived in terms of the amelioration of life and working conditions, of the reduction of social tensions and of the attenuation of frustrations.

In the same perspective, IBRAHIMA AMADOU (2005) underlines the internationalist interpretation so as to show that the defenders of this thesis stand against the negative vision of brain drain phenomenon and consider that emigration lead to a virtuous circle. Likewise, migrant are looking for a social and economic optimum because of the increase of their income. Thus, scientific migrations appear as survival strategies, professional insertion and preservation of human security. The internationalist viewpoint also shows that brain drain creates taking over conditions from the local elite through the setting up of poles connected to the migrant's pole of origin. This dynamics could be in a position to promote scientific research, to contribute to the development of human resources and the

economic competitiveness of the migrant's country of origin (CHARUM; GRANES and MEYER, 1994).

#### 4.2.2. Brain drain as source of anxiety

Seen from this perspective, brain drain is a real source of anxiety for Cameroon. Human resources constitute a specific capital thanks to their limited transferability (GNIGNINDIKOUP, 2009). The loss of intelligent Men raises serious problems for the entire society.

As regards these figures which show the impact of the Cameroonian University brain drain, one immediately realizes that the Cameroonian state bears very high rates linked to the training expenditures of University Human Resources.

Sure enough, the sectors like health and education which really feel the impact of brain drain benefit from substantial subventions of the State. The setting to work of qualified Human Resources such as University teachers should therefore permit a return on investment. Unfortunately, these one are hidden with their exodus.

From all departures, it emerges that assistant lecturers are the most concerned. At this level, one notes over the period of study about 105 assistant lecturers on 162 departures, that is 64.8% of the total number of departures. This can be explained by the fact that assistant are the highest in number. Another explanation may come from the fact that assistants are at the beginning of their professional career and still have great ambitions with the aim of improving their living conditions and assuring a better professional future.

For the University as well as for any other enterprise, competitiveness essentially reposes on the talents of human capital. Thus, it is obvious that brain drain deprived Cameroun of her Human resources. The most immediate collateral damage is the decrease of the quality of the training offered by the University system.

If one considers competences as an economic item of property, the economic principle of scarcity and cost immediately works hard insofar as the Human Resources that migrate become rare and costly.

Moreover, taking into consideration the increasing number of students registered in Cameroonian University, the ratio teachers/students becomes very insignificant. This is indisputable because the numbers of students do not increase proportionally to the number of teachers which is considerably low due to the lack of recruitment and desertions. This situation leads to a professional overloading of teachers and automatically diminishes their output as far as teaching and research are concerned. Therefore, the University system suffers from this.

In general, according to the International Organization for Migrations (IOM, 2002), the number of African scientists currently in Africa is estimated to 20.000 (there will be a need of at least 10000000). This amount only represents 3.6% of the world number. The Economic commission for Africa (ECA) and the IOM estimate to 27000 the number of African executives who left the continent between 1960 and 1975 to go and work in developed countries. From 1975 to 1985, the number increase to 40000. Since 1990, this number is about 20000 per year (UNESCO, 2004).

#### IV. CONCLUSION

In general, the competitiveness of enterprises is subject to the availability of human resources in terms of quality and quantity. In one way or another, a shortcoming can endanger the said competitiveness. From the slave trade, the brain drain undergone by Africa has slowed down the competitiveness of African enterprises.

The impact of brain drain has nowadays reached uncontrolled proportions.

The solution is alarming with regard to the figures published by organisms such as IOM, FMI, ECA and UNESCO. It is no doubt that the eradication of this phenomenon is an illusion. However, one should avoid the pessimistic attitude. It is therefore possible to think about some solutions likely to attenuate this phenomenon. These are political, diplomatic and socio-economic solutions.

#### **5.1.** Political solutions

As political solutions, it is advisable that Africans in general improve the governmental practices in the framework of the principle of good governance in some countries. This is reinforced by actions in favour of equity in the share of the national cake and of the good functioning of democracy. This supposes the organization of free and transparent elections. Social peace is equally an important asset.

#### 5.2. Diplomatic solutions

The agreement of a migratory status securing the western countries could permit migrants to easily move about between the welcoming countries and the country of origin. Likewise, the welcoming county and the country of origin should jointly sign a double nationality to migrants. This procedure will help them to freely move about between the countries. This can be completed by the flexibility of conditions for the obtaining of visas and reduction of police and custom hassles at the level of airports.

### **5.3. socio-economic solutions**

Many alternatives can be taken into account in formulating socio-economic solutions to fight against brain drain.

Thus, the countries of origin could develop migrants' strategies of reinsertion. This can be possible through mechanisms that can ease access to bank financing in order to propel investments. Improvement efforts of economic growth could also permit to reduce the gap between rich countries and poor countries while bringing along the building up of infrastructures (research laboratories equipments, libraries, etc.)

The development of the TIC may favour the broadcasting and the sharing of knowledge between members of the Diaspora and those of local communities. This dynamics falls under the framework of virtual mobility.

More so, the government should make efforts to improve the level of life of her population in general (construction of decent accommodations, road infrastructures, etc.). A case peculiar to the University community could concern the substantial improvement of the Special Funds of support for the modernization of the research decided and implemented by the Cameroonian Head of State since 2009. This solution is more efficient because it has permitted to improve in one way or another the living conditions of lecturers even though some augmentations are still awaited. With to regard to the low number of deserted associate professors and professors, this special allowance could explain even partially this situation. This is obvious because this research allowance passes from the simple for the assistant lecturers to the double for senior lecturers, to the triple and even more for associate professors and professors. This approach could permit to avoid precarious living and working conditions to which Cameroonian lecturers are subject.

The present paper has analyzed the conceptual and methodological framework. Secondly, results have been presented and it emerges that assistant lecturers are more concerned with brain drain followed by senior lecturers. On the other hand, the number of associate professors and professors concerned with this phenomenon is insignificant within Cameroonian Universities. It is important to note that as a phenomenon firmly rooted, it is more than never for Africa in general and Cameroon in particular to try to accentuate the positive aspect of brain drain so as to benefit from it. These gains have been analyzed in the form of multiform gains. It is about financial and socio-economic gains via technological and scientific gains. The fact to accentuate the positive aspect of brain drain immediately contrasts with the growing anxiety facing the increase of competence movements. It has been highlighted the anxieties related to the high cost bore by the Cameroonian state in the training of University Human resources, the decrease of the quality of the training offered an the low ration teachers/students.

With the aims of trying to reduce if there is not any means of stopping the phenomenon of brain drain, political, diplomatic and socio-economic solutions have been outlined.

With regard to the gravity of this phenomenon, it is pretentious to think that brain drain can be totally eradicated in a short term.

While waiting for other solutions that may come from accurate research, it would be important to transform the movement of brain drain into a kind of partnership where both Africa and western countries are beneficiaries. The improvement of the Cameroonian University system also depends on this.

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#### AUTHORS

First Author - Sonkeng Germain, Doctor in Management,

University of Dschang, IUT-FV of Bandjoun, e-mail :

gsonkeng2001@yahoo.fr

Second Author – Tafah Edokat, Professor, University of

Bamenda, e-mail: tafahs@yahoo.com

Third Author - Fouda Ongodo Maurice, Associate Professor,

University of Douala, e-mail : fongodo@yahoo.fr

Fourth Author – Gnignindikoup Issofa, Ph.D Student,

University of Yaoundé e-mail : youssoufamalum@yahoo.fr

# The Impact of Teacher Errors on Senior Students' Understanding of Concept Respiration, in Awka, Anambra State.

Ezenduka Christiana Uzoamaka<sup>\*</sup>, Okafor C. O<sup>\*\*</sup>, Akusoba E. U<sup>\*\*</sup>

\*\* Department of Biology, Nwafor Orizu College of Education, Nsugbe, Anambra State, Nigeria \*\* Department of Science Education, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

*Abstract*- The study investigated how teachers' conceptual errors influenced secondary school students understanding of concept of respiration. The sample comprised 40 out of 72 biology teachers and 432 out of 2049 biology students drawn from 10 secondary schools in Awka Education zone of Anambra State. Two research questions and one null hypothesis guided the study. Date was collected using three instrument developed by the researchers.

The result of the study indicated that student's error and misconceptions of respiration were partly contributed by the teacher's and partly by students' lack of understanding of the conceptual areas of respiration themselves. The result was discussed and its implication to biology education was given.

#### I. INTRODUCTION

Over the years, the problem of conceptual and cognition of the processes in the life sciences has been the focus of research (Mintzes, Tombridge, Arnandin and Wandersee 1991, Songer, 1993) in Minztese & Novoak (1994). One of the major issues explored in these evolving research programme was students' alternative conceptions in natural phenomena, and that of understanding the conceptual change (Wandersee, Minztes and Novoak, 1994),. It was discovered that students come to class with a lot of naïve and prefixed, ideas about certain natural phenomena and construct knowledge individually using these ideas which may be resistant to change and which may lead to error and misconception. An error is operationally taken to represent a mismatch of student's performance with the correct model.

An Error as defined by the chambers dictionary is a blunder or mistake. Some scholars defined error in relation to performance and knowledge. An error is an observable event or performance which in a way judged to be significant, differs from an expected ideal, (correct) model of performance.(Sanders & Crammer, 1992).

A number of Nigerian science educators has investigated secondary school students' error in mathematics (Isineyi, (1991), Akusoba, Okafor & Nwokolo,2003) discovered that secondary school students develop error in solving in-equalities. Ivowi,(1983) discovered that physics students develop error in certain physics concepts. Soyibo,(1985,1992) discovered preservices teachers errors in certain biological diagrams. Some non-Nigerian science educators also worked on error and discovered that even teachers have error in the subject they teach.

In their work with South African pupils, Sandars and Crammer (1993), discovered that teachers may propagate erroneous ideas about respiration to their students through dishing out inaccurate information, as well as not using the available texts critically. It is pertinent to note recently that no work has been done on the influence of teachers' error on students understanding of a concept, such as respiration.

However these researchers choose to focus on respiration as respiration has been identified by many researchers as a difficult concept that is poorly understood by students'.(Soyibo, (1985) Igelstud, (1988). The WAEC chief examiner's report.(1995 – 2000) showed consistency in students' poor performance in respiration.

Respiration can be defined as a process by which food substances in the body are oxidized to release energy. It is an important biochemical process the understanding of which is critical to a meaningful appreciation of life at organism and community levels of biological organization.

Understanding the events in cellular respiration is critical to an understanding of several of the conceptual understanding of topics in the biology discipline, including energy flow in the Ecosystem and metabolic activities of multicellular organisms. When students have difficulty in understanding a particular science concept, they develop erroneous views, which may impede the understanding of related concepts in order areas of subject matter.

The identification of error is an important and obvious stage in remediation of students' misconceptions and error. Driver and Easely,(1978) in Okoli, (2003) opined that not until the reasons for students misconceptions are understood will progress be made in instructional terms. It is these possibilities that have informed the need to identify errors held by secondary school students about respiration and the possible influence of teachers in the development of these errors.

The purpose of this study therefore is to identify the conceptual errors about respiration held by biology students and their teachers, and to determine the extent or the influence which teachers' errors have on students in understanding of the concept respiration. The study addresses these 2 research questions and 1 Hypothesis.

#### II. RESEARCH QUESTIONS

(1) To what extent do teachers hold the same conceptual errors as their students about the concept respiration in the assessment of SEIT?

(2) To what extent do errors exhibited by teachers in their classroom teaching correspond to conceptual errors about respiration exhibited by students in SEIT?

One null hypothesis tested at 0.05 level of significance guided the study.

Ho: There is no significant relationship between students' errors on response to SEIT and teacher's assessment error on students response to SEIT.

#### III. METHOD

A descriptive survey design was adopted in which biology teachers and students drawn from Awka Education zone of Anambra State were used. Awka Education zone is made up of 4 Local Government Areas which include, Awka North and South, Njikoka and Anaocha Local Government Areas. This Education zone is located at Anambra Central Senatorial zone of Anambra State.

#### **Population and Sampling:**

There are about 72 biology teachers and 2049 biology students in Awka Education zone of Anambra State (source: Anamabra State Education Commission Awka zonal office). Through random sampling, 40 biology teachers were drawn from 72 teachers, while 432 biology students were drawn from 2049 students to constitute the sample.

The research instrument for this study were 3 types (i) students Error identification test (SEIT) (ii) Teachers indirect Assessment Technique TIAT (iii) Teachers Direct Assessment Checklist TIDAC

SEIT is a 20 item researcher made test for students drawn from 4 conceptual areas of respiration. Teacher Indirect Assessment Checklist is prepared from four conceptual areas of respiration to check teachers' knowledge of the conceptual areas during classroom instruction and assessment. For the convenience of this study, respiration was categorized into 4 conceptual areas which includes (a) purpose of respiration (b) chemical nature of respiration (c) source of energy release (d) time of occurrence in all organisms

#### The instrument was validated by experts in department of biology and measurement and evaluation of Nnamdi Azikiwe University Awka, and was administered as follows:

(a) Students error identification test (SEIT). Copies of the 20 items test of yes or No in concepts of respiration were administered to the students to respond to, from the student's response, conceptual errors were determined.

(b) Teachers indirect Assessment Technique. Students' responses on SEIT were given to the teachers to mark by ticking each correct answer and making cross to any incorrect answer. The researcher latter assessed the teachers markings using the marking scheme to determine where correct answers were marked wrong or wrong answers were marked correct. The scores of the items were used to determine the extent the teachers had correct or erroneous conceptions of respiration.

(c) Teachers Direct Observation Checklist. Each of the 40 teachers were observed for two weeks. During the teaching, mistakes and errors on the concept of respiration were noted and recorded. At the end of the lesson, the researchers held discussions with the teachers to find out if the concepts held by the teachers was a mistake of the language or level of knowledge, from that the researchers noted common conceptual errors.

Data was analyzed on corresponding ratios by using frequencies to facilitate the answering of the research questions. Chi-square was used to test the hypothesis. Care was also taking in noting the errors of omission especially where some numbers were not scored it will be recorded as omission.

#### IV. RESULTS AND FINDINGS

Results of the findings are presented in the tables below.

Research question 1: To what extent do biology teachers hold the same conceptual errors as their students about the concept respiration in the assessment of SEIT?

 Table 1: Frequencies of conceptual errors made by students in response to Student's Error Identification Test (SEIT) and errors made by the teachers in the assessment of SEIT.

	Categories of conceptual areas of respiration	Frequency of students' incorrect responses on SEIT	Frequency of Teachers' errors in the assessment of
1	Purpose of respiration	1076	
2	Chamical nature of respiration	1120	605
2	Source of energy release	052	225
1	Time of occurance	813	46
5	Omissions	82	70
5	Total	4052	1448

From the data presented in the above table, it was noted that the frequencies of conceptual errors were high for both the students and the teachers, except for the errors of omission. It was also noted that there were correspondence ratio in the errors committed by teachers during the assessment of SEIT and those committed by students in response to SEIT.

The result as presented on the table indicated that the frequency of conceptual errors were highest for both the students and teachers on the chemical nature of respiration (1129 for

students, 605 for teachers), followed by purpose of respiration 1076 for students, 402 for teachers, source of energy release 952 for students, 325 for teachers and least in the time of occurrence 813 for students and 46 for teachers.

Research question 2: To what extent do errors exhibited by teachers in their classroom teaching correspond to conceptual

	Categories of conceptual areas of	Frequency of students incorrect	Frequency of teacher's errors
	respiration	response on SEIT	during classroom instruction
1	Purpose of respiration	1076	35
2	Chemical nature	1129	50
3	Sources of energy release	952	28
4	Time of occurrence	813	13
5	Omissions	82	28
	Total	4070	154

As can be seen from the table, the categories of conceptual errors committed by teachers and students showed that more errors existed on the chemical nature of respiration with the frequencies of 50 and 1129 respectively for the teachers and students. Some errors were also found on the purpose of respiration with frequencies of 35 for teachers and 1076 for students. Source of energy release had a frequency of 28 and 952 respectively for teachers and students while in the time of occurrence it had 13 and 813 indicating that least error occurred in this category.

areas of respiration. Though, student's frequencies of errors were much higher than that of their teachers, probably because of their number. However, there were similarities of errors committed by the teachers and students in the categories of conceptual areas of respiration during classroom instructions.

Testing hypothesis. This is tested at 0.05 level of significance

# **Chi-square Table**

The above data showed that erroneous ideals existed between both the teachers and the students in the 4 conceptual

	Purpose of respiration	f Chemical nature respiration	of	Source of energy release	Time of occurrence in all organisms	Omission	Total
	Observed	Observed		Observed	Observed	Observed	
Teachers	402	605		325	416	70	1818
errors	(456.3)	(535.3)		(397.3)	(381.1)	(46.9)	
Students errors	1076	1129		952	831	82	4070
	(102.6)	1198.6)		(889.6)	(861.9)	(105.0)	
Total	1478	1734		1287	1247	152	5888

Table 111. X<sup>2</sup> contingency table for test of relationship between the teachers assessment errors and students response on SEIT in the 4 conceptual areas of respiration.

Calculate  $X^2 = 60.30$ Critical  $X^2$  at df4= 9.49 at 0.05 level of significance.

The chi-square result indicated that significant relationship occurred between teachers errors and students errors since the calculated result was 60.30 while critical was 9.49 on df4 at 0.05 level of significance.

# V. DISCUSSION

The data above showed that both students and teachers committed errors in different categories of conceptual areas of respiration. It is pertinent to note that the teachers' errors were mainly noticed during teachers' assessment of students Error Identification Test (SEIT) and during teachers' classroom instruction. Surprisingly both teachers and students committed similar errors and in the higher frequencies on conceptual areas of respiration, these errors include, purpose of respiration, chemical nature of respiration, source of energy release and time of occurrence in both plants and animals.

However, the result of this study suggests that students might actually be taught incorrect ideas through the teachers method of assessment as the teachers marked some correct answers wrong and some incorrect answers right. In any case, this type of result is not expected as teachers are looked upon as masters in the class of whom the students repose confidence on. This finding agreed with what Onyeike (1975) in Okoli (2003) said, that the amount and quality of learning that takes place in the schools depends on the competences of the teachers in schools.

On the other hand, teachers who committed these errors may have been misinformed on the concept of respiration and can consequently impart such wrong information to their students. Or it could be that respiration is viewed as an abstract concept that involves physical process that cannot be conceived in physical terms. In most cases it is usually difficult to impart such information to a novice. This is similar to what Ukpeteran, (1988) reported. He noted that it requires good teaching to make students detach themselves completely from errors that appear to be backed by common sense such as sun revolves round the earth or heavy bodies fall faster than light ones.

As a remedy to this type of error and misconception, Mintezes & Clain (2000) suggested the use of instructional strategies like concept map for reconstruction and stable alteration of conceptual frame work through negotiation of meaning between students and teachers.

#### VI. CONCLUSION AND RECOMMENDATIONS

The finding of this study show that conceptual errors exist between students and their teachers. Student's errors were caused partly by the teachers' during the course of instructions and assessment. And also by students misconception which may have arisen most probably due to lack of understanding of both the technical terms and conceptual understanding. Other factors such as use of language, poor illustration and poor diagrams in textbooks can also lead to students Error.

The implication of this finding to science Education can not be over emphasized. This study helps in creating awareness on the errors which SS2 biology students and their teachers committed on the concept respiration. The teachers therefore are enjoined to find means for eliminating these errors so as to improve performance of students in Biology. It also implied that students are expected to master basic concepts and acquire adequate knowledge of the pre-requisites topics in the concept. This knowledge will help to reduce the rate with which errors are committed in biology and science in general.

It is recommended therefore that teachers should Endeavour to update their knowledge with students misconception on various biology topics and device a better method to teach such topics so as to eliminate errors. Curriculum planners should try to restructure senior secondary school biology curriculum topics to reflect pre-requisite topics such as what is respiration, types, respiratory structures and mechanism before including biochemical processes in respiration. More so teachers are urged to device a better method of assessment in which students' problems will be identified at the on set of the lesson then tries to remedy the problems with a better teaching strategy before continuing the lesson

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#### AUTHORS

**First Author** – Ezenduka Christiana Uzoamaka, Department of Biology, Nwafor Orizu College of Education, Nsugbe, Anambra State, Nigeria, Email: Christynduka56@gmail.com **Second Author** – Okafor C. O, Department of Science

Education, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

**Third Author** – Akusoba E. U, Department of Science Education, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.
# Enhancing Implementation of Performance Contracting In the Public Sector under Devolved County Governments of Kenya

# Gerrard Charles Mutembei<sup>1</sup>, Njuguna Maryann Wanjiru<sup>2</sup>, Ondabu Ibrahim Tirimba<sup>3</sup>

<sup>1</sup>PhD in Human Resource Management Candidate at Jomo Kenyatta University <sup>2</sup>MBA (Strategic Management) Student at Kenya Methodist University <sup>3</sup>Research Fellow and PhD Finance Candidate at Jomo Kenyatta University

Abstract- The use of performance contracts has been acclaimed as an effective and promising means of improving the performance of public enterprises as well as government departments. The debate in the public sector has been more complex than just increasing the effectiveness of strategic management systems and narrowing the gap between ambitious strategies and annual planning. The Kenyan government acknowledges that over the years there has been poor performance in the public sector, especially in the management of public resources which has hindered the realization of sustainable economic growth. To improve performance, the government has continued to undertake a number of reform measures. The seminar explained the role of county government, the performance contracting, challenges being faced by counties in implementation of performance contract and suggested solution towards effective implementation of performance contract in the counties.

*Index Terms*- Performance, Performance contracting, Expectation, Devolution

## I. INTRODUCTION

The performance contracting system in Kenya, has contributed to remarkable improvement in public service delivery since its inception in 2004. The system is credited for changing the attitudes of public officers by focusing them on results and citizen service rather than emphasis on processes. The public sector is the entity that is entrusted with the delivery of goods and services by, and, for the government at the national, regional or local levels (Mansour, 2008).

Unequivocally, the public sector in modern politicoadministrative settings is merited to be characterized in many ways. Peters (2006) identifies that it can be described in terms of the types of public policies that organizations in the public sector deliver for citizens (for example, the Welfare State), by the degree of democratic control exercised over those policy choices, or any number of other political and administrative variables. In an increasingly turbulent environment, the public sector lately has been experiencing a bumpy journey as its tasks seem overwhelming and beyond human capacity to perform satisfactorily (Caiden, 2007).

Public sector monopolies in developing countries are often associated with inefficiencies and inability to meet rapidly growing demand. Studies estimate the annual losses from inefficiencies and unsustainable pricing policies to be nearly equal to the annual investment in infrastructure (Araral, 2008). As a result, the contribution of the traditional public sector is largely questioned, suggesting the need for a major overhaul. Public sector reform (PSR) in both developed and developing countries has now become a routine matter of public policy reform is almost continuous if not always successful (Pal and Ireland, 2009). Over the past three decades, governments across the world have made efforts to improve the efficiency and quality of public services and its cost-effective delivery to citizens. These efforts have involved restructuring, an increased use of technology to offset staff cutbacks, the introduction and enforcement of service standards for employees and managers, an increase in managerial discretion, the contracting out of service delivery, and the adoption of flexible staffing practices (Foley, 2008).

Introduction of New Public Management (NPM) models in Africa was influenced by challenges emanating by African countries trying to maintain a macro-economic stability, lowering inflation, reducing scope and cost of government and cutting deficit spending by deregulating public enterprises and ensuring they run as private sector business (World Bank, 1989). Obong'o (2009) uses the term NPM widely to label changes occurring in the conduct of the public sector business in 'managerialism'. The concept has incorporated application and adoption of private sector management systems and techniques into public services and reassessing which services should be privatized. It shifts emphasis from traditional public administration to public management and entrepreneurship (Economic Commission for Africa, 2003).

The force behind NPM reform wave is that greater cost efficiency will be realized when public service becomes more market oriented. Consequently most developing countries have implemented reforms that involve adoption of multiplicity of measures intended to improve service delivery (Kiragu and Mutahaba, 2005).

Mulgan (2008) examined PSR in New Zealand and found that the reforms focused mostly on public accountability through the specification of outputs, clarity of contractual agreements, and division of government departments into smaller agencies. The study concluded that while one of the key objectives of the reforms was to improve public service delivery, it failed to give members of the public a greater right to complain about government services, and did not encourage managers to answer directly to the public.

Borghi and Berkel (2007) investigated individualization trend as a component of PSR in the provision of social services in the UK, The Netherlands, and Finland. It was revealed that in The Netherlands there were decentralization and privatization in the area of social services as a means of reducing welfare state dependency and promotes labor-market participation. While the privatization of services were expected to result in increased effectiveness and efficiency, lower prices, and higher quality of services and more responsive service providers, it reduced rather than increase the room for client choices. In the UK it was observed that individualization of service provision was aimed at stimulating providers to offer services that are tailored to individual needs and circumstances, especially in the areas of social security and welfare-to-work related services and such aims are for the most part, being realized. In Finland, the study found decentralization of responsibilities in policies aimed at vulnerable groups, and an integration of the service provision of social welfare and employment administrations.

On the issue of e-government, Kudo (2008) examined the role of e-government in PSR in Italy and Japan. The study uncovered that the use of e-government initiative in Italian taxation system and procurement processes enabled financial rationalization as well as transparency. It also led to better accountability and transparency in the public sector, improved communication and management among local governments, and more transparency and efficiency in interaction between the public and private sectors. In Japan the use if ICT helped to ensure better sharing of information between the central and local governments. However, the problem with e-government in Japan was the lack of legislation especially on privacy of information.

In the area of Civil Service reform, Coggburn (2000) studied the impact of state personnel deregulation on the economy and efficiency of state human resource operations, and on the proportions of state's workforce occupied by part-time workers, and found that many states have moved to deregulate their personnel systems to a significant degree. Kellough and Selden (2003) reported considerable variation in state implementation of six aspects of personnel reform: decentralization of personnel authority, contracting out of personnel management functions, reductions in the number of job classes of titles, implementation of broad banding, and implementation of labor-management partnerships and the use of strategic workforce planning.

PSR is particularly relevant for Central Asian countries that were part of the Soviet bloc (Kazakhstan et al., 2010) and experiencing political, social and economic transitions. The issues of good governance and public service delivery have thus become the fundamental concerns of Central Asian governments. After the dissolution from the Soviet Union, these republics faced three different issues of transition: economic shock, transformation to market-based economy and political transition (Saneret et al., 2008). PSR initiatives in Kazakhstan are progressing in the midst of hazy political climate, where the Nazerbaev regime consolidates its control by redistributing the spoils of political office among the loyal clients and beneficiaries who control the pro-presidential parties (Dave, 2005). As a result, in Kazakhstan, like other Central Asian countries, political opposition struggles to exist; rulers practice varying degrees of authoritarianism and rely on networks of patronage, clans and corruption that constitute important pillars of governance (Fritz, 2007).

Performance measurement is often taken to be crucial to the delivery of improved services as part of New Public Management. Emphasis on performance management for delivery of results is undoubtedly influenced by the basic assumption of performance management which lies in its professed ability to unite the attention of institution members on a common objective and galvanize them towards the attainment of this objective (Balogun, 2003).

According to GoK (2007), a performance contract is a management tool for measuring negotiated performance targets. It is a freely negotiated performance agreement between the government, acting as the owner of public agency on one hand, and the management of the agency on the other hand. The performance contract specifies the mutual performance obligations, intentions and the responsibilities of the two parties. Similarly, it also addresses economic/social and other tasks to be discharged for economic or other gain. It organizes and defines tasks so that management could perform them systematically, purposefully and with reasonable probability of achievement. Since inception of devolved government, two major changes have been effected by the coming into force of the new constitution; the first is a change to a presidential system, hence singing of contracts between the Excellency and cabinet secretaries, as a contractual commitment to deliver on the economic agenda that will ensure that the economy grows by double digits – in order to create jobs for the youth and improve the quality of life of the Kenvans. The second major change is the shift from a unitary state to a devolved system of government, which marks a fundamental shift in the way the performance management accountability with regard to functions that were previously undertaken by national government and are now within the ambit of county governments.

The objectives of the seminar were: to show the importance of performance contracting in the public sector, to educate on the implementing challenges of performance contracting in the Public sector and to explore the strategies for enhancing implementation of performance contracting in Public sector.

# II. LITERATURE REVIEW

## 2.1 Definition of Performance Contracting

Lane (1987) defines a contract as a binding agreement between two or more parties for performing, or refraining from performing some specified act(s) in exchange for lawful consideration. On the other hand, The American Heritage Dictionary (2009) defines performance as the results of activities of an organization or investment over a given period of time. Performance contracting as part of strategic management is, therefore, defined as a binding agreement between two or more parties for performing, or refrains from performing some specified act (s) over a specified period of time. It is a branch of management control systems which provide information that is intended for managers in performing their jobs and to assist organizations in developing and maintaining viable patterns of behaviour (CAPAM, 2005).

As part of performance management, performance contracting is a central element of new public management, which is a global movement reflecting liberation management and market-driven management. Liberation management means that public sector managers are relieved from a plethora of cumbersome and unnecessary rules and regulations which usually hinders quick decision making in the organization (Gianakis, 2002).

# 2.2 Origin of Performance Contracting

The term performance contracting can be traced from France in the late 1960's and other countries including India, Pakistan and Korea (OECD, 1997). Prior to this period the business environment was rather stable and therefore strategic planning was entrusted in the hands of the top management of the organization. This practice was counter-productive as managers who were implementers of the strategic plans were not involved at the formulation stage.

Aosa (2000) supports this view when he argues in his study that due to increased environmental turbulence in the early 1970's, especially 1973 top executives were forced to recast the way they looked at their business for survival. They redefined performance management as a proactive management tool for achieving business goals and objectives, through a structured and continual process of motivating, measuring and rewarding individual and team performance. Earlier, management tools for example the Carrot-and-Stick policies and behaviour which were common in the 19<sup>th</sup> Century Industrial Age had become increasingly irrelevant to modern management practices and therefore, this called for more flexible and adaptability in strategic planning, forcing managers responsible for implementing strategies be involved in all stages of strategy formulation (Barclays Africa, 1997).

However, Steiner (1983) speculates that many of the strategic planning systems failed to link planning and resource allocation and did not place emphasis on strategy implementation. He further observes that the existing systems failed to reward managers and employees for strategic thinking, creativity and innovation. This led to disenchantment with strategic planning and thus forcing managers to believe that it was of little or no value to the organization. Despite of these problems practitioners and academics like Porter (1983) came in support of strategic planning by placing emphasis on strategy implementation.

# 2.2.1 Key Changes of performance contract under devolved system

According to GoK (2013), under the devolved system, the ministry of devolution as made various modification to the performance contract. First, there is included apeer review element, that will ensure that Cabinet Secretaries support each other in achieving our collective responsibility as a Cabinet because of the realization that the success of government isas good as the weakest link. Hence Cabinet Secretaries must work together at sharpening each other in the achievement of our collective responsibility. Secondly, the performance contracting has moved from ranking of ministries, that was based on sectoral assessment to a within ministry assessment. This involves

establishing a baseline measure, against which a ministry will strive to improve hence, creating a dynamic incentive within the respective ministry for continuous improvement. Thirdly, two critical performance indicators on tracking "Youth and Women Empowerment", and "Ease of Doing Business" were introduced.

The other major departure from past practice is that, due to the implementation of the devolved system of government, there will be no performance contracts between the county governments and the national government, as was the case before, when the defunct local authorities signed performance contracts with the central government. However, county governments should be aware of the requirements of the County Governments Act(Article 47 and Article 113) that requires county governments to design performance management plans for evaluating the performance of county public service and implementation of county plans (GoK, 2013).

# 2.3 Purpose of Performance Contracting

Performance contracting constitutes a range of management instruments used to define responsibilities and expectations between parties to achieve mutually agreed results. It is a useful tool for articulating clearer definitions of objectives and supporting innovative management, monitor and control methods and at the same time imparting managerial and operational autonomy to public service managers. An organization's purpose defines the ways in which it relates to its environment. If this purpose is fulfilled, the organization will survive and prosper (Luo and Peng, 1999).

The main purpose of the performance contracting according to Armstrong and Baron (2004) is to ensure delivery of quality service to the public in a transparent manner for the survival of the organization. Hope (2001) points out that performance contracts specify the mutual performance obligations, intentions and the responsibilities which a government requires public officials or management of public agencies or ministries to meet over a stated period of time. As part of the performance contracting are to clarify the objectives of service organizations and their relationship with government, and facilitate performance evaluation based on results instead of conformity with bureaucratic rules and regulations which have killed thinking, innovation and creativity in the public sector (Hittet et al., 1999).

# 2.4 Devolved Function in the Counties

County Governments are responsible for: county legislation outlined in article 185 of the Constitution of Kenya, executive functions outlined in article 183, functions outlined in the fourth schedule of the constitution of Kenya, functions transferred from the national government through article 187 of the constitution of Kenya, functions agreed upon with other counties under article 189 (2) of the Constitution of Kenya, and establishment and staffing of a public service under article 235 of the Constitution of Kenya, County Governments (Act, 2012).

# 2.4.1 Transition to Devolved Government

The Constitution of Kenya, 2010 in the Fourth Schedule assigns functions between the national and county governments, (IEA, 2013). The constitution assigns the task of service delivery in key sectors like water, health and agriculture among others to county governments, with the national government's role in some of the sectors being that of policy formulation. The Sixth

Schedule Part 4 Article 15 of the constitution provides for the phased transfer of functions assigned to county governments three years after the election of county assemblies. The first phase of the transfers involved the identification of roles to be performed by the national and county governments, while the second phase entails overseeing the transfer of functions from the national to the county governments IEA.

# 2.5 Challenges of devolved Functions

The long awaited county governments were established after the March 4 general election. This period marked a new era of devolved government in Kenya, which Kenyans have very high expectations of. Responding to the said expectations is likely to be one of the greatest challenges that those elected and appointed to county positions will face. There are a number of functions devolved under the new constitution, but challenges have arisen with a number of key functions as cited below.

## 2.5.1 National Security

Akaranga (2008) posits that, under the new Constitution, security is the sole mandate of the National Government placed under the Inspector General of Police. At the county level, County Commissioners are responsible of coordinating security management, national Government functions and delivery of services, facilitate conflict management and peace-building, and mobilize national government agencies for national events and programmes. Counties also collaborate with the citizens and foreign nationals' management service in the identification of persons for registration and also manage and maintain administrative boundaries, security roads and airstrips.

## **2.5.2 Health Services**

Since independence in 1963, centralization has been at the core of Kenyan governance, with power concentrated in the capital. As a result, Kenya has been marked by spatial inequalities during this period of time; it is against this backdrop that healthcare devolution is taking place. Article 174 of the Kenya Constitution clearly articulates the rationale behind devolution as, among other reasons, self-governance, economic development and equitable sharing of national and local resources (Moy, 2005).

Key challenges in the health sector include: Public officers in the devolved health services contend that appropriate and suitable arrangements have not been made for them to transfer their services to the county governments and have made their demands, which they wish to be met before they transfer their services (Mulgan, 2008). No modalities have been made or agreed upon for their transfer to the county public service and no suitable arrangements seem to exist in the public domain to facilitate this. The result is that the health workers are in the employment of the national government under the Public Service Commission but their services are transferred to and deliverable in the counties.

## 2.5.3 Water Sector

Water services in Kenya are at an important and exciting crossroad. Devolution of the water services function has assigned responsibility for water provision to democratically elect county governments that now face the challenge of being responsive to the needs of their electorates and to honor the constitutional obligation to progressively provide water services to all people. The role of national government will change to policy development, sector oversight and support. Key challenges in Water sector include: Significant institutional reform required (amalgamation of existing water boards into one); WSB staff may fear redundancy and/or resist change and while it would meet constitutional requirements if the Board's role is confined to national public works, it still leaves the assignment of other functions unresolved. Understanding and addressing the challenges identified in this note can smoothen the transition process thereby ensuring that services continue to be delivered and access extended while policy and institutional reforms are designed and implemented (Dave, 2005).

## 2.6 Benefits of Performance Contracting

Moy (2005) in his final report to the Office of Financial Management which summarized the results of their literature search and state survey on the best practices and trends in performance contracting in a number of state and local agencies in Washington D.C. indicates that the use of performance contracts and the accompanying increase of operational autonomy had induced some developments in the internal structures of the agencies under study. The implementation of performance based contracting ranges from state-wide, agency wide, to only within specific agency divisions or programs and that its impacts in each state agency varied, but including increased accountability for service delivery and deliverables and increased partnership between the contractor community and the state agency. States agencies had defined performance as deliverables, outputs, outcomes, and effectiveness and efficiency, among others.

With respect to changes in customer relations, new interfaces and instruments are installed, resulting in increased client-orientedness. Most state corporations and government ministries in Kenya, for instance, now have functional customer care and public relations offices. These offices have acted as valuable instruments for introducing a client focus. However, the functioning of these offices is hampered, in some cases, by the insufficiency of financial and human resources (Akaranga, 2008). The success may also bring with it some challenges. The winners expect to be rewarded, over and above the normal pay. However, the initial rounds of performance contracting took place before the finalization and approval of reward and sanction system. It was not just the high performers who did expect to be rewarded; the public also expected the bad performers to be punished.

When this does not happen it may demoralize the high performers but also cast aspersion on the rationale and motivation for the whole exercise. On a broader note it is important to view a performance contract as part and parcel of a wider performance management system, but not as a standalone operating outside the established human resource regulations. The successful introduction is partly attributed to the political goodwill and leadership which in this case has been provided by the highest office in the land, the presidency. The enthusiasm and commitment of the Permanent Secretary, Secretary to the Cabinet and Head of the Public Service has also significantly contributed to this success (Obongo, 2009).

Bologun (2013) concludes that, the independent ad-hoc committees has brought into the process a high degree of autonomy from the management of public service, in addition to infusing credibility, objectivity and professionalism into the entire exercise. The strategy has also been implemented in an

inclusive and interactive manner such that there have been very limited cases of organizations claiming unfair evaluation or being denied an opportunity for expression of opinions and ideas.

# **2.7 Implementation challenge of Performance Contract in the Counties**

Whereas the general public and even some high ranking public servants may very much welcome the idea of performance contracting and measuring performance, it might not be readily accepted by everybody. Especially those who might feel exposed (negatively in terms of poor performance) by the outcomes. In other cases resistance may come in the grading structure, those who feel that no grading system can even out the effects of lumping big and small ministries together. In the state corporations similar sentiments can be expressed that it is unfair to grade state corporations operating in different sectors of the economy together (Akaranga, 2008).

Despite the application of composite score, which allows for comparisons of different ministries and state corporations, some ministries and even state corporations would still prefer to be grouped and ranked differently citing their uniqueness emerging from their areas of service delivery (industry), size in terms of turnover, number of employees and even their mandate. Change management is not easily accepted hence there are eminent challenges in the implementation of performance contract at county level (Moy, 2005).

A number of challenges identified include organizational structure, leadership and management styles, rigid organizational culture and lack of effective performance management. There is need that the organizational structure should restructured to facilitate quick decision making and subsequent faster response than is currently experiencing, also some managers at county level have not been enthusiastic enough in implementing the PC and coming up with strategies to counter the challenges that face the ministry. The success may also bring with it some challenges. The winners expect to be rewarded, over and above the normal pay (Monsour, 2008). However, the initial rounds of performance contracting took place before the finalization and approval of reward and sanction system. It was not just the high performers who did expect to be rewarded; the public also expected the bad performers to be punished. When this does not happen it may demoralize the high performers but also cast aspersion on the rationale and motivation for the whole exercise. On a broader note it is important to view a performance contract as part and parcel of a wider performance management system, but not as a stand-alone operating outside the established human resource regulations.

## III. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## 3.1 Summary

In order to increase the reliability and validity of performance measurements, various approaches are recommended such as multiple raters, combination of objective and subjective criteria, and so on. For instance, Bobko and Collela (1999) suggest that performance standards are external to the individual and for evaluative purpose and that it is different from individual goals as a person's internal aim. They proposed the importance of the employee reaction and acceptance of performance standards. Similarly, Huber et al., (1999) suggested that performance standards should be clear and specific in order for raters to evaluate performance accurately using such standards. They however observed that the major concern was the kind of rating scales increase rating accuracy to be used. They suggested various rating scales among them behavioral anchored rating scale (BARS), behavioral observation scales, and other similar scales were proposed to increase the rating accuracy.

### 3.2 Conclusion

In conclusion performance contracting as an implementing tool in strategic planning is of great importance under the new public administration. There is, however, need for a good definition of outputs and solid performance measures which will be able to promote organization internal performance through a well customer-oriented ability of employees to further promote the organization external performance. This requires a welldefined training program for the public servants to support implementation of performance contracting. On the other hand, there is need to study both the public servants' perceptions on the role of performance contracting in improving service delivery to the end users and also the impact of the performance contracting on service delivery to the populace. This will confirm whether the objectives of implementing performance contracting are being achieved in the public sector.

The following issues also need to be addressed; stability and availability of resources is vital for the success of performance contracting and therefore the top leadership must ensure that necessary resources are available at all time; the political top leadership must respect the operational autonomy of the contracted organizations/ministries; knowledge of strategic planning, its development and monitoring capacities among the staff is central to success of performance contracting and the management support and their technical knowledge is vital; contract management should be accompanied by performanceoriented change in the public service structure and management culture. Culture that empowers staff to embrace and manage change is necessary. Management instruments, focusing on performance and cost in the field of human resources and financial management should be developed in an integrated manner.

#### **3.3 Recommendation**

There is need for a good definition of outputs and solid performance measures. This requires a well-defined training program for the public servants to support implementation. A solid legal framework, which sets out the basic premises and the status of the contract, may avoid ad hoc and fragmented solutions. Stability of resources enhances the motivating effect of the contract. When resources are not available or availed late, the staff involved gets frustrated.

The political top must respect the operational autonomy of the contracted organizations/ministries. Knowledge of strategic planning, development of work plans and monitoring capacities among the staff is central to the success of PC and the management support and their technical knowledge is crucial. Contract management should be accompanied by performanceoriented change in the public service structure and management culture. Culture that empowers staff to embrace and manage change is necessary. Management instruments, focusing on performance and cost in the field of human resources and financial management should be developed in an integrated manner. Other instruments of control such as quality service charters and regulations concerning transparency and accountability must complement performance contracting. PC tends to emphasize competition among staff to meet their targets. Competition if not well-controlled may bring conflicts with values hence interfere with organization culture. Performance contracting is not a substitute for poor management. PC will only succeed where best management practices are practiced. Top management key competencies and participatory approach to decision making is crucial.

There should be regular overall evaluations and audits of benefits and drawbacks of the implemented contract in order to learn from experiences. Differences in implementing contexts may provide different learning experiences. The early years of implementing PC are difficult both for the staff and management. A degree of tolerance from the management may sustain the momentum. Mistakes are likely to be made but what is critical is drawing lessons for innovations and creativity for future performance improvements. The government need to invest more resource in enlighten of the following key forces of driving the change in the public sector especially under devolved government structure: changing the attitudes to the role of government in the economy, in that the government is in the business of ensuring that the environment is viable for better service provision and creation of conducive environment for investors. The process of micro-economic reform, since the adoption of the new constitution and Kenya being an agricultural economy, the government introduced policy to drive the economy to middle income status and introduction of funds as incentive like women fund, youth fund and UWEZO fund among many. Changing community and business expectation and especially by revival of new tourist destination, new commerce body to sell Kenya to different destination so as to ensure Kenya is a competitive global partner and increase in provision of jobs to our youth. The other change is the impact of technology; the government has created Konza City. County governments have initiated similar technology cites. This is to ensure that the future of economic growth is linked to technology development and hence the public sector is in the first line to utilize the technology in its operations.

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### AUTHORS

First Author – Gerrard Charles Mutembei, PhD in Human Resource Management Candidate at Jomo Kenyatta University Second Author – Njuguna Maryann Wanjiru, MBA (Strategic Management) Student at Kenya Methodist University Third Author – Ondabu Ibrahim Tirimba, Research Fellow and PhD Finance Candidate at Jomo Kenyatta University, tirimba5@gmail.com

# Effect of Servant Leadership on Affective Commitment among Hotel Employees

# Azeyan Awee, Wen-Yao Cheah, Ching-Ning Cheng, Kok-Sing Hong, Lih -Bing Ling, Mey-Chia Tan

Universiti Tunku Abdul Rahman

Abstract- Servant leadership is an issue of growing interest among scholars. Previous studies have shown that servant leadership has lead to positive behaviors which subsequently influence the individual-level outcomes. Therefore, underpinned by leader-member exchange theory (LMX) and social exchange theory, this study examined the effective of servant leadership on affective commitment among the hotel employee. Data were collected from a sample of 149 hotel employees working in Malaysia using convenience sampling. Statistical Analysis System (SAS) version 5.1 had been used in order to run the reliability analysis, frequency analysis, explaining the correlation coefficient analysis and test of hypothesized relationships among the dependent variable and the independent variables. The results of analysis confirmed that positive correlation exists between the empowerment, humility, stewardship, standing back, forgiveness, courage, accountability, authenticity and affective commitment. This study is believed to enhance the literature gap since not much research emphasize on servant leadership on Malaysian context.

### I. INTRODUCTION

In Malaysia, hotel industry has been recognized as a promising industry. According to the United Nations World Tourism Organization (UNWTO), Malaysia was ranked at 10th in the World's Top Tourist Destination in 2012 with 25 million of international tourists' arrival. In addition, according to Tourism Malaysia, the tourists' arrival and receipt to Malaysia had been consecutively increasing from 2004 to 2013. In 2013, Malaysia has the highest number of tourists' arrival which is 25.72 million and receipt of RM65.44 billion. Furthermore, Tourism Malaysia also reported that average occupancy rates of hotels in Malaysia in 2012 had increased at a rate of 1.8 as compared to 2011 from 60.6 to 62.4.

Despite of all growth and promising prospect in hotel industry, yet Malaysia is facing of turnover crisis among the executives in different sectors. According to a study by Malaysian Employers Federation (MEF), average yearly turnover rate of executives from June 2010 to July 2011 in 143 companies from different sectors in Malaysia reported that in nonmanufacturing industry, the highest turnover rate of executives was IT/Communication with a rate of 75.72%. Followed by the second highest turnover were Associations/Societies with a rate of 33%, and the third highest turnover was Hotel/Restaurant with a rate of 32.4%. Furthermore, another study conducted by AON Hewitt titled as "APAC Year on Year Attrition Rate (2009-2011)" reported that the staff turnover in Malaysia in 2011 was 15.9%. Among the 12 countries in the Asia Pacific, Malaysia was ranked at sixth in term of high staff turnover.

According to the findings from these 2 surveys, it shows clearly that major changes are required for Malaysian hotels to solve this increasingly staff turnover issue. From the past studies by researchers, organizational commitment has been proven by having important implications for employees and organizations. According to Bennett and Durkin (2000), they stated that absenteeism and turnover are the negative effects associated with an absence of employee commitment. In the service industry, successful firms have recognized the dominant factors that drive the firm's profitability such as quality of service which significantly rely on employee commitment (Little & Dean, 2006).

Leadership style is one of the factors that affect organizational commitment. Organizational commitment can be enhanced by appropriate leadership styles (Drury, 2004; Lok & Crawford, 2004; Lee & Ahmad, 2009).

As a service provider, the core value that a hotel provides undeniably is the service it delivers to its customers. Therefore, providing excellent service is the key to corporate success in hotel industry. In order to deliver excellent service, it is vital to have well trained, motivated and committed employees on the frontline to ensure customer satisfaction. How to keep employees to be motivated, committed and loyal is a big challenge for every hotel manager. In this research, we are going to explore how servant leadership as demonstrated by hotel managers will influence the affective commitment of employees.

### II. RESEARCH PROBLEM

In Malaysia, Malaysian companies are not only have to encounter with the turnover issue, but also have to confront low leadership quality issue. A trend research was conducted by Development Dimensions International (DDI) titled as "Lessons for Leaders from the People Who Matter" to explore and comprehend the persistence of low rating on leadership quality. This research was conducted among 1279 full time workers between August 31 and September 20, 2011 by partnering with Harris Interactive. These 1279 workers around the world from U.S., U.K., Canada, Australia, Germany, India, China, and South East Asia (includes Malaysia, Philippines, and Singapore). These workers were asked to say about their daily interactions with their leaders and how the employees view their leaders.

In our research, 3 findings were extracted from the trend research to explain the low leadership quality. The first finding reveals that workers are not confident in their bosses' skills. From an employee's point of view, the belief that his or her boss is a skilled leader is worthy of respect and loyalty. Thus, this dim view of leader capability is predicted in resulting to turnover. 39% respondents said that they quit a job mainly because of their leader, while 55% said they have considered quitting a job because of their leader.

The second finding reveals that boss does more harm than good to the employees. Workers often feel hurt and demotivated by their boss's action. In addition to this finding, only nearly half the bosses (54%) involve their employees in making decisions that affect the employee's own, or the employee's team work. Those decisions are decided by the boss without much explanation. 43% of the employees tell that their bosses very seldom to explain the rationale for their decisions.

The third finding reveals that leaders are lacking in fundamental leadership skills. There are a lot of leaders are ineffective in motivating and engaging their people. In other words, this indicates that leaders have poor day-to-day interactions with their team members. According to this finding, employees are not looking for their boss or leader to become their friend but they do expect courtesy, respect, honesty, and tact in their interactions. Nevertheless, a lot of leaders are not delivering on these basic requirements to establish a healthy manager/employee relationship.

Furthermore, there is another survey about relationship between employee and supervisor. According to the Business Wire (2013), there are three main factors that able to influence the employee engagement. These 3 main factors are relationship with immediate supervisor, belief in senior leadership and pride in working for their company respectively. The most impressive finding shows that employees have 80% chance to become disengaged if they are dissatisfied with their immediate supervisor. The statistics reinforces that there is very important to build the positive relationship with their leaders and upper management. Owning a caring manager is one of the factors to maintain the positive and successful employee engagement strategy.

In ddressing the turnover issue and low leadership quality, we introduce servant leadership as a way to investigate the both issues encountered in Malaysia's hotel industry. There are limited studies in exploring the relationship between servant leadership and organizational commitment (Drury, 2004; Hill, 2008; Hoveida, Salari & Asemi, 2011 as cited in Lim & Desa, 2013). According to Lim and Desa (2013), the studies of servant leadership and organizational commitment were mostly discussed in Western context. In addition, they pointed out that there were limited studies had been conducted in Malaysia as well. From the suggestions as proposed by Liden, Wayne, Zhao & Handerson (2008), they deemed that it might be beneficial for examining servant leadership in other countries beyond in United States.

By acknowledging this gap, we conduct this research with a hope to explore the effect of servant leadership of hotel manager on the employees' affective commitment as well as improve the current issue of turnover and leadership quality. Furthermore, it also helps to contribute to the current pursuit of empirical exploration of servant leadership by examining its relationship with affective commitment.

## III. RESEARCH OBJECTIVE

In order to assist Malaysian government to transform Malaysia from middle-income nation to high-income nation by 2020, there is need to improve and strengthen all Malaysian sectors including hospitality and services industry performance and reputation. Thus, it is very crucial for leaders in each indutries to understand leadership quality to manage entire organization in more effective and efficient way. Hopeful to this, all leaders able to lead all their employees in achieving company's mision and objectives to fulfill the demand of competitive world. Therefore, the objective of this paper is to examine and understand the relationship between servant leadership style and affective commitment among hotel employees.

## IV. LITERATURE REVIEW

## SERVANT LEADERSHIP

According to Schneider and George study as cited in Greenleaf (1997), defined servant leaders who are put their member's needs, interests and others as priority than themselves. Servant leadership is leadership styles that provide the organization opportunities in order to help the followers to grow. Servant leadership is concerned to serve the followers and makes sure that follower achieving their personal well-being and grows. On the other hand, other leadership focuses on the organization goal and objectives and less focuses on the needs of employees in the organization. Servant leadership theory is more concern the needs of followers than any other leadership theory. According to Mayer, Bardes & Piccolo (2008) stated that employee performance will increase when they view their managers as servant leader. Servant leader willing invests time and energy in order to understand the needs of individual and work together to satisfy individual needs. Harrison, Newman & Roth (2006) stated that foundation of servant leaders is serve others and helping them to grow, and not established on the traditional power model of leadership. Graham (1991) confirms that a servant leader would focus the needs of followers first, the organization's goals become the second and their needs placed the last. Franke & Park (2006) stated through the servant leadership effort will increase loyalty to the organization due to the reduced intensities of work anxiety and greater degrees of job satisfactions.

## **AFFECTIVE COMMITMENT**

Organizational commitment is an issue of great significance to an organization because it is related with an employee's eagerness to go above and beyond the job requirements while performing his or her duties. Besides that, it also indicates the desire of an employee to maintain and continue his or her membership with an organization. According to Meyer and Allen (1991), they came out with a new model of commitment after they had reviewed the theories and researches on organizational commitment. They are further named their new model as the "Three-component model of organizational commitment". Their model consists of affective commitment, continuance commitment, and normative commitment. A conclusion made by Meyer and Allen indicated that commitment was a psychological state with these 3 components. These 3 components reflect a person's desire, a need, and an obligation to preserve his or her employment within an organization.

According to them, affective commitment was defined as an employee's emotional attachment to, identification with, and involvement in a company's activities. Strong affective commitment as displayed by the employees would tend to continue to stay in the company because they have a positive attitude toward the company's goals and values. Such a positive commitment is resulted due to the emotional attachment of the employees. Thus, employees are devoted and loyal to the employer. In addition, these employees are more likely to go for an extra mile for the company.

# SERVANT LEADERSHIP AND AFFECTIVE COMMITMENT

Positive relationship was found and proved from various empirical studies related to servant leadership and organizational commitment (Liden et al., 2008). According to Liden et al. (2008), with an organizational sample of 182 individuals, servant leadership was reported as a significant predictor of followers' organizational commitment, community citizenship behavior, and in-role performance. Similarly, a study by West and Bocarnea (2008) found out servant leadership, affective organizational commitment and job satisfaction were significant and positive correlated. In addition, a study conducted by Jaramillo et al. (2009) in 501 full time sales people revealed that servant leadership was correlated to person organization fit, organizational commitment and turnover intention. This study demonstrated that effects of servant leadership lead to positive behaviors which subsequently influence the individual-level outcomes. Leader member exchange (LMX) is a theory aims in explaining the nature of relationship between a leader and his or her followers. LMX indicates how such relationship affects the leadership process. According to Sparrowe and Liden (1997), the quality of the member's exchange relationship with the leader depends on the degree of emotional support and exchange of valued resources. This is very crucial in determining a member's fate in an organization. Masterson, Lewis, Goldman & Taylor (2000) describes LMX is a social exchange relationship between a manager or supervisor and an employee.

In practical, a leader is unlikely to treat all followers on an equal basis. Therefore, the relationship between a leader and every single follower will be different. Subsequently, ranging of high to low quality among their relationship will be resulted (Dienesch and Liden 1986; Liden and Graen, 1980). According to Dienesch et al. (1986), a high quality relationship is described by high level of trust, interaction, support, formal and also

informal rewards. Therefore, a follower could then receive greater attention from his or her leader and also benefits as well. In comparison, a low quality relationship is described by task orientation and mistrust. Therefore, a follower is reportedly received less attention or benefits from his or her leader.

However, the theory social exchange posits that employees tend to be more effective in a high quality LMX relationship (Sparrowe et al., 1997). A major principle of social exchange theory explains this process is called as the norm of reciprocity. Positive norm of reciprocity suggests that people who are being treated well by others will have a sense of obligation to respond positively or favorably in return (Blau, 1964; Gouldner, 1960 as cited in Walumbwa, Mayer, Wang, Wang, Workman, & Christensen, 2011). Thus, in a workplace where high quality LMX exists, subordinates would tend to pay back by exerting more effort to their leader (Wayne & Green, 1993 as cited in Walumbwa et al., 2011).

Empirically, there are several studies have been proven that employees will reciprocate their employers through adjusting their perceived obligations when their employer had fulfilled their promises to the employees (Coyle-Shapiro & Kessler, 2002; Robinson, 1996; Robinson & Morrison, 1995). On the other hand, several studies also found that LMX was positively correlated with job performance (Bauer, Erdogan, Liden, & Wayne, 2006; Walumbwa, Cropanzano, & Hartnell, 2009).

There are the reasons we believe that servant leadership could facilitate the establishment of high quality. This is because LMX, in turn, could positively contribute to followers' job performance. Besides, servant leadership is a theory that advocates serving and meeting the needs of others from the role and motivation of a leader. In addition, servant leaders also help to develop people, helping followers to strive and flourish (Russell & Stone, 2002, McMinn, 2001).

# CONCEPTUAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

Based on the discussions presented in the literature review, the paper proposed a conceptual framework on the relationship between servant leadership and affective commitment in the context of hotel employees' in Malaysia. From the review of the literature, it is suggested that servant leadership will affect affective commitment. Further to this, the current paper also encapsulate that servant leadership can be measured based on several dimensions such empowerment, humility, standing back, authencity, forgiveness, courage, accountability and stewardship has influences over affective commitment. The research framework is well-constructed and presented in Figure 1.

### Figure 1: The proposed Conceptual Framework For The Study



On the basis of the literature arguments above, we believe that when leaders demonstrate the servant behavior or characteristics, they could influence their followers' affective commitment. Accordingly, researchers propose that:

**Hyphothesis 1**: There is a significant relationship between servant leadership and affective commitment.

## V. RESEARCH METHODOLOGY

### **MEASUREMENT:**

Servant leadership was assessed using a 34-item scale developed by Van Dierendonck, D., & Nuijten, (2010) and Barbuto, J.E., & Wheeler, D.W. (2002). This scale measures several characteristics of servant leaderships which is empowerment, humility, standing back, authencity, forgiveness, courage, accountability and stewardship with a ratings scale of five-point likert scale (1=Strongly Disagree to 5=Strongly Agree). A eight-item scale was used to measure affective commitment, which was adapted from Meyer and Allen (1997). Hence, the eight items were anchored by a five-point likert sclae with one representing strongly disagree and five representing strongly agree.

## DATA COLLECTION

Data were collected from a convenience sample of 400 employees working at hotels in Perak, Malaysia. A web-based questionnaire survey was used because this medium assured the respondents of their anonymity and confidentiality of responses when providing information. All responses were saved directly in a database when respondents clicked the submit button. By responding to the survey link, the respondents indicated their agreement to participate in the survey.

# STATISTICAL ANALYSIS

Data were analyzed by using Statistical Analysis System (SAS) version 5.1. The data analysis section consists of four subsections. The first section was descriptive analysis which includes the frequency and percentage of sample characteristics. Secondly, reliability test was conducted by using the Cronbach's Alpha's coefficient to evaluate the internal consistency realibility of the items within the constructs. Apart from this, the Pearson correlation coefficients were used to examine the relationships between servant leadership and affective commitment. Lastly, the multiple regression analysis was employed to examine impacts of one or more independent variables to one dependent variables.

## DATA ANALYSIS

# FREQUENCY AND DESCRIPTIVE DATA

Out of 400 respondents, total of 267 (66.75%) were female respondents and the majority of respondents have less thab 2 years working experience (n=124, 46.5%). Besides to this, the largest number of respondents was Malays ethnicity (n=150, 37.5%). This was followed by Malay Chinese ethnicity (n=127, 31.75%) and Indian etnicity (n=46, 11.5%). The educational qualifications of participants were varied: Advanced Diploma (21.75%), Diploma (45%), Bachelor Degree (32.75%) and Master Degree (0.5%). The distribution percentage of the respondents according to age group were 58.75% of the respondents were less than 30 years old, 10% were 41-50, 15.75% were 31-40 years old and 7.25% were more than 50 years old.

#### **RELIABILITY TEST**

Table 1 depicts the reliability levels of servant leadership and affective commitment. According to the result, it showed the Cronbach's alpha value of each variable are more than 0.60. Affective commitment (dependent variable) which constructed with 8 items shows the coefficient alpha at 0.751. In contrast, all the eight independent variables also show the good situation in the level of internal consistency respectively. Sekaran (2003) stated that a scale alpha value greater than 0.7 is considered good reliable. In conclusion, the general reliability of all variables in the study is acceptable due to all variables have more than 0.60 Cronbach's coefficient alpha.

Table 2: Reliability Test Value for Independent and
Dependent Variables

Variables		Number of Items	Cronbach's Alpha
Dependent Variable (DV)	Affective Commitment	8	0.751106
	Empowerment	7	0.723107
	Standing back	3	0.652541

Independent	Accountability	3	0.665029
Variable (IV)	Forgiveness	3	0.748987
	Courage	2	0.768603
	Authenticity	4	0.801630
	Humility	5	0.792837
	Stewardship	7	0.733066

# INFERENTIAL ANALYSIS PEARSON CORRELATION COEFFICIENT:

The table 3 has indicated that the servant leadership (SL) is significantly related with affective commitment (AC). The

significant values for all variables indacated less thab p-value 0.05. Result shows that there is moderate positive correlation between empowerment (r = 0.511), stewardship (r = 0.527), accountability (r = 0.530), standing back (r = 0.465), courage (r = 0.656) and authencity (0.437) with AC. However, there is a small but definite relationship between humility (r = 0.213) and forgiveness (r = 0.305) with AC. Thus, all hyphotheses were fully supported. The increase of SL will subsequently enhance affective commitment among employees.

## Table 3 : Correlation between Factors Scores of Servant Leadership and Affective Commitment

		Empowerment	Humilit	Stewardshi	Accountabi	Forgiven	Standi	Courage	Authencity
			У	р	lity	ess	ng		
							Back		
	Pearson	0.511	0.213	0.527	0.530	0.305	0.465	0.656	0.437
Affective	Correlation								
Commitm	Sig.(2-	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
ent	tailed)								
	Ν	400	400	400	400	400	400	400	400

# MULTIPLE LINEAR REGRESSION ANALYSIS

**Table 4 : Analysis of Variance** 

Analysis of Variance							
Source	DF	Sum of Squares	Mean Square	F Value	$\Pr > F$		
Model	8	42.69184	5.33648	62.76	< 0.0001		
Error	391	33.24425	0.08502				
Corrected Total	399	75.93609					

According the result of Table 4, p-value (< 0.0001) is less than alpha value 0.01. The F-statistic is significant. The model for this study is a good descriptor of the relation between the dependent and predictor variables. Thus, the independent variables (empowerment, humility, stewardship, accountability, forgiveness, standing back, courage, and authenticity) are significant explain that variance in affective commitment. The alternate hypothesis is supported by the data.

## Table 5 : Model of Summary of R Square

Root MSE	0.29159	R-Square	0.5622
Dependent Mean	3.90438	Adjusted R-square	0.5533
Coefficient Variables	7.46824		

Bases on Table 5, R square shows the percentage of the independent variables to illuminate dependent variable's variations. Independent variables (empowerment, humility, stewardship, accountability, forgiveness, standing back, courage, and authenticity) can explain 56.22% of the variations in dependent variable (affective commitment) in this study. Nevertheless, 43.78% (100% - 56.22%) is left over which is

unexplained in this research which means other important additional variables in explaining affective commitment that have not been considered in this research.

#### VI. DISCUSSION

The result of the current study has indicated that servant leadership influence affective commitment among the hotel employees. Thus, hypothesis 1 is supported in this study. The above hypothesis 1 is proved and supported by previous researchers and studies such as Van Dierendonck and Nuijten (2011) and Bobbio, Van Dierendonck, & Manganelli (2012). In their studies, similar 8 dimensions of servant leadership were used. According to Van Dierendonck et al., (2011), the 8 dimensions to organizational commitment, performance, and leadership clarity studies relating to their evidence for criterionrelated validity came. According to their study, the general verifying factor analyses across different samples support the predicted 8-factor structure and inter-connectedness of the dimensions. Meanwhile, a study conducted by Bobbio et al., (2012) in Italy context, servant leadership is significantly and positively correlated to leadership integrity, organizational commitment and organizational citizenship behavior while it is negatively correlated to cynicisms

#### **IMPLICATIONS:**

The importance of servant leadership on organizations' performance in Malaysia cannot be over-emphasized. In particular, the efficacy of these organization might be difficult to achieve without the correct leadership style. Thus, this study was an attempt to explore the perspective often neglected in research setting but yet investigating an important aspect of leadership styles - servant leadership. Therefore, the findings of this empirical study are expected to provide fruitful implications to both practitioners and academicians. On the practitioners' side, important influential role of servant leadership towards employees' commitment is highlighted. It is important to know the ways to increase the employee commitment and now it is increasingly gaining importance among the practitioners and consultants in the region of the world. They may benefit from the feedback of this study and could implement relevant strategies for particular industry's commitment plans to assure their competitiveness.

Second, the findings of this study also provide some support to leader-member exchange theory (LMX) and social exchange theory. The present study found that the impact of servant leadership leads towards positive behavior. In addition, this study adds to th body of knowledge by systematically explore the effect of servant leadership on employees' commitment in organization. In particular, the current study findings provide tentative support to the proposition that servant leadership should be recognized as significant antecedent to foster commitment among employees.

# VII. LIMITATION AND SUGGESTIONS

The present study has several limitations. First, the nonprobability sampling technique was used in this study to distribute the survey questionnaire to respondents. Although this sampling technique is suitable for gathering responses on important issue such leadership styles, it limits the ability to generalize the study findings. Therefore, future research is encouraged to use probability sampling technique, especially when population comes from a same organization, to increase generalizability of the findings.

Second, The result of R square in this research indicated that independent variables (empowerment, humility, stewardship, accountability, forgiveness, standing back, courage, and authenticity) can only explain 56.22% of the variations in dependent variable (affective commitment). Therefore, there is still lacking of 43.78% (100% - 56.22%) which has not been explained and explored in this research. Hence, future studies can also extend the current study conceptual framework by studying the effects of a larger set of variables. Above and beyond, this will immeasurably contribute new knowledge to the existing body of servant leadership literature on certain organizations in developing countries which happen to be overlooked in research contexts in academics.

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#### AUTHORS

**First Author** – Azeyan Awee, Universiti Tunku Abdul Rahman azeyan@utar.edu.my

# **Event Identification for Wireless Sensor Network**

# Shimi K S

Department Of Computer Science Of Engineering Sreenarayana Gurukulam College Of Enginnering Ernakulam, India

Abstract- Wireless sensor networks consist of sensor nodes with radio, processor, memory, battery and sensor hardware. With widespread deployment of these devices one can precisely monitor the environment. Sensor nodes are resource constrained in terms of radio range, processor speed, memory and power. WSNs are mostly unguarded and the wireless medium is broadcast. This makes them more vulnerable to attacks. Without proper security measures, an enemy can launch various kinds of attacks in hostile environments. These attacks can disrupt the normal working of WSNs and can defeat the purpose of their deployment. Therefore security is an important aspect of these networks. WSNs are often deployed to monitor important emergency events, such as forest fire and battlefield monitoring. System Monitoring Modules (SMM) should be integrated with Intrusion Detection Modules (IDM). This integration can facilitate classification between malicious events and important emergency events. Unlike existing techniques, proposed system aims at addressing secure in-network aggregation problems from an intrusion detection perspective. Existing systems uses clustering, authentication mechanisms and cryptographic techniques for data aggregation in WSNs. These systems gives more priority to secure data aggregation than anomaly detection. Most of these systems assume that not more than one compromised nodes in the network. In the proposed system, if more than one malicious node is present, then also the false event is identified.

Index Terms- intrusion detection system, Wireless sensor networks, IDM-SMM

## I. INTRODUCTION

Wireless sensor networks comprise a large number of tiny sensor nodes that have limited power, bandwidth, memory and computational capabilities. These inherent limitations of sensor nodes can make the network more vulnerable to faults and malicious attacks. A key challenge in identifying misbehaviors in wireless sensor networks is to develop algorithms for detecting anomalies in the network, such that these algorithms minimise their communication overhead and energy consumption in the network. Misbehaviors in the network can be identified by analysing the data from the sensor nodes. A node may show misbehaviours whenever a fault occurs or due to malicious activity by compromised sensors. In both cases, misbehaviors can be identified by analysing sensor or traffic measurements to discriminate normal behavior from anomalous behavior. Note that the underlying distribution of these measurements may not be known a priori. Therefore, anomaly detection in data with an unknown distribution is an important problem to be addressed in wireless sensor networks.

WSNs are often deployed to monitor important emergency events, such as forest fire and battlefield monitoring. To enhance WSN security, System Monitoring Modules (SMM) should be integrated with Intrusion Detection Modules (IDM). This integration can facilitate classification between malicious events and important emergency events. When node A raisesan alert on node B because of an event E, node A can further initiate investigation on event E. node A can wake up relevant sensor nodes around node B and request their opinions about event E. If the majority of sensor nodes think that event E could happen, node A can make a decision that event E is triggered by some emergency event. Otherwise, node A can suspect that event E is malicious.

## **II. RELATED WORK**

Peng [1] present an interleaved hop-by-hop authentication scheme that guarantees that the base station will detect any injected false data packets when no more than a certain number t nodes are compromised.

In a cluster-based technique [2] is used to detect routing attacks in sensor networks. In this approach each sensor node monitors the routing messages it receives. At regular intervals, each sensor node characterizes the set of routing records it has seen in terms of a vector of features. Fixed width clustering algorithm creates spherical clusters of fixed radius for a data set. Then the clusters are labelled normal if they contain more than a given fraction of the total data points; otherwise, they are labelled anomalous.

Wu *et al.* [3] propose a Secure Aggregation Tree (SAT) to detect and prevent cheating in WSNs, in which the detection of cheating is based on topological constraints in a constructed aggregation tree.

Chan *et al.* [4] present a secure aggregation scheme for arbitrary aggregator topologies and multiple malicious nodes. Yang *et al.* [5] propose a Secure Hop-by-hop Data Aggregation Protocol (SDAP) based on principles of divide-and-conquer and commit-and-attest.

#### III. PROPOSED METHODOLOGY

Proposed protocol is equipped with two modules: Intrusion Detection Module (IDM) and System Monitoring Module (SMM). The functionality of the IDM is to detect whether monitored nodes are malicious nodes, while the functionality of the SMM is to monitor important emergency events. SMM is a necessary component for most of WSN applications. Since WSNs are usually densely deployed, nodes close to each other can have spatially correlated observations, which can facilitate the collaboration of sensor nodes in proximity to differentiate between malicious events and important emergency events. IDM and SMM need to be integrated with each other to work effectively. Relying on local detection alone is not desirable because each node has only very limited information available. Furthermore, since sensor nodes are prone to failure, it is very difficult to differentiate between emergency events sent by good nodes and malicious events.



Figure 1 An Example Of Aggregation Tree

In this scheme, whenever IDM and SMM detect some abnormal events, they need to request the collaboration of more sensor nodes around the events in order to make a final decision. Node A promiscuously overhears its neighbor's transmitted aggregate value and compares it with the predicted normal range. If the overheard value lies outside the normal range, either an event E happens or the neighbor N then becomes a suspect. To tell whether node N is a malicious node or event E is an important emergency event like the outbreak of a forest fire, node A initiates the collaboration between IDM and SMM by waking up relevant sensor nodes around node N and requesting their opinions about event E.

## **IV. IMPLEMENTATION**

Consecutive observations of sensor nodes are usually highly correlated in the time domain. This correlation, along with the collaborative nature of WSNs, makes it possible to predict future observed values based on previous values. This motivates our proposed local detection algorithms. Furthermore, since WSNs are usually densely deployed, nodes close to each other can have spatially correlated observations, which can facilitate the collaboration of sensor nodes in proximity to differentiate between malicious events and important emergency events. This motivates us to integrate SMM and IDM in order to achieve accurate detection results.

To utilize data aggregation, an aggregation tree is often built first. Figure 1is one example of such an aggregation tree. In Figure 1, nodes A, B, C, and D perform sensing tasks, obtain values and transmit them to their parent node H. Node H aggregates (min, max, sum, average, etc.) the received values from nodes A,B,C, and D, and transmits the aggregated value further up to node K. The same is true for operation (E, F,G) -> I -> J and operation (M,N) -> L ->J. These aggregation operations are performed based on the established parent-child relationship, which can be modelled using Figure 1. In Figure 1, the base station collects all these data and, if necessary, can transmit them across the Internet.

WSNs are often deployed to monitor emergency events like forest fire. Assume that the majority of nodes around some unusual events are not compromised. In anomaly based detection, the normal system behavior is defined as the behavior of the majority of nodes (or similarly, the behavior of the system in the majority of its operational time). By majority, it means that the number of these nodes is much larger than other (potentially compromised) nodes. This assumption is necessary to make any forward progress.

When node A raises an alert on node B because of some event E, to decide whether E is malicious or emergent, A may initiate a further investigation on E by collaborating with existing SMMs. To save energy, some sensor nodes are periodically scheduled to sleep. Based on this, node A can wake up those sensor nodes around B and request from these nodes their opinions on E. Whenever the opinion from the neighboring nodes are available, data aggregation operation is performed. That is, the values obtained by the neighboring nodes are undergoing the aggregation operation (min, max, average, etc). The aggregated value is compared with the value received earlier. If the difference is close to the threshold (threshold value is fixed manually) then the event is identified as emergency event.



Figure 2 Collaboration between IDM and SMM

On the other hand, if A finds that the majority of sensor nodes think that event E should not happen, A then thinks that E is triggered by either a malicious node or a faulty yet good node. In this way, A can continue to wake up those nodes around event E and ask their opinions about E. the values obtained by the neighboring nodes are undergoing the aggregation operation (min, max, average, etc). The aggregated value is compared with the value received earlier. If the difference is lying outside the threshold (threshold value is fixed manually) then the event is identified as malicious event. After A makes a final decision, A can report this event to base stations.

The above mentioned method is feasible when only one malicious node is present in the network. When there is more

than one compromised nodes in the network, the opinion may contain more than one false opinion about an event. In this case, the decision can't be taken from the opinion by neighbors. Then IDM-SMM module comes in to action. IDM-SMM module is continuously monitoring the network. The compromised nodes will be acting abnormal to the messages sent by IDM-SMM module. Reply messages are not sent by the compromised nodes. These nodes are identified by the IDM-SMM module. When there is an event happens, IDM-SMM module verifies the opinions sent by the neighbour nodes and also identifies the misbehaving nodes in the network. This information is taken in to account for taking a decision about that event.

The IDM-SMM module will be monitoring the nodes coming under its range. This monitoring will be helpful to identify the misbehaving nodes in the network. Whenever an event happens, IDM-SMM module and the aggregation operation at the parent node will be work together to identify the event. Whether it's an emergency event or malicious event, it will be send to base station.

Set node three nodes as compromised nodes. That is, these nodes can inject falsified a data into a network. Intuitively, it is easier to detect attackers that have larger variations from normal nodes. These three nodes are identified and their activity of false event alerting is identified. Packet delivery ratio and throughput of the system will be low in the case of multiple compromised nodes. These are tested under NS2 background.

## V. CONCLUSION AND FUTURE WORK

Security in wireless sensor networks is an important problem. To enhance WSN security in this system, first proposed that the integration or broadcasting of IDM and SMM to provide intrusion detection capabilities for WSNs. Then introduce local detection mechanism (data aggregation operation on values from neighboring nodes) to detect false injected data. Further demonstrated how the proposed IDM can work together with SMM to differentiate between malicious events and emergency events when multiple neighbouring nodes become malicious.

The method is suitable for lesser number of malicious nodes when compared to the normal nodes. Method should be enhanced to work properly if the number of compromised nodes increases.

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#### AUTHORS

**First Author** – Shimi K S, MTech, Sree Narayana Gurukulam College of Engineering, shimi.sivadas@gmail.com

# Performance Enhancement for Routing in Cognitive Radio Mobile Ad Hoc Networks using Topology Control

A.Bajulunisha. AP/CSE<sup>\*</sup>, Dr. J. Williams. H.O.D/IT<sup>\*\*</sup>

\* Roever college of Engineering & Technology – Perambalur \*\* M.A.M College of Engineering, Siruganur - Trichy

*Abstract*- Cognitive Radio (CR) is an adaptive, intelligent radio and network technology that can automatically detect available channels in a wireless spectrum and change transmission parameters enabling more communications to run concurrently and also improve radio operating behavior. We are going to discuss topology control and routing issues in CR-MANETs and propose a distributed prediction-based cognitive topology control (PCTC) scheme to provision cognition capability to routing in CR-MANETs. PCTC is a middleware residing between CR model and routing makes use of cognitive link availability prediction based on that it captures the dynamic changes of topological and constructs an efficient and reliable topology which improves the end to end Network performance such as throughput and Delay. A simulation result also ensures the effectiveness of the proposed scheme.

*Index Terms*- Cognitive radio (CR), link-availability prediction, mobile ad hoc network (MANET), routing, topology control.

## I. INTRODUCTION

Cognitive Radio is an enabling technology that allows cognitive users (CUs, i.e., unlicensed users or secondary users) to operate on the vacant parts of the spectrum allocated to primary users (PUs, i.e., licensed users). CR is widely considered as a promising technology that deals with the spectrum shortage problem caused by the current inflexible spectrum-allocation policy. CR technology will have significant impact on upper layer performance in wireless networks, particularly in mobile ad hoc networks (MANETs), which enable wireless devices to dynamically establish networks without necessarily using a fixed infrastructure.

Although some efforts have been done to the medium access control (MAC) layer issues [1], [2], routing is still one of the particularly important networking issues in CR-MANETs. The routing in CR-MANETs (called cognitive routing hereafter) should have the following unique characteristics.

1) *PU interference awareness*: Cognitive routing should choose a path that the interference to PUs is below the required threshold.

2) *Link-availability prediction*: It is mentioned in [8] that a CR network should be forward looking, rather than reactive. since spectrum sensing may take a long time and be delayed [3]–[4], a reactive CR network will degrade performance. Therefore, cognitive routing should not only be aware of PUs but should be concern with link-available periods

3) *Adaptive acting*: Cognitive routing should be adaptive to choosing a path based on the prediction to increase end-to-end throughput and decrease end-to-end delay.

There are a large number of routing protocols proposed in classical MANETs, such as destination-sequenced distance vector routing [5], dynamic source routing (DSR) [6], and adhoc on-demand distance vector (AODV) routing [7]. However, it is difficult to apply them directly to CR-MANETs due to the distinct characteristics described above, it is better to provision the cognition capability to routing via a middleware-like mechanism. Specifically, we propose a novel scheme, called prediction based cognitive topology control (PCTC), to provision cognition capability to routing protocols in CR-MANETs.

It can capture the topology dynamically based on link prediction to provide efficient and opportunistic link management and routing. The cognitive link-prediction model considers both user mobility and interference to PUs. It predicts both link duration and the probability that this duration may really last to the end of this period. Based on the cognitive prediction, we further describe how to construct a more reliable topology and reduce rerouting. It requires only local neighbor information, and network connectivity is preserved in a distributed manner. Simulation results show that PCTC results in a simpler topology and has longer link durations than that without topology control. Routing protocols also perform better in the resulting topology.

## II. TOPOLOGY CONTROL AND ROUTING IN COGNITIVE RADIO MOBILE AD HOC NETWORKS.

The dynamic spectrum availability and the importance of limiting the interference to PUs differentiate the CR-MANET from classical MANETs. Two factors affect spectrum availability.

1. The first one is capability limitation of some CUs. Since CUs are considered to be low priority and secondary users of the spectrum allocated to PUs, CUs should sense the spectrum to detect PU activities by itself, or cooperatively. Due to the capability limitation of some CUs and a large number of possible spectrum bands, spectrum sensing may take a long time [3]–[4].

2. The second factor that affects spectrum availability is CU mobility. In classical MANETs, routes formed by multiple hops may experience frequent disconnections caused by node mobility.

This problem may be detected when the next-hop node in the path does not reply to messages and the retry limit is exceeded.

However, this problem is difficult to solve in CR-MANETs since a node may not be able to transmit if the spectrum becomes unavailable when a node moves into the interference boundary of an active PU. Therefore, correctly inferring mobility conditions in designing effective topology control and routing scheme [9].

In this sense, we concentrate on how the spectrum availability due to CU mobility affects the network performance in CR-MANETs. We use a simple scenario in Fig. 1 to illustrate the effects of CU mobility on routing in CR-MANETs. There are one PU and four CUs in this scenario. The source node is CU1, and CU4 is the destination node. As we can see in Fig. 1, CU3 is moving toward the PU, while CU2 is moving away from the PU. The traditional routing in classical MANETs will select paths under a shortest path criterion. Link CU1  $\rightarrow$  CU3 may be selected in the route. However, as CU3 moves close to the PU, link CU1  $\rightarrow$  CU3 cannot be used due to the interference from CU3 to the PU.



Fig 1. Motivation scenario. Cognitive routing selects CU2 in its path other than CU3 for the sake of reducing rerouting frequency when considering interference avoidance to PU. The arrows indicate the movement directions of CU2 and CU3, respectively.

The relaunching route request will be triggered to find another route. Link CU1  $\rightarrow$  CU2 does not have this problem, since CU2 is moving away from the PU, and the interference from CU2 to the PU is below the threshold. The rerouting problem would not happen if link CU1  $\rightarrow$  CU2 instead of CU1  $\rightarrow$  CU3 were selected. From this example, we can see that mobility prediction can help improve the performance of routing in CR-MANETs. It is desirable that cognitive routing should prefer the links with long durations to prolong the path survival time and improve the path stability.

Existing routing protocols in classical MANETs lack this cognition capability. Therefore, to provision cognition to routing, we adopt a middleware-like technology, i.e., topology control, in CR-MANETs. In our framework, topology control is treated as a cross-layer module connecting the routing layer and the CR module.

# III. COGNITIVE LINK- AVAILABILITY PREDICTION

A large number of prediction models are available for link availability prediction [10]–[11]. The basic principle of the prediction framework is to provide a predicted time period Tp that the link between two nodes will stay available. In addition,

another important parameter, which is denoted by L(Tp), can be obtained from this framework to estimate the probability that this link may really last to the end of Tp by considering possible changes in velocities. In CR-MANETs, [Tp, L(Tp)] is not sufficient to predict link duration, because the links between CUs are affected by CU mobility as well as by the interference to Pus.

In this situation, a link with a high quality may be regarded as unavailable if a node in that link is moving close to a PU. As a result, to avoid interference, the distance between a CU and a PU should be monitored. This paper proposes another pair of [ $^{T}Tp$ ,  $L(^{T}Tp)$ ] to predict the link availability before nodes moves into the interference boundary of PUs. Similar to Tp,  $^{T}Tp$  is the predicted time until a CU moves into the interference area of a PU, and  $L(^{T}Tp)$  is its corresponding probability. The final link availability is revealed by the combination of [Tp, L(Tp)] and [ $^{T}Tp$ ,  $L(^{T}p)$ ] to enable cognitive link prediction.

## A. $[^Tp, L(^Tp)]$ Estimation

Then, the available period  $T_P$  if counted from *t*2, is Obviously, the preciseness of  $\hat{T}p$  depends on the measurement {Formula}- (1).

$$Tp = \frac{\sqrt{\beta^2 + 4\alpha\rho^2 - 4\alpha\gamma - \beta}}{2\alpha} - t_2$$

There are some methods to obtain distance information. Similar to [Tp, L(Tp)] estimation, we also have to provide a probability L(Tp) to Tp {Formula}-(2)

$$L(T_p) = 1^{\lambda T p 1^{-\lambda T}} + \zeta (1 - 1^{-\lambda T p})$$

## **B.** Link-Availability Prediction

A link is considered available if the two nodes associated with this link are within the transmission range of each other and if they are both out of the interference region of any PU in CR-MANETs. The former is a common condition in MANETs, while the latter is the specific requirement in CRMANETs. Consequently, link availability should be determined by [Tp, L(Tp)] and  $[\uparrow Tp, L(\uparrow Tp)]$  together. Jiang *et al.* [21], [24] use  $Tp \times L(Tp)$  as a routing metric to assist routing protocols in selecting reliable paths. However, it is far from sufficient for CR-MANETs. For instance, if a link with  $Tp \times L(Tp) = 8$  s, but  $\uparrow Tp \times L(\uparrow Tp) = 5$  s, it cannot stay available for 8 s since it will move into the interference region of PUs, which suppresses its transmissions.

### IV. COGNITIVE TOPOLOGY CONTROL AND ROUTING

## A. Distributed Topology Construction

The dynamic changes due to CU mobility or the interference to PUs, which will result in frequent rerouting, waste large amounts of scarce network resources and achieve low end-to-end performance. In PCTC, a new link reliability metric is defined for topology construction. We first introduce a rerouting penalty denoted by  $\delta$ . This penalty is a period that is incurred by rerouting and reduces link availability to  $(Ta - \delta)$  in the sequel. Actually, the path duration is not the main concern of an end-to-end transmission. Instead, by nature, it is expected to deliver as many packets as possible before a path failure happens. From this point of view, the only consideration of link available duration Ta is not enough since a link with long duration may have a poor quality resulting in low data rate.

In the long run, it needs fewer re routings if the selected path consists of links with longer Ta and higher quality. To quantify this measurement, we set the link weights to {*Formula*}-(6) *AND* (7)

$$\omega = \gamma * (T_a - \delta)$$
$$W = \min W_i, i \in L$$

where the link data rate *r* captures its link quality. Herein, the rerouting penalty  $\delta$  is converted into a capacity loss  $r \times \delta$  during the available period. The link weight then presents the traffic carrying ability of this link.

& L is the set including all the links along the path. We can see that the definitions of link and path weights reflect its true data-transmission ability.

It is desirable to transmit more data traffic before link failure. Similar to other topology control algorithms, the topology-construction process in this paper consists of three steps: neighbor collection, path search, and neighbor selection. The distributed localized Dijkstra topology control (LDTC) algorithm, which aims at constructing an energy-efficient topology, has some beneficial properties, particularly the 1spanner property, which preserves the global minimum energy paths in a distributed manner. LDTC runs the Dijkstra algorithm over a neighborhood graph. Therefore, it requires only local information exchanges. In this paper, the distributed cognitive PCTC algorithm enhances LDTC to preserve the end-to-end reliable paths for CR-MANETs.

As a distributed algorithm, each node runs the following procedures as an initial node.

# 1) Neighbor collection:

a) Collect all of its neighbors, and calculate the edge weights according to (6).

# 2) Path search:

a) Set the path weights to infinity for the initial node and to zero for neighbors. Mark all the neighbors as unvisited and the initial node as the current one.

b) Calculate the path weights according to

(7) from the initial node to unvisited neighbors via the current node. If they are larger than the previously recorded ones, update the path weights to them.

c) Mark the current node as visited, and set the unvisited node with largest path weight as the current node. Then, repeat from b) until all the neighbors are visited.

# 3) Neighbor selection:

a) All of the most reliable paths from the initial node to its neighbors are now found. The resulting topology is the output by preserving all the first-hop neighbors of the initial node along these paths.

# **B.** Topology Reconfiguration

Wireless links are changing dynamically due to node mobility, fading, barrier, interference, etc. In this section, we study how to do topology reconfiguration due to the dynamically changing wireless links in CR-MANETs. Topology reconfiguration can also be used to deal with inaccurate link availability predictions since prediction errors are inevitable.

In CR-MANETs, therefore, an intuitive method for topology reconfiguration is to run the topology control algorithm frequently to keep pace with the dynamical links. However, this frequent topology control requires an enormous amount of computational loads and is quite power consuming. To respond promptly to topology changes, it is desirable to be able to deal with some asynchronization occurrences, such as link appearance, disappearance, and link weight change

1) When a new node wants to joint the network, it first predicts all links to its neighbors based on the cognitive linkduration prediction scheme presented in Section III. These predictions are then broadcast to neighbors in its range. For any node that has been in the network, it is not necessary to rerun the topology algorithm to reconfigure the topology.

What a reconfiguration needs to do is to find a reliable path to the new node from the existing topology. After running PCTC, the initial has obtained the reliable paths to all its original neighbors. Then, the topology reconfiguration extends these paths by adding the newly appearing links to the newcomer.

The one with maximum weight is selected, and the first-hop neighbor in the path is preserved. The new node may compose more reliable paths to the existing nodes. Therefore, reconfiguration extends the reliable path of the newcomer

# C. Cognitive Routing on the Resulting Topology

Routing is defined to select paths in a network to send data traffic. A challenge in CR-MANETs is to provision cognition capability to routing protocols. With PCTC, existing routing protocols can be easily adopted in CR-MANETs with cognition capability. Based on the cognitive link-prediction scheme presented in Section III, routing on the PCTC resulting topology is aware of PUs and is forward looking to link duration.

Further, PCTC makes routing adaptive to a mobile environment, in which routing favors reliable paths in the network. Take the popular routing protocols, such as DSR and AODV, as examples. They usually send routing request packets (RREQs) to find a path for a source and a destination. When an RREQ reaches an intermediate node, it may be dropped if the transmitter does not exist in the neighborhood relationship generated by the PCTC algorithm. Otherwise, this RREQ is disposed by the intermediate node and rebroadcast.

As a result, the links in the vicinity of PUs or with poor quality and short available duration are avoided. The first RREQ is replied to in terms of a routing metric of the first found path to confirm the found path. Actually, PCTC optimizes neighborhood relationship among nodes and assigns each path a weight with regard to reliability. With PCTC, we can improve the performance of other routing metrics such as shortest path or quality-of-service routings.

D. Message Overhead Analysis

PCTC in this paper requires the knowledge of local connectivity. Consequently, message exchanges with neighbors are indispensable. Each node periodically broadcasts a message including its neighbor list and the corresponding predicted link durations. On receiving these messages, each node is able to construct a local connected graph for PCTC. On the other hand, as discussed in Section IV-D, the routing on the PCTC resulting topology reduces the number of RREQs in the route establishment phase.

### V. SIMULATION RESULTS AND DISCUSSIONS

In this section, the proposed scheme is evaluated via computer simulations. In the simulation environment, nodes are randomly moving in a 2-D space according to the random-walk based mobility model, where a node moves with a direction uniformly and a speed uniformly from 0 to vmax with exponentially distributed epochs. IEEE 802.11 is adopted for the MAC layer. The maximum transmission range of each node is 300 m, and the transmission rate is 2 Mb/s.

Routing over the PCTC topology is then adaptive in CR-MANETs. The following two routing strategies are adopted to evaluate the performance of the topology control algorithm further in the simulations.

1) *Shortest path (SP)*: Each flow is transmitted along the path with the minimum number of hops.

2) *Reliable path with regard to Ta (RPTa)*: This is the proposed scheme in this paper. It selects the path with maximum path duration



Fig 6.Routing over Different Topologies



Fig. 7. End-to-end performance studies

Fig. 6(a) shows the results of SP routing. We can see that SP routing under the original topology, which is not aware of PUs, has the smallest hop counts while performing the worst in terms of path duration. The PCTC resulting topology has longer path length compared with the predicted topology.

End-to-end performance is a critical objective for routing protocols. Fig. 7 demonstrates the two main performance metrics, i.e., 1) end-to-end throughput and 2) delay, of routing on the predicted topology and cognitive routing on the PCTC resulting topology. For RPT*a* routing, although the same path is selected on the predicted topology and PCTC topologyThis is because less node degree in PCTC topology may alleviate the contention in the shared wireless medium and results in less medium access time. As for SP routing, although there are paths with more hop counts, the end-to end throughput under the resulting topology is higher than that under *Ta* topology. The end-to-end delay is also shorter. The reason is that the paths under the resulting topology last longer, resulting in fewer link breakages and less rerouting frequency.

#### VI. CONCLUSION AND FUTURE WORK

CR technology will have significant impact on upper layer performance in CR-MANETs. In this paper, we have proposed a framework to provision cognition capability to the routing protocols in CR-MANETs, which are aware of the interference to PUs, forward looking to link-available duration, and adaptive to the mobility environment. A novel distributed PCTC scheme was presented. Link-available duration prediction takes into account both the interference to PUs and the mobility of CUs. We have evaluated the routing performance over the resulting topology by computer simulations. It was shown that with the proposed middleware-like topology control residing between the routing layer and CR module, the resulting network topology is simpler, and links last longer.

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### AUTHORS

**First Author** – A.Bajulunisha. AP/CSE, Roever college of Engineering & Technology – Perambalur. **Second Author** – Dr. J. Williams. H.O.D/IT, M.A.M College of Engineering, Siruganur - Trichy

# An Overview of Additive mixed EDM

# Mahendra G. Rathi\*, Deepak V. Mane\*\*

\* HOD (Workshop), Government College of Engineering, Aurangabad, Maharashtra, India.
\*\* PG Student, Dept. of Mechanical Engineering, Government College of Engineering, Aurangabad, Maharashtra, India.

*Abstract-* The objective of this paper is to understand various trends of Electrical discharge machining (EDM) has been widely used as a removal process to produce parts, dies and molds for several decades. In recent years, the surface modification for hardening and depositing some functional materials by EDM has been studied [1]. The development of the super tough electrical conductive material such as carbides, stainless steel, nitralloy etc. resulted in development of the nontraditional machining processes. These materials are difficult to machine by conventional machining process & have wide range of applications in industry. In EDM thermal energy is used to machine all electrical conductive materials of any hardness & toughness. Since there is no direct contact between the tool electrode & work piece in EDM, machining defects like mechanical stresses, clattering & vibration do not create problem during machining [2]. In spite of remarkable advantages of the process, disadvantages like poor surface finish and low volumetric material removal limits its use in the industry. In the past few years, Additive mixed Electric Discharge Machining (AEDM) emerges as new technique to enhance process capabilities. In this process, a suitable material in fine powder form (aluminum, chromium, graphite, copper, or silicon carbide, etc.) is mixed into the dielectric fluid of EDM. The spark gap is filled up with additive particles. The added powder significantly affects the performance of EDM process. The electrically conductive powder reduces the insulating strength of the dielectric fluid and increases the spark gap distance between the tool electrode and work piece. As a result, the process becomes more stable, thereby improving machining rate (MR) and surface finish.

Index Terms- Electro Discharge Machining (EDM), AEDM, Electrical conductive Powder, spark, Gap, Machining rate, Surface finish.

### I. INTRODUCTION

Electro discharge machining is a non-traditional concept of machining which has been widely used to produce dies and molds. It is also used for finishing parts for aerospace and automotive industry and surgical components. This technique has been developed in the late 1940s where the process is based on removing material from a part by means of a series of repeated electrical discharges between tool called the electrode and the work piece in the presence of a dielectric fluid. The electrode is moved toward the work piece until the gap is small enough so that the impressed voltage is great enough to ionize the dielectric. Short duration discharges are generated in a liquid dielectric gap, which separates tool and work piece. The material is removed with the erosive effect of the electrical discharges from tool and work piece. EDM does not make direct contact between the electrode and the work piece where it can eliminate mechanical stresses chatter and vibration problems during machining. Materials of any hardness can be cut as long as the material can conduct electricity.



# Fig. 1.1 The principle of Additive mixed EDM

When voltage is applied the powder particles become strengthened and act in a zigzag manner. These charged particles are accelerated due to the electric field and act as conductors encouraging breakdown in the gap. This rises the spark gap between tool and the work piece. Under the sparking area, these particles come adjacent to each other and arrange themselves in the form of chain like constructions. The interlocking between the powder particles arises in the direction of flow of current. The chain formation helps in linking the release gap between the

electrodes. Since of bridging effect, the shielding strength of the dielectric fluid falls resulting in easy short circuit. This causes early blast in the gap and series discharge' starts under the electrode area. The quicker sparking within a discharge causes sooner erosion from the work piece surface and hence the material removal rate increases. The sparking is evenly spread

between the powder particles, hence electric concentration of the spark drops. Due to constant scattering of sparking between the powder particles, narrow craters are formed on the work piece

surface. This results in improvement in surface finish.

The basic machining mechanism of AEDM.

Additive\_mixed Electric discharge machining has a various machining mechanism from the conventional EDM [3]. In this process, a suitable material in the powder form is mixed into the dielectric fluid either in the same tank or in a separate tank. For better circulation of the powder mixed dielectric, a stirring system is employed. For constant reuse of powder in the dielectric fluid, a modified circulation system (Fig. 1.2) is used.



Fig 1.2 Setup of Electric Discharge Machining

# A) Major Component of Additive mixed Electrical discharge Machining

**1. Power supply:** The power supply is an important part of any EDM system. It converts the alternating current from the main utility supply into the pulse direct current (DC) essential to create the spark ejection at the machining gap.

**2. Pulse Generator & Control Unit:** is likely for providing pulses at a definite voltage and current for precise extent of time. The power supply control the extent of energy spent. First, it has a time control purpose which controls the span of time that current flows during each pulse; this is called "on time." Then it is regulating the volume of current permissible to flow during each pulse. The control unit is control the all function of the machining for example of Ton, Ip, duty cycle, placing the values and maintain the workpiece the tool gap.

**3.** The servo system to feed the tool: The servo control unit is provided to maintain the pre-determined gap. It senses the gap voltage and relates it with the present value and the different in voltage is then used to control the drive of servo motor to adjust the gap.

**4. Tool holder:** The tool holder clamps the tool with the process of machining.

5. Circulating Pump: Circulation of powder mixed dielectric.

6. Electrode: The EDM electrode is the tool that fixes the shape of the cavity to be produce.

7. Permanent magnet: Magnetic forces are used to isolate the debris from the dielectric fluid. For this purpose, two permanent magnets are positioned at the bottom of machining tank

8. Machining Tank: The system contains of a transparent bath-like container, called the machining tank. It is placed in the work tank of the EDM, and the machining is accomplished in this container.

**9. Working tank with work holding device:** All the EDM oil preserved in the working tank, it is used to deliver the fluid throughout the process of machining.

10. X-Y table accommodating the working table: They are used to the movement of the workpiece from X and Y direction. [3]

# II. MAJOR PARAMETERS OF EDM

EDM Parameters mainly classified into two categories. Process parameter and Response Variable. [12]

## Process Parameters: The process parameters in EDM are used to

regulate the performance methods of the machining process. Process parameters are generally well-disciplined machining input factors that decide the conditions in which machining is carried out. These machining situations will affect the process performance result, which are gauged using various performance methods.

- 1. Duty factors
- 2. Gap Voltage
- 3. Peak Current
- 4. Average current
- 5. Push on time
- 6. Pulse off time
- 7. Discharge voltage
- 8. Polarity
- 9. Pulse Frequency
- 10. Pulse waveform
- 11. Electrode gap
- POWDER BASED PARAMETERS
  - 1. Type of powder
  - 2. Powder size
  - 3. Powder conductivity
  - 4. Powder concentration
  - 5. Powder density
- ✤ NON ELECTRICAL PARAMETERS
  - 1. Type of Dielectric
  - 2. Working time
  - 3. Electrode lift time
  - 4. Nozzle flushing
  - 5. Gain
- ELECTRODE BASED PARAMETER
  - 1. Electrode material
  - 2. Electrode size
  - 3. Electrode shape

# Response variable: These variables measure the various process performances of EDM results.

- 1. Material removal rate (MRR)
- 2. Tool Wear rate (TWR)
- 3. Surface Quality
- 4. Surface Roughness

# TYPES OF DIELECTRIC FLUIDS:

- Mineral Oils: liquid petroleum is a byproduct in the refinement of petroleum.
- Kerosene: was one of the first popular dielectric oils. Its primary advantage is that it has very low viscosity and flushes very well.
- Transformer Oil: is another mineral oil based product that was revised for use in EDMs due to its dielectric properties. Earlier generations of transformer oil were compounded with PCBs. Transformer oil has no current application in EDM.
- EDM Oils: There are currently various choices of mineral oils formulated specially for EDM.
- Synthetic oil: Synthetic oil is oil containing of chemical compounds which were not originally present in crude oil (petroleum)



Fig 2.1 Process parameters and Output variables of EDM Process a cause and effect diagram

S			Metal			
No.	Material	Wear Ratio	Removal	Fabrication	Cost	Application
			Rate			
1.	Copper	Low	High on	Easy	High	On all metals
			rough range			
2.	Brass	High	High only on	Easy	Low	On all metals
			finishing			
			range			
3.	Tungsten	Lowest	Low	Difficult	High	Small holes are
						drilled
4.	Tungsten copper	Low	Low	Difficult	High	Used higher
	alloy					accuracy work
5.	Cast iron	Low	Low	Easy	Low	Used on few
			_			materials
6.	Steel	High	Low	Easy	Low	Used for finishing
						work
7.	Zinc based alloy	High	High on	Easy die	High	On all metals
			rough range	casted		
8.	Copper graphite	Low	High	Difficult	High	On all metals

# Table 2.1 Types of electrode material

# TYPES OF POWDER:

- 1. Aluminum
- 2. Silicon
- 3. Graphite
- 4. Chromium
- 5. Aluminum oxide
- 6. Silicon carbide.

## III. LITERATURE REVIEW

Research Contribution year wise as follows:

Erden A., et al., (1980) Reported during the machining of mild steel that the machining rate rises by the adding of powder particles (Al, Cu, iron) in the dielectric fluid of dielectric machining. Here enhancement in the Break Down characteristics of the dielectric fluid is noticed with the addition of powder particles, but after a certain critical concentration of powder short circuiting take place which causes poor machining.

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Jeswani M.L., et al., (1981) Study the effect of adding of graphite powder to kerosene used as dielectric fluid in the EDM. He concluded that addition of about 4gm/l of fine powder having average size of particle as 10Hm increases the MRR (Material Removal Rate) by 60% and TWR (tool wear rate) by 15% in electrical discharge machine. Wear ratio is also reduced by 30%. He concluded that there is 30% reduction in the breakdown voltage of kerosene at spark gap of 50Hm was witnessed.

Narumiya H., et al., (1989) Used Si, Al & graphite as powder materials. The concentration range of the powder was between 2gm/l to 40gm/l. Their conclusion showed that the gap distance increases with the powder concentration and is larger for the aluminum powder but there is no direct relation between the surface roughness and the gap distance. The best results about the surface finish were attained for low powder concentrations levels and that also for silicon and graphite powders.

Mohri, et al. (1992) Found that an EDM finishing process using dielectric mixed with silicon powder provides a mirror surface of up to 500 cm2, area. Recently this machining method has been introduced in commercial machine tools and practically applied in industry.

Kobayashi K., et al., (1992) Have concluded that silicon powder mixed in the dielectric improves the surface finish of SKD-61 tool steel. It has also been observed, however, that at specific machining conditions in the EDM of steel the aluminum and graphite powders create better surface roughness than silicon powder.

Yan and Chen (1994) That the powder particles contribute to the reduction of surface cracks and to the smoothness and homogenization of the white layer. The lowest surface roughness levels and a correct balance between the discharge energy density and the discharge rate were observed for a powder concentration within the range of 2 to 5 g/l.

Ming and He (1995) Indicates that some conductive powder can lower the surface roughness and the tendency of cracks in middle finish and finish machining but the inorganic oxide additive does not have such effect.

Wong Y.S., et al., (1998) Study the powder mixed dielectric electric discharge machining (PMD-EDM) by employing a current of 1A and pulse on time as 0.75Hs to produce a near mirror finish on SKH-54 tool steel. The conclusion was that the resulting machining surface was composed of well defined, uniformly sized, smoothly overlapped and shallow craters. The analysis was carried out by varying the silicon powder concentration and the flushing flow rate.

Uno et al. (1998) Observed that nickel powder mixed working fluid modifies the surface of aluminum bronze components. Nickel powder was purposely used to deposit a layer on an EDM surface to make the surface abrasion-resistant.

Chow et al. (2000) Studied the EDM process by adding SiC and aluminum powders into kerosene for the micro-slit machining of titanium alloy. The addition of both SiC and aluminum powder to the kerosene enhanced the gap distance, resulting in higher debris removal rate and material removal depth.

Furutani K., et al., (2001) Used titanium powder in dielectric fluid (Kerosene) and found that the layer of titanium carbide of hardness 1600HV (Vickers hardness number) on a carbon steel with negative polarized copper electrode, peak current 3A and 2 Hs pulse duration. Titanium and titanium Carbide are found in XRay diffraction (XRD) analysis of machine surface. It was concluded that the breakdown of dielectric takes place and carbon came from it.

Tzeng Y.F., et al., (2001) Examines the effect of powder characteristics on machining efficiency of electrical discharge machining. They reach to a conclusion that 70- 80nm powder suspended in dielectric produces the greatest material removal rate and least increase in the spark gap.

Yan BH., et al., (2001) Studied the electric discharge machining with powder suspended working media and reported that the gap length become shorter regardless of a mixed powder with a decrease of the pulse duration at a duty factor of 0.5.

Peças P, et al., (2003) Investigated the influence of silicon powder mixed dielectric on conventional EDM. The relationship between the roughness & pulse energy was roughly investigated under a few sets of the conditions in the removal process. Still, the effect of the energy was not systematically analyzed.

Kozak J., et al., (2003) Reported that the material removal rate and tool wear rate were decreased by addition of powder. Consequently the machined surface becomes smooth.

Klocke F., et al., (2004) Used HSFC high speed forming camera technique to find out that in comparison to standard electrode, the Al mixed dielectric forms larger plasma channel. It was concluded that discharge energy distribution is on the larger art on the wok piece surface. The type and concentration of the powder mixed in the dielectric fluid also found to have direct effect on the machining performance output.

Biing Hwa Yan et al. (2005) Investigates the influence of the machining characteristics on pure titanium metals using an electrical discharge machining (EDM) with the addition of urea into distilled water. Experimental results indicate that the nitrogen element decomposed from the dielectric that contained urea, migrated to the work piece, forming a TiN hard layer, resulting in good wear resistance of the machined surface after EDM. They have concluded that Adding urea into the dielectric, MRR and EWR increased with an increase in peak current. Moreover MRR and EWR declined as the pulse duration increased. The surface roughness deteriorated with an increase in peak current.

Wu KL., et al., (2005) Study the problem of powder settling by adding a surfactant with Al powder in dielectric fluid and observed that a surface roughness (Ra value) of less than 0.2µm. This is because of more apparent discharge distribution. It was also reported that negative polarity of the tool resulted in better hardness of the surface.

H.K. Kansal et al. (2005) Optimized the process parameters of powder mixed electrical discharge machining (PMEDM) on tool steel using Response surface methodology. Pulse on time, duty cycle, peak current and concentration of the silicon powder added into the dielectric fluid of EDM were chosen as variables to study the process performance in terms of material removal rate and surface roughness. The silicon powder suspended in the dielectric fluid of EDM affects both MRR & SR. They concluded that more

improvement in MRR and SR are expected at still higher concentration level of silicon powder.

Kansal H.K., et al. (2006) founds optimum process conditions for PMEDM of Al- 10%SiCP Metal Matrix Composites by an experimental investigation using Response Surface Methodology. Aluminium powder was suspended into the dielectric fluid of EDM.

Bai and Koo (2006) Investigated the effects of kerosene and distilled water as dielectric during electrical discharge surface alloying of super alloys.

Yeo S H., et al., (2007) The experiments were conducted using dielectric with and without additive and at low discharge energies of  $2.5\mu$ J,  $5\mu$ J and  $25\mu$ J, and was observed that a considerable difference in crater morphology is seen between craters in dielectric with and without the powder at low discharge energy of  $2.5\mu$ J,  $5\mu$ J and  $25\mu$ J. More circular shapes with smaller diameters are produced with powder additive as compared to without powder additive. Craters with the additives are smaller and have more consistent depth than in dielectric without additive. They reported that dielectric with additive in it lower the amount of discharge flowing between the work piece and the tool electrode and slows down the rate at which these charges flow.

H.K. Kansal et al. (2007) Have also identified number of issues that need to be addressed in future for implementation of PSD-EDM of this modified process of machining. Few of them are discussed here. Many researchers have shown that powder suspended EDM machining can distinctly improve the SR and

surface quality in the finish machining phase and obtain nearly mirror surface effects. Despite the promising results, PMEDM process is used in industry at very slow pace. One of the key reasons is that many fundamental issues of this new development, including the machining mechanism are still not well understood. The complexity of this process, particularly in context with thermo physical properties of the suspended particles deserves a thorough investigation. Secondly, the difficulty in operation of dielectric interchange, the high amounts of powder consumption, the environmental requirements of fluid disposal and its higher initial cost (two to three times higher than the one required for a conventional EDM system) have restricted its frequent use.





Norliana Mohd Abbas et al. (2007) Have reported a review on current research trends in electrical discharge machining (EDM). They have observed that Fine abrasive powder is mixed into the dielectric fluid. The hybrid material removal process is called powder mixed EDM (PMEDM) where it works steadily at low pulse energy and it significantly affects the performance of EDM process.

Han-Ming Chow et al. (2008) Have investigated the use of SiC powder in water as dielectric for micro slit EDM machining of titanium (Ti) alloy. They have concluded that SiC powder suspended in pure water causes a larger expanding-slit and electrode wear

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than those of using pure water alone. Also, pure water and a SiC powder attain a smaller amount of machined burr than that of using pure water alone.

Peças P. et al., (2008) Study the effect of silicon powder particles suspended in dielectric fluid. The powder concentration & flushing flow rate are two input parameters. They reach to a conclusion that even for small level of powder concentration there is evident amount of reduction in crater depth, crater diameter and the white layer thickness. They reported that for a particular experimental configuration used, we can find the powder concentration that generates better surface morphology. It was observed that there is dielectric flow rate that minimizes the surface roughness for each electrode area and for larger flow rates, no positive effect on the surface morphology.

Beri and Anil (2008) Performed experimentation on EDM of AISID2 steel in kerosene with copper tungsten (30% Cu and 70% W) electrode (made through Powder Metallurgy technique) and conventional Cu electrode. An L18 orthogonal array of Taguchi methodology was used to identify the effect of process

input factors (viz. current, duty cycle and flushing pressure) on the output factors (viz. material removal rate and surface roughness). It was recommended to use conventional Cu electrode for higher MRR and CuW electrode made through PM for low SR.

Kun Ling Wua et al. (2009) Explored the influence of surfactant on the characteristics of electrical discharge machining (EDM) process on mold steel (SKD61). In this study, particle agglomeration is reduced after surfactant molecules cover the surface of debris and carbon dregs in kerosene solution. The

experimental results show that after the addition of Span 20 (30 g/L) to dielectric, the conductivity of dielectric is increased. The machining efficiency is thus increased due to a shorter relay time of electrical discharge. When proper working parameters are chosen, the material removal rate is improved by as high

as 40-80%. Although the improvement of surface roughness is not obvious, the surface roughness is not deteriorated since the material removal rate is great.

Kibria G., et al. (2009) relates different dielectrics in micro- EDM machining operation and reported that the machining characteristics are greatly influenced by the nature of dielectric used during micro-EDM machining. From the available literature, it is concluded that the machining characteristics of some hard and difficult to cut material can be studied by suspending powder of some material in the dielectric fluid of

EDM.

Prihandana G.S., et al. (2009) Presents a new method that contains of suspending micro-MoS2 powder in dielectric fluid and using ultrasonic vibration during  $\mu$ -EDM processes. It was detected that the introduction of MoS2 micro-powder in dielectric fluid and using ultrasonic vibration significantly increase the MRR and improves surface quality.

Kung et al., (2009) Reported that the material removal rate and electrode wear ratio in powder mixed electrical discharge machining of cobalt-bonded tungsten carbide by suspending aluminium powder in dielectric fluid. They observed that the powder particles disperses and makes the discharging energy dispersion uniform.

Furutani K., et al., (2009) The conditions for deposition machining by Ti powder suspended EDM was investigated with respect to discharge current and pulse duration in this paper. They concluded that the discharge energy affected the deposit able condition range. TiC could be deposited in the case that both

discharge energy and powder density was small. They reported that the hardness of the deposition achieved was 2000Hv. The matrix surface was also hardened.

Kumar S., et al., (2010) Found that significant amount of material transfer takes place from the manganese powder suspended in dielectric fluid to the machined surface under appropriate machining conditions which changes the surface composition and its properties. They reported that percentage of manganese increased to 0.95% from 0.52% and that of carbon to 1.03% from 0.82% that result in increase in the micro hardness. For surface alloying favourable machining conditions were found to be low peak current (4 A), shorter pulse on-time ( $5\mu$ s), longer pulse offtime ( $85\mu$ s),

Sharma S. et al (2010) Study the effect of aluminium powder on the machining performance of conventional EDM with reverse polarity. The machining performance is evaluated in terms of material removal rate, tool wear rate, percentage wear rate, surface roughness. Concentration and grain size of aluminium powder are taken as the input powder parameters and its effect are presented on machining performance. It is found experimentally that powder characteristics significantly affect machining characteristics.

Singh P. et al., (2010) investigate the Concentrations of Al powder and grain size of powder mixed in dielectric fluid strongly affects the machining performance of EDM process

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Sharma S. et al. (2011) Study the effect of graphite powder on the machining performance of conventional EDM. The machining performance is evaluated in terms of tool wear rate. Concentration of graphite powder, polarity, electrode type, peak current, pulse on time, duty cycle gap voltage and retract distance is taken as the input parameters and their effect are presented on machining performance. Conventional copper electrode and cold treated copper electrodes were used during the experimentation. It is found experimentally that with the addition of the powder particles in the dielectric and the use of cold treated electrode Tool Wear Rate decreased.

SYED K. H. et al., (2012) Investigations on addition of Al metal powder to dielectric fluid in electric discharge machining(EDM). As more stress is given currently to the green manufacturing concept, the present analysis uses distilled water mixed with aluminium powder as dielectric fluid instead of conventional hydrocarbon-based oils. The workpiece & electrode materials chosen for the investigation are W300 die-steel and electrolytic copper, respectively. Taguchi design of experiments is used to conduct experiments by varying the parameters peak current, pulse on-time, concentration of the powder, and polarity. The process performance is measured in terms of material removal rate (MRR), electrode wear ratio (EWR), average surface roughness (Ra), and white layer thickness (WLT). The trial results indicate that the polarity significantly affects the machining performance. Signal-to noise (S/N) ratio and the analysis of variance (ANOVA) are employed to find the optimal levels for the process parameters to achieve maximum MRR, low EWR, Ra, and WLT values. [12].

## IV. CONCLUSION

Electric discharge machining (EDM) has been found to be a promising machining technique for obtaining desired dimensional accuracy and intricacy from hard and tough die steels like high carbon high chrome materials. Powder mixing into the dielectric fluid of EDM is one of the innovative developments that ensure better machining rates at desired surface quality and at reduced tool wear rate.

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### Authors

First Author - Mahendra G. Rathi, HOD (Workshop), Government College of Engineering, Aurangabad, Maharashtra, India.

mgrathi kumar@yahoo.co.in, +91-9049504930

Second Author – Deepak V. Mane, PG Student, Dept. of Mechanical Engineering, Government College of Engineering, Aurangabad, Maharashtra, India.

deepakvmane@gmail.com, + 91-9922504914

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# Study on Effect of Powder Mixed dielectric in EDM of Inconel 718

# Mahendra G. Rathi\*, Deepak V. Mane\*\*

<sup>\*</sup> HOD (Workshop), Government College of Engineering, Aurangabad, Maharashtra, India. <sup>\*\*</sup> PG Student, Dept. of Mechanical Engineering, Government College of Engineering, Aurangabad, Maharashtra, India.

*Abstract*- Electrical discharge machining (EDM) is one of the most extensively disseminated manufacturing technologies, in particular as regards the generation of precise and difficult geometrical shapes on hard metallic components. The objective of this paper is to Study on Effect of Powder Mixed dielectric in EDM of Inconel 718. The effect of various powder mixed in dielectric is studied input parameters like Duty cycles, current, pulse on time and powder media in that Silicon carbide, Aluminium oxide, Graphite powder used. Machining characteristics measured in terms of Material removal rate, tool wear rate. To obtain the optimal process parameter combination, optimization is carried out by the Signal-to-Noise (S/N) ratio analysis of Taguchi method using L18 Orthogonal Array. An analysis of variance (ANOVA) is used to present the influence of process parameters on material removal rate, tool wear rate. Results obtained by Taguchi method and by ANOVA method, are compared and found that they match closely with each other. As the MRR is depends mostly on current [4]. Current carrying capacity of any material depends on it electric conductivity. Here Graphite is having highest electric conductivity than Aluminium oxide and Silicon carbide and therefore MRR is higher in case of Graphite powder. As well as TWR is less.

*Index Terms*- Electro Discharge Machining (EDM), PMEDM, Electrical conductive Powder, Duty cycle, POT, ANOVA, Taguchi Method, Signal-to-Noise ratio, Inconel 718, Orthogonal array, MRR, TWR.

## I. INTRODUCTION

Lectro discharge machining is a non-traditional concept of machining which has been widely used to produce dies and molds. It is also used for finishing parts for aerospace and automotive industry and surgical components. This technique has been developed in the late 1940s where the process is based on removing material from a part by means of a series of repeated electrical discharges between tool called the electrode and the work piece in the presence of a dielectric fluid. The electrode is moved toward the work piece until the gap is small enough so that the impressed voltage is great enough to ionize the dielectric. Short duration discharges are generated in a liquid dielectric gap, which separates tool and work piece. The material is removed with the erosive effect of the electrical discharges from tool and work piece. EDM does not make direct contact between the electrode and the work piece where it can eliminate mechanical stresses chatter and vibration problems during machining. Materials of any hardness can be cut as long as the material can conduct electricity.



## Fig. 1.1 The principle of Powder mixed EDM

When voltage is applied the powder particles become strengthened and act in a zigzag manner. These charged particles are accelerated due to the electric field and act as conductors encouraging breakdown in the gap. This rises the spark gap between tool and the work piece. Under the sparking area, these particles come adjacent to each other and arrange themselves in the form of chain like constructions. The interlocking between the powder particles arises in the direction of flow of current. The chain formation helps in linking the release gap between the

electrodes. Since of bridging effect, the shielding strength of the dielectric fluid falls resulting in easy short circuit. This causes early blast in the gap and series discharge' starts under the electrode area. The quicker sparking within a discharge causes sooner erosion from the work piece surface and hence the material removal rate increases. The sparking is evenly spread

between the powder particles, hence electric concentration of the spark drops. Due to constant scattering of sparking between the powder particles, narrow craters are formed on the work piece

surface. This results in improvement in surface finish.

# II. LITERATURE REVIEW

Kumar et al. [27] studied the effect of Graphite powder addition to check performance of machining it was found that addition of graphite powder enhances machining rate appreciably. Machining rate is improved by 26.85% with 12g/l of fine graphite powder at best parametric setting for machining of Inconel 718.

Sharma et al. [2] made an attempt to study the effect of Al powder on the machining performance of conventional EDM with reverse polarity. They have found that with increase in the grain size of the Aluminium powder particles in the dielectric, the material removal rate increases continuously.

Ghewade et al. [28] studied The material removal rate (MRR) mainly affected by peak current (Ip) and gap voltage (Vg). The effect of pulse-on time (Ton) is less on MRR. Duty cycle (t) has

least effect on it. The electrode wear rate (EWR) is mainly influenced by pulse-on time (Ton) and duty cycle (t). The effect of peak current (Ip) & gap voltage (Vg) is less on EWR and has least effect on it.

Kansal et al. [4] studied the effect of Silicon powder mixing into the dielectric fluid of EDM on machining characteristics of AISI D2 (a variant of high Carbon high Chrome) die steel. Peak current, concentration of the Silicon powder, pulse-on time, pulse-off time, and gain significantly affect the material removal in PMEDM. Peak current and concentration of Silicon powder are the most influential parameters for causing material removal. The suspension of Silicon powder into the dielectric fluid of EDM appreciably enhances material removal rate.

Kung et al. [11] studied the effect PMEDM on Cobalt-bonded tungsten carbide (WC-Co). They have showed that the MRR generally increases with an increase of aluminum powder concentration. This trend is valid up to a maximum value, after a certain limit, the increase of aluminum powder concentration leads to the decrease of MRR. MRR also increases with grain size and pulse on time.

Singh et al. [10] made an attempt to study the effect of Aluminium powder mixed in the dielectric fluid of electric discharge machining on the machining characteristics of Hastelloy. They have found that the addition of Aluminium powder in EDM oil results in appreciable reduction in TWR of Hastelloy when machined with Copper electrode.TWR of Copper electrode can be lowers down by reducing the size of suspended Aluminium powder particles in EDM oil.

Ojha et al. [18] studied on PMEDM of EN-8 steel. Response surface methodology (RSM) has been used to plan and analyze the experiments. They have found TWR increases with lower range of powder concentration shown in Figure 2.8 but then decreases. Increase in tool diameter results in decreasing tool wear.

# III. EXPERIMENTAL SET UP

Powder\_mixed Electric discharge machining has a various machining mechanism from the conventional EDM [3]. In this process, a suitable material in the powder form is mixed into the dielectric fluid either in the same tank or in a separate tank. For better circulation of the powder mixed dielectric, a stirring system is employed. For constant reuse of powder in the dielectric fluid, a modified circulation system (Fig. 3.2) is used.

Work piece material is Inconel 718. Inconel alloy 718 is a high-strength, corrosion-resistant nickel chromium material used at -423° to 1300°F.

# **Table 3.1 Physical Properties of Inconel 718**

Density	8.2 g/cm <sup>3</sup>
Melting point	1260-1340 °C



Fig 3.1 Setup of Powder Mixed Electric Discharge Machining

Typical physical properties are shown in Table 1.1. The age-hardenable alloy can be readily fabricated, even into complex parts. Its welding characteristics, especially its resistance to post weld cracking, are outstanding. The ease and economy with which Inconel alloy 718 can be fabricated, combined with good tensile, fatigue, creep, and rupture strength, have resulted in its use in a wide range of applications. Examples of these are components for liquid fueled rockets, rings, casings and various formed sheet metal parts for aircraft and land-based gas turbine engines, and cryogenic tank. It is also used for fasteners and instrumentation parts.



Fig 3.2 Setup of Electric Discharge Machining

Inconel 718 alloy is Austenitic structure, precipitation hardening generate " $\gamma$ " made it excellent mechanical performance. Grain boundary generate " $\delta$ " made it the best plasticity in the heat treatment.

 Table 3.2 Inconel 718 Alloy Minimum Mechanical Properties at the Room Temperature

Alloy	Tensile strength N/mm <sup>2</sup>	Yield Strength N/mm <sup>2</sup>	Elongation 5%	Brinell Hardness HB
Solution treatment	965	550	30	≤ 363

Copper is used as a tool electrode and dielectric fluid used is power mixed (Graphite, Al2O3 and SiC) Kerosene. Properties of abrasive which are used as dielectric medium are as shown in Table 3.5.

**Table 3.3 Properties of Abrasive** 

Powder	Density (gm/cm <sup>3</sup> )	Thermal conductivi ty (w/cm- k)	Electrica l resistivit y (Ohm- cm)	Meltin g point (k)	Sp. Heat (J/gm- k)
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Graphite	2.15	119-165	1.350	3800	1.190
Silicon Carbide	3.21	120	1*10 <sup>6</sup>	3170	0.790
Alumini um Oxide	3.95	31-40	1*10 <sup>11</sup>	2350	0.77

Following input parameters are taken into consideration:

- i. Powder media (Graphite, Al2O3,SiC)
- ii. Current (A)
- iii. Pulse on time( $\mu$ sec)
- iv. Duty cycle (%).

Current: Current is measured in Amp, which is allowed to flow per cycle. Discharge current is directly proportional to the Material removal rate.

Spark On-time (pulse time or Ton): The duration of time ( $\mu$ s) the current is allowed to flow per cycle. Material removal is directly proportional to the amount of energy applied during this on-time. This energy is really controlled by the peak current and the length of the on-time.

Duty cycle ( $\tau$ ): It is a percentage of the on-time relative to the total cycle time. This parameter is calculated by dividing the on-time by the total cycle time (on-time pulse off time) as shown by Equation 3.1.

Duty cycle ( $\tau$ ):  $\frac{\text{Ton}}{\text{Ton+Toff}}$  .....2.1

Straight polarity (electrode negative) is used because it is desirable setting for material transfer to occur and also has better surface finish [6].

## **Response Variable :**

There are many response variables such as MRR, TWR, and hardness of machined surface, surface roughness, dimensional accuracy and surface integrity

Following parameters are selected:

- i. MRR (Material removal rate)
- ii. TWR (tool wear rate)

MRR: MRR generally increases with an increase of powder concentration. This trend is valid up to a maximum value, after a certain limit, the increase of powder concentration leads to the decrease of MRR. MRR also increases with grain size and pulse on time [2, 4]. TWR: The TWR value tends to decrease with the powder concentration down to a minimum value after which it tends to increase.TWR also increases with grain size, with the increase of the discharge current and pulse on time [10, 18].

## Table 3.4 Response Variables used

Response variable	Response type	Unit
Material Removal Rate	Higher the Better	gm/min
Tool wear Rate	Lower the Better	gm/min

## IV. RESULTS AND DISCUSSION

The experiments are performed according to design of experiments (DoE). Among the available methods, Taguchi method is one of the most powerful DoE methods for design of experiment. It is widely recognized in many fields particularly in development of new products and processes in quality control. Here material removal rate, tool wear rate values are response variables. They are analyzed using Minitab software. Initially some trials are taken so we have some direction to experiments.

MRR (eq. 1) and TWR (eq. 2) are calculated by the following formula:

Wt. of the WP before machining- Wt. of WP after M/cg

MRR = -

Time

# $TWR = \frac{Wt. of the WP before machining-Wt. of WP after M/cg}{}$

Time

Copper electrode with a diameter of 6 mm is used as tool electrode. The machining is performed in standard Kerosene. SiC, Graphite and Al2O3 powder is mixed in Kerosene as per the requirements of the experiments. The powder particle size of 15 microns and powder concentration of 50gm/l is used. The parameters selected are peak current, pulse on time, duty cycle and different dielectric media. Material removal rate and tool wear rate are taken as the output parameter.



# Fig 4.1 Workpiece after Machining on EDM

Orthogonal array which is used to perform final experiments and the results are as shown in Table 4.1.

# Table 4.1 L18 Orthogonal Array used for Experiments with Results

Duty cycle	Powder media	Current	РОТ	MRR	TWR	S/N	S/N
90	Sic	12	5	0.07785	0.002193	-22.1748	53.1793
90	Sic	15	10	0.142	0.0037879	-16.9542	48.4321
90	Sic	18	20	0.1678	0.0045977	-15.5042	46.7492
90	Graphite	15	20	0.134	0.0037313	-17.4579	48.5627
90	Graphite	18	5	0.204	0.0057471	-13.8074	44.811
90	Graphite	12	10	0.0896	0.0023923	-20.9538	52.4235
90	Al2O3	12	20	0.07128	0.00292	-22.9406	50.6923
90	Al2O3	15	5	0.1236	0.0036101	-18.1596	48.8496
90	Al2O3	18	10	0.1818	0.004914	-14.8081	46.1713
85	Sic	18	5	0.2078	0.005618	-13.6471	45.0084
85	Sic	12	10	0.08799	0.0023781	-21.1113	52.4753
85	Sic	15	20	0.1132	0.0031898	-18.9231	49.9248
85	Graphite	18	10	0.2272	0.0060606	-12.8718	44.3497
85	Graphite	12	20	0.07547	0.0020964	-22.4445	53.5704
85	Graphite	15	5	0.1409	0.0039139	-17.0218	48.1478
85	Al2O3	15	10	0.1806	0.0049505	-14.8656	46.107
85	Al2O3	18	20	0.2115	0.0057971	-13.4938	44.7358
85	Al2O3	12	5	0.06882	0.00295	-23.2457	50.6036

4.1 Signal-to-noise ratio for Response Characteristics:
The parameters that influence the output can be categorized into two classes, namely controllable (or design) factors and uncontrollable (or noise) factors. Controllable factors are those factors whose values can be set and easily adjusted by the designer. Uncontrollable factors are the sources of variation often associated with operational environment. The best settings of control factors as they influence the output parameters are determined through experiments.

Depending upon the type of response, the following three types of S/N ratios are employed in practice:

# **Higher the Better:**

 $(S/N) HB = -10 \log (MSDHB)$ 

$$MSD_{HB} = \frac{1}{R} \sum_{i=1}^{R} \left(\frac{1}{Y_{i}}\right)^{2}$$

MSDHB = Mean Square Deviation for higher-the-better response

# Lower the Better:

 $(S/N)_{LB} = -10 \log (MSD_{LB})$ 

Where

 $MSDLB = \frac{1}{R} \sum_{i=1}^{R} (Yi)^2$ 

MSDHB =Mean Square Deviation for Lower-the-better response

:	Material removal rate
:	Higher the better
:	Tool wear rate
:	Lower-the-better
	: : :

# 4.2 ANOVA (Analysis Of Variance):

In statistics, analysis of variance (ANOVA) is a collection of statistical models, and their associated procedures, in which the observed variance is partitioned into components due to different explanatory variables. The initial techniques of the analysis of variance were developed by the statistician and geneticist R. A. Fisher in the 1920s and 1930s, and are sometimes known as Fisher's ANOVA or Fisher's analysis of variance, due to the use of Fisher's F-distribution as part of the test of statistical significance.

# Analysis of MRR:

Analysis of variance (ANOVA) for material removal rate (gm/min) is given in Table 4.2. These values are obtained from Minitab 16 software. It shows that current and powder media are the significant parameters for material removal rate. The increase of peak current will increase the pulse discharge energy channel diameter and hence an increase in the crater diameter and depth which in turn can improve the metal removal rate. Similar trend is observed by S. Habib [24]. With the increase in pulse on-time the MRR decreased. This trend is exactly matching with the results of Kansal et al. [4]. This may be due to reason that with high pulse on time more material gets melted at the tool work piece interface, which require proper flushing time but as the value of pulse off time is too short, so there is not enough time for the flushing to clear the debris from the inter-electrode gap between the tool and work piece, so arcing take place which result in decreasing the MRR. As the MRR is depends mostly on current. Current carrying capacity of any material depends on it electric conductivity. Here Graphite is having highest electric conductivity than Al2O3 and SiC. Therefore MRR is higher in case of Graphite powder.

The value of F ratio is greater than 4 for current, hence this is significant. Remaining parameters are not significant. The relation between material removal rate and respective process parameters are shown in Figure 4.2. Here larger signal to noise ratio is considered as better one, hence values of plot at top positions indicate better results.

Source	DF	Seq SS	Adj MS	F	Р
Powder Media	1	0.000821	0.000821	3.29	0.10 0
Current (A)	2	0.000464	0.000232	0.93	0.42 6
POT (µsec)	2	0.044298	0.022149	88.7 9	0.00 0
Duty Cycle (%)	2	0.001577	0.000788	3.16	0.08 6
Error	10	0.002494	0.000249		
Total	17	0.049655			
S = 0.01579 R-Sq = 95.0% R-Sq(adj) = 91.5%					



## Fig 4.2: Main Effects Plot of SN Ratios for Material Removal Rate (gm/min)

The interaction between process parameters, i.e. the combined effect of parameters on response variables are shown in the Figure 4.3. Considering powder media and current, the lowest value for material removal rate is obtained at 12 A current and SiC as powder media while the highest value is obtained at 18 A current and Graphite.

Considering powder media and POT, the lowest value is obtained at 5  $\mu$ sec POT and SiC as a powder media while highest value is obtained at 5  $\mu$ sec POT and Graphite as powder m media.

Whereas for powder media and duty cycle, lower value is obtained at 90% duty cycle and SiC as powder media while highest value is obtained at 90% duty cycle and Graphite as powder media.

Now, considering current and POT, lower value of material removal rate is obtained at 12 A current and 20 µsec POT while



## Fig 4.3 Interaction Plot for Material Removal Rate (gm/min)

higher value is obtained at 18 A current and 5 µsec POT. For current and duty cycle, lowest value of material removal rate is obtained at 12 A current and 90% duty cycle while highest value is at 18 A current and 85% duty cycle. Whereas for POT and duty cycle, lowest value is obtained at 20 µsec POT and 90% duty cycle while highest value is obtained at 10 µsec POT and 85% duty cycle.

# Analysis of TWR :

Analysis of variance (ANOVA) for tool wear rate (gm/min) is given in Table 4.3. These values are obtained from Minitab 16 software. It shows that current and powder media are the significant parameters for Tool Wear rate. Increasing discharge current results in the melting and evaporation of a larger amount of material from the craters formed on both tool and work surfaces. As the TWR is depends mostly on current. Current carrying capacity of any material depends on it electric conductivity.

Source	DF	Seq SS	Adj MS	F	Р
Duty Cycle (%)	1	0.000001	0.000001	2.50	0.145
Powder Media	2	0.000001	0.000000	2.34	0.146
Current (A)	2	0.000026	0.000013	63.50	0.000
POT (µsec)	2	0.00000	0.000000	1.03	0.392
Error	10	0.000002	0.000000		
Total	17	0.000030			
S = 0.0004565 R-Sq = 93.2% R-Sq(adj) = 88.4%					

 Table 4.3 ANOVA for Tool Wear Rate (gm/min)

Here Graphite is having highest electric conductivity than Al2O3 and Sic. Therefore TWR is higher in case of Graphite powder and lower in case of Al2O3 and SiC. Increasing discharge current results in the melting and evaporation of a larger amount of material from the craters formed on both tool and work surfaces thus TWR increase with current [20].

The value of F ratio is greater than 4 for current, hence this is significant. Remaining parameters are not significant. The relation between Tool wear rate and respective process parameters are shown in Figure 4.4. Here lower signal to noise ratio is considered as better one, hence values of plot at top positions indicate better results.



# Fig 4.4: Main Effects Plot of SN Ratios for Tool Wear Rate (gm/min)

The interaction between process parameters, i.e. the combined effect of parameters on response variables are shown in the Figure 4.13.



Fig 4.5 Interaction Plot for Tool Wear Rate (gm/min)

Considering powder media and current, the lowest value for tool wear rate is obtained at 12A current and SiC as powder media while the highest value is obtained at 18 A current and Graphite. Considering powder media and POT, the lowest value is obtained at 5 µsec POT and SiC as a powder media while highest value is obtained at 5 µsec POT and as powder media. Whereas for powder media and duty cycle, lower value is obtained at 90% duty cycle and SiC as powder media while highest value is obtained at 90% duty cycle and SiC as powder media while highest value is obtained at 90% duty cycle and SiC as powder media while highest value is obtained at 90% duty cycle and SiC as powder media.

Now, considering current and POT, lower value of material removal rate is obtained at 12 A current and 30 µsec POT while higher value is obtained at 18 A current and 5 µsec POT. For current and duty cycle, lowest value of Tool wear rate is obtained at 12 A current and 90% duty cycle while highest value is at 18 A current and 85% duty cycle. Whereas for POT and duty cycle, lowest value is obtained at 30 µsec POT and 90% duty cycle while highest value is obtained at 10 µsec POT and 85% duty cycle.

# V. CONCLUSION

Powder mixing into the dielectric fluid of EDM is one of the innovative developments that ensure better machining rates at desired surface quality and at reduced tool wear rate. The present work on addition of powder in Kerosene based on trial and main experiments resulted in high MRR and minimum TWR. The results are obtained from the present investigation for selecting the optimum machining conditions for Inconel-718 work material, which is extensively used in steam turbine, rocket engine, and exhaust system of formula one car. Within the range of parameters selected the following specific conclusions are drawn from the experimental results.

- Maximum MRR is obtained at a high peak current of 18 A, a moderate Ton of 5µs, duty cycle 85% and Graphite as powder media.
- Low TWR is achieved at a current of 12 A, a moderate Ton of 20 µs, duty cycle 90% and SiC as powder media.

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Authors

First Author - Mahendra G. Rathi, HOD (Workshop), Government College of Engineering, Aurangabad, Maharashtra, India.

mgrathi\_kumar@yahoo.co.in, +91-9049504930

**Second Author** – Deepak V. Mane, PG Student, Dept. of Mechanical Engineering, Government College of Engineering, Aurangabad, Maharashtra, India.

deepakvmane@gmail.com, + 91-9922504914

# Are Smart Buildings Same as Green Certified Buildings? A Comparative Analysis

## Zakari Amamata<sup>\*</sup>, Bashir Faizah Mohammed <sup>\*\*</sup>and Badiru Yunus Yusuf<sup>\*\*</sup>

\* Department of Property Management, Faculty of Geo-information and Real Estate, Universiti Teknologi Malaysia & Department of Estate Management Federal Polytechnic Bauchi, P. M. B. 0231 Nigeria

\*\* Department of Architecture, Faculty of Built Environment, Universiti Teknologi Malaysia81300 Skudai Johor Malaysia

*Abstract-* The adoption of sustainable Architecture shows that green building is a key element for successful built environment in this dispensation, which call for policy innovative as an ingredient to enable the paradigm shift in the building industry and create guidance towards a sustainable future. More often the smart buildings are usually mistaken for green buildings and they are different in terms of construction materials and intentions and level of sustainability. The aim of this paper is to differentiate amongst buildings that have been rate rated by some selected countries which include; USA's Leadership in Energy and Environmental Design (LEED) UK's Building Research Establishment Environmental Assessment Methodology (BREEAM) and the Malaysia's Green Building Index (GBI). A review of literature on the current dispensation of sustainable buildings was carried out from various data bases which include internet and other books source to come with the comparison between green buildings and smart buildings'. This method is based on review of literature. Smart buildings and green buildings are both subset of the sustainable buildings and are might have some similar characteristics but might be different as mostly smart buildings are technological oriented as they rely more on information Technology (IT)

Index Terms- Green Certified Buildings, Smart Buildings, Sustainable buildings, Technology

### 1. INTRODUCTION

The research look into green buildings and various types available with special consideration on smart buildings which is a sub-set of green buildings. These buildings are been rated with different rating tools and categories. On one hand green buildings have swept the construction industry since the year 2000, with commercial buildings taking the lead and office building in the trail. A green building is one that considers and reduces its impact on the environment and human health. Sustainable-green building is a subset of sustainable construction, representing simply the structure. While sustainable construction most comprehensively addressed the ecological, social, and economic issue of a building in the context of its community Kibert, (1994) and Yudelson, (2009). On the other hand, smart buildings have some criteria of green building which are; integration of building systems on a common IT infrastructure or shared network utilizing open protocol and common HMI; high-performance building performance and energy efficiency and use open protocol and are technology neutral strategies that add long-term, sustainable value to the property. Smart buildings successfully merge building management and IT systems that can dynamically optimize system performance and simplify facility operations. Integration greatly reduces both the hardware expense and frustration associated with installing and operating multiple autonomous building systems.

#### Energy, climate and building policies

Policies to enhance energy conservation, efficiency and sustainable planning at the local building authority level are more common in developed countries while in the developing countries these policies are less common (Siong, 2006). Many cities and towns have embraced sustainability as solution and a long term approach to advancement in activities and growth. This as an ingredient to enable the paradigm shift in the building industry and create guidance towards a sustainable future (Mondazzi, 2008).



#### Fig.1 Conceptualization concept of sustainability

The Brundtland report (1987) and the Rio declaration(1992) which were published under the title 'Task for the 21th Century' served as a guiding principles for the implementation of 'sustainable development' It require the participation of all professionals from the various field of science and various sectors of the economy and society (Kunszt, 2003). The International Union of Architects (UIA) and the International Council for Building Research (CIB) played a key-role in the detail study of the tasks of sustainable architecture and sustainable construction. After the first International Symposium of sustainable Construction in Tampa, Florida in 1994, Kibert's definition for sustainable construction was unanimously accepted as a first approximation and was emphasized by CIB in its publication title AGENDA 21.

Fig. 2 Three perspectives on sustainable design: source adopted. (Edwards, 2005)



**Construction Ecology**- The process used in producing most building materials; bricks, cement, glass and steel required a great no of thermal energy, which may add to the adverse effect of climate change. The use of environment-friendly building materials, the treatment and the reutilization of solid waste materials all cause serious ecological problems that, the comprehensive solution is beyond the scope of architecture or construction technology. Although there are measure that an Architect could put in place in the designing and construction of buildings that would reduce an adverse effect on the ecology with regard to climate change

**Social-Cultural Requirements**-Critics of globalization have identify that quite a number of countries, region and cities would lose their identity with the advent to globalized the world and Architecture has a key-role in the preservation of identity, which is a reflection of how we can deal with the environmental issue in a more measurable terms. Besides providing solutions to eliminate or minimize environmental problems, there is need for a holistic approach to a sustainable environment

### II. PURPOSE OF THE STUDY

The purpose of this work is mainly to differentiate amongst building that have been rate rated by some selected countries which include; USA's LEED, UK's BREEAM, and the Malaysia's GBI

## III. RESEARCH METHODOLOGY

A review of literature on the current dispensation of sustainable buildings was carried out from various data bases which include internet and other books source to come with the comparison between green buildings and smart buildings'. This method is based on review of literature Creswell (2012).

# A. Smart Buildings Have Several Things In Common:

- Integration of building systems on a common IT infrastructure or shared network utilizing open protocol and common HMI.
- High-performance buildings that provide significant benefits to building owners, property/facility management professionals, and end-users.
- Maximize building performance and energy efficiency.
- Use open protocol and are technology neutral strategies that add long-term, sustainable value to the property.



Fig. 3: A pie chart showing commercial building Electrical consumption with varying percentage The New Straits Times Press Malaysia

Smart buildings successfully merge building management and IT systems that can dynamically optimize system performance and simplify facility operations. Integration greatly reduces both the hardware expense and frustration associated with installing and operating multiple autonomous building systems.

# a. How They Work

Integration begins with a common IT backbone or infrastructure; the majority of buildings utilize separate and usually proprietary systems that have their own controls, protocol, cabling, and HMI. Once individual building systems are integrated onto one network they can be monitored and controlled by a single interface, accessible via a secure Web browser for unlimited user access. Additional use of a network operating center (NOC) allows for 24/7 monitoring and control of an unlimited number of equipment, systems, and buildings by personnel with the proper training and skill set. Utilizing open-protocol such as LonWorks® and BACnet® allows the building systems to employ the best sensors and technology on the market while not being tied to a particular vendor or manufacturer.

# b. Benefits and Capabilities

- *Tenant attraction and retention.* A significant benefit to the building owner is the expectation that smart buildings can demand above-market rents, have lower vacancy rates, and can reduce turnover through higher customer service, added technologies, and increased efficiencies.
- *Reduced operating costs.* Smart buildings are usually highly efficient buildings where operating costs are significantly lower than comparable buildings. Using accurate, intelligent monitoring and control of energy-intensive systems such as HVAC and lighting help reduce costs.
- *Energy metering*. Integrated systems allow for sub-metering of individual tenants; tracking and automatically invoice tenants for their energy use. This not only gives the tenant control of their electrical costs but may allow for shared savings through demand response programs.
- *Fast and effective service*. Smart building technologies give building management professionals the tools they need to better serve tenants, occupants, and users. Accessing building systems via the Internet makes it easier for facilities professionals to assess real-time conditions, detect problems, and monitor building performance off-site. Problems are identified early and solved immediately, sometimes prior to the customer realizing there is a problem.
- *Simplified operations management.* Changes to a system can be made from a network operations center (NOC). The result is a leaner facility management operation which directly correlates to reduced labor costs.

- *Enhanced life safety and security.* A fire situation is perhaps the most commonly cited example of how integrated systems are beneficial. A fire alarm is triggered and the integrated building systems respond: Smoke exhaust dampers open and fans operate, the paging and intercom system warns the occupants and issues instructions, the access-control system unlocks doors for evacuation, lighting is turned on, and security cameras provide emergency personnel with a view of the fire.
- *Mobile security systems.* A Web-based security system allows security personnel the ability to view live video from surveillance cameras on a laptop or portable device. Future technology. Since technology and equipment are changing rapidly, a building with an IT backbone utilizing open protocol will be ready to support almost anything that comes onto the market. Additionally, with tenant needs changing, a smart building is flexible enough to adapt quickly.
- Added revenue stream. Smart buildings can offer occupants wired and wireless high-speed Internet along with other communications services such as Voice over Internet Protocol (VOIP) that will maximize the building's revenue per square foot.
- *Environmentally friendly.* Monitoring and control of energy use for the purpose of reducing consumption defines a green building. While it may be possible to have a green building that isn't smart, all green buildings will have some form of a building automation system (BAS). The BAS could allow a daylight-harvesting system to work together through an IT backbone with interior lights and photoelectric and occupancy sensors to provide optimum light levels and save energy use.

## **B.** Green Buildings'

## Sustainable design

The concept of sustainable development can be traced to the energy (especially fossil oil) crisis and the environmental pollution in the (1970's)shortage of energy, global warming, urban sprawl, air pollution, overflowing landfills, water shortage, disease and global conflict will be the legacy of the twenty first century unless the movement of sustainability is implemented (Ali, 2008). In broader perspective sustainability main goal is to strike a balance of interaction amongst; biological resource system, the economic system and the socio-cultural system (Newman, 2001). According to Yudelson (2009), green building is the one that considers its impact on the environment and human health; while, high-performance building design is the building that has gain the certification from a third party certifier like; USA's LEED, UK's BREEAM, Singapore's GREEN MARK or the Malaysia's GBI.

- Sustainable/green building is a subset of sustainable construction, representing simply the structure. While sustainable construction most comprehensively addressed the ecological, social and economic issue of a building in the context of its community (Kibert, 2007)
- Green buildings are part of a global response to increasing awareness of the role of human activity in causing global climate change. Buildings account for more than 40% of all global carbon-dioxide emissions, one of the main culprits implicated in the phenomenon of global warming.
- Green buildings have swept the construction industry since the year 2000, with commercial buildings taking the lead and office building in the trail (Yudelson, 2009). A green building is one that considers and reduces its impact on the environment and human health.
- Green building, sustainable construction, high performance buildings are mostly used interchangeably but are difference. Sustainable/green buildings can be defined as the facilities which are the outcome of sustainable construction for the purpose of promoting occupant health and resource efficiency, minimizing the impacts of the built environment on the natural ecology system (Kibert, 2004)

## **IV. CONCLUSION**

The past two decades have witnessed a rapid increase in the number of Sustainable Building Rating System (SBRS) used worldwide; SBRS have played an important role in the sustainable construction delivery system with LEED taking the lead and BREEAM achieving great success in several countries (Xiaoping, *et al.*, 2009). From studies conducted it is clear that all of these tools pointing to a single similar objective that's the implementing the principles of sustainability. Obviously the differences among these tools are also significant as elaborated below (Xiaoping, *et al.*, 2009). There is a great different in temperate, tropical and the Mediterranean climatic conditions as well as the cultural and political diversities, this lead to the party that are involve in the development of the SBRS tools. LEED and BREEAM are established by non-profit third party. Some of these tools have a weighting system while some other don't have weighting systems. These weighting systems were used to establish the difference between green buildings and smart which is that both green buildings are those buildings that have been rated by a rating (weighting system) while a smart building might reduce the impact on the environment but if not rated it is no considered as a green building.

Smart buildings and green buildings are both subset of the sustainable buildings and are might have some similar characteristics but might be different as mostly smart buildings are technological oriented as they rely more on information Technology (IT)

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#### AUTHORS

First Author – Amamata Zakari, M. Sc. Real Estate UTM Malaysia and <u>amazak4real@yahoo.com</u> Second Author – Faizah Mohammed Basir, B.Tech Architecture MAUTECH Nigeria and <u>faizahbash@yahoo.com</u> Third Author – Badiru Yunus Yusuf M.Sc. Architecture ABU Zaria Nigeria and <u>badiru.yusuf@gmail.com</u>

Correspondence Author - Amamata Zakari, amazak4real@yahoo.com, amazak4real@gmail.com

# A survey on regenerating codes

V. Anto Vins<sup>\*</sup>, S.Umamageswari<sup>\*\*</sup>, P.Saranya<sup>\*\*</sup>

<sup>\*</sup> P.G Scholar, Department of CSE, Prathyusha Institute of Technology and Management, Tiruvallur- 602025 <sup>\*\*</sup> Associate Professor, Department of CSE, Prathyusha Institute of Technology and Management, Tiruvallur- 602025

*Abstract*- Cloud computing refers to the various remote systems interconnected through the internet. We can outsource data, software, infrastructure from the cloud environments. Once we outsource storage there is a possibility for the data for the data to get corrupted or be hacked. The general solution is to stripe the data across multiple servers. In the setting the repair traffic will be high and the fault tolerance will be low. In order to improve the storage efficiency and the repair traffic regenerating codes have been use. In this paper we will discuss about the various regenerating codes that have evolved from time to time.

*Index Terms*- Erasure coding, regenerating codes, cloud storage, I/O overhead.

#### I. INTRODUCTION

Due to the decreased storage pricing and the decreasing bandwidth, leading IT firms implement software as a Service(SaaS), Infrastructure as a service(IaaS) inside their data centers. This new paradigm of providing services and infrastructure is called cloud computing. The volume of data generated and stored by the cloud users is rapidly increasing exponentially everyday. In order to maintain the massive volume of data being stored, cloud storage systems must be scalable. In this case, it becomes a major challenge for cloud storage systems to maintain data integrity due to large volume of data and the large number of disks used. Even though the number of disk failures is small within a data center, it may increase due to the addition of the large volumes of disks. Moreover other systems in the data center may cause outages of data, making data unavailable or even get lost.

To guarantee the integrity of data stored in the cloud, it is natural to store replicas in multiple cases, such that data loses can be managed when there is atleast one replica running. However, replicas can significantly reduce the storage efficiency. For example, if data are stored with 3-way replication, the effective storage space can be no better than 1/3 of the total consumed storage space. If the design objective is to maximize the storage efficiency without sacrificing the ability to tolerate disk failures, the storage system should store data encoded by erasure coding. Before the emergence of cloud computing, erasure coding has long been proposed to detect or correct errors in storage or communication systems. For example, RAID 6 can compensate for at most 2 disk failures by parity coding, whose storage efficiency is at most 1 - (2/n) where n is the total number of disks. Reed-Solomon codes can provide even more flexibility such that any number of disk failures under a certain threshold can be tolerated. Wual<sup>[1]</sup>, an online secure storage service, uses Reed-Solomon codes to ensure data integrity, by encoding data with Reed-Solomon codes after encryption.

However, two main drawbacks conventionally prevent erasure coding from being practical and popular in cloud storage. First, to read or write data, the system needs to encode or decode data, leading to a high access latency and a low access throughput due to the CPU limit. Second, though erasure coding stores data as multiple coded blocks, when one coded block gets lost, the system must access multiple coded blocks that are sufficient to recover all the data. This overhead makes the repair with erasure coding very expensive in terms of both bandwidth and disk I/O overhead. Unfortunately, applications hosted in the cloud are sensitive to the disk I/O performance, and bandwidth is always a limited resource inside the data center since most data centers introduce link oversubscription<sup>[2]</sup>.

In this paper, we examine recent advances of these coding techniques. Specifically, we introduce coding techniques that optimize the overhead of data repair in the objective of minimizing the bandwidth consumption and increasing the storage efficiency. Due to the high frequency of data repairs and the high repair overhead of conventional erasure coding, optimizations in both of these two axes fall into the considerations of data repair.

For bandwidth consumption, Dimakis et al<sup>[3]</sup> proposed a family of regenerating codes. Based on a model inspired by network coding, the repairs of coded data can be modeled into an information flow graph, with a constraint that maintains the ability to tolerate disk failures. Based on this model, an optimal tradeoff between storage and bandwidth can be derived, such that given the amount of data stored on the disk, we can obtain an optimal lower bound of the amount of data that should be transferred during the repair. In the tradeoff curve, two extreme points attract much more attention than interior points, corresponding to the minimum storage cost and the minimum bandwidth cost, respectively. To achieve these two extreme points, many papers proposed instances of regenerating codes that either construct randomized codes that maintain the tolerance against disk failures with a high probability, or construct deterministic codes using interference alignment. With the help of deterministic coding, lost data can be repaired exactly, suggesting that we can construct systematic codes to achieve an access latency as low as replicas. Moreover, cooperative regenerating codes make it possible to repair from multiple disk failures with an even lower bound of bandwidth consumption, with the help of cooperation among participating servers. In this paper, we examine the various available regenerating codes and their significance.

#### II. ERASURE CODING AND ITS PERFORMANCE METRICS

#### A. Erasure codes in Storage Systems

In a storage system where data are stored on a large number of commodity disks, it is clear that disk failures cannot be considered as just exceptions, but as a rule. Therefore, the storage system has to store redundancy such that when a certain number of disks lose data, data can still be accessible from other disks. For example, the N -way replication, which stores N replicas in N different disks, is able to tolerate at most N - 1 disk failures. Figure 1a illustrates an example of 3-way replication, where the original data are disseminated into 3 different disks and any one disk is able to repair or access the original data. However, N -way replication can only achieve a storage efficiency of 1\N at best. Erasure coding, on the other hand, is able to tolerate the same number of disk failures, yet with a much better storage efficiency. Among erasure coding, Maximum Distance Separable (MDS) codes (e.g., Reed-Solomon codes<sup>[4]</sup>) achieve the optimal storage efficiency. Suppose that in the storage system, data are organized in the unit of data object, which may correspond to a file or a fix-sized block in different storage systems. Assume that a data object can be stored onto n disks. Given an arbitrary number of k, where k < n, (n, k) MDS codes can guarantee to



Fig. 1 Comparison of 3-way replication and (5,3) MDS codes. In 3-way replication, the original data object is replicated into 3 different disks, such that any bit of data can be obtained from any one disk. In (5,3) MDS codes, data are encoded into smaller blocks in which any three can be decoded into the original data.

tolerate at most n - k disk failures, i.e., k disks are sufficient to access any bit of the original data. Specifically, the data object is encoded into n coded blocks and are uniformly disseminated into the n disks. Suppose the size of the data object is M bits, the size of each coded block should be M\k bits, if we do not consider the metadata of the data object. In this sense, the storage efficiency of MDS codes is at best k\n. Compared to the 3-way replication as shown in Fig. 1b, (5; 3)MDS codes can still tolerate at most 2 disk failures, while improving the storage efficiency by 80%. To access the data object, the system needs to access k different coded blocks (from k different disks) and recover the original data object by the decoding algorithm of the corresponding MDS codes. Apparently, the decoding algorithm incurs an additional access latency. To improve the access latency, the storage system can use a cache to store one replica of the original data object as well<sup>[5]</sup>. Recovering the whole data object for data access may sound reasonable in most cases. However, from the point of view of the storage system, it is totally unnecessary to recover the whole data object if we only need to repair one lost coded block, as what we need is just a very small portion of the data object. Unfortunately, before the appearance of regenerating codes, all MDS codes, to our best knowledge, require to access at least k disks to repair even only one disk, while in the case of replication, to repair one replica we only need to transfer one replica. This requirement can dramatically increase bandwidth overhead in a data center, and significantly affect the performance of the storage system and other applications hosted in the cloud.

## B. Performance Metrics

It has been made clear that it is not enough to consider only the storage efficiency and the tolerance against disk failures in cloud storage systems. The performance metrics that should be considered when designing erasure coding for cloud storage should also include:

• *Repair Bandwidth:* To repair failed disk, data stored on that disk should be repaired in a replacement disk. The server with the replacement disk, called a newcomer, needs to retrieve data from some existing disks. If the servers that host these existing disks, called providers, send out the raw data of their coded blocks, the bandwidth used to transmit the existing coded blocks equals the size of these coded blocks and then the newcomer encodes the received data by itself to generate the lost data. However, if encoding operations can be performed both on the newcomer and providers rather than on the newcomer only, a much smaller amount of data can be transferred.

In the pioneering paper of Dimakis et al<sup>[3]</sup>, a surprising and promising result was shown that the bandwidth used in the repair can be approximately as low as the size of the repaired block by encoding operations of providers and the family of erasure codes that achieves the optimal bandwidth consumption during the repair was called regenerating codes.

- *Repair I/O*. Besides bandwidth, another performance metric in the repair for erasure coding is disk I/O at the participating servers. Specifically, the writing operations are performed only at the newcomer, and the amount of data written should equal the size of the coded block. As the writing operations are unavoidable, what we really care is actually the amount of data read from disks of providers. Similar to the bandwidth consumption, conventional erasure codes will ask for providers to read k blocks in total just to repair one block.
- Access latency. Due to the decoding operations, the access latency of data encoded by erasure coding has to be much larger than replicas. However, systematic codes, in which the original data can be embedded into code blocks, are able to maintain a higher storage efficiency than replicas while achieving a low access latency, since we now only need to access the systematic part with no decoding operations. This attractive property of systematic codes comes with a high price that makes the repair much more complex

than non-systematic codes, because the repaired data should be exactly the same as the lost data, at least for the embedded original data. Therefore, the deterministic construction of codes must be considered when designing systematic erasure codes for cloud storage.

• Storage efficiency. The storage efficiency denotes the ratio of the amount of the original data to the actual amount of data stored on disks. In other words, given the same amount of data, with a higher storage efficiency we can use a smaller amount of storage space to tolerate the same number of disk failures. MDS codes achieve the optimal storage efficiency, i.e., given n and k, MDS codes can be constructed such that any k among all n coded blocks are sufficient to recover the original data.)

#### III. VARIETIES OF REGENERATING CODES

## A. Information Flow Graph

To investigate the bandwidth consumption in repairs with erasure coding, Dimakis et al.<sup>[3]</sup> proposed to use the information flow graph, which is a tool used in the analysis of network coding, as a model to characterize the tradeoff between storage and bandwidth.

As shown in Fig. 2, in the information flow graph, all servers can be categorized as the source, storage nodes, and the data collector. The source denotes the server where the data object is originated. Suppose that the size of the data object is M bits. After encoding, coded blocks of  $\alpha$  bits are disseminated into n storage nodes. Particularly, the source is represented by a vertex and a storage node is represented by two vertices in the information flow graph. The weight of the edge corresponds to the amount of data stored in the storage node. Thus, after the dissemination, all n storage nodes store  $\alpha$  bits and any k of them suffice to recover the original data object, suggesting that  $k^{\alpha} \leq$ M A virtual vertex called data collector is able to connect to any k storage nodes to recover the original data object. When a storage node fails, a newcomer does not just connect to k available storage nodes, but d storage nodes as providers (d  $\leq$  k). Different from



## Fig 2: An illustration of the information flow graph that corresponds to (4,2) MDS codes. This figure was firstly shown in Ref. [9].

conventional MDS codes, the newcomer can receive  $\beta$  bits from each provider,  $\beta \leq \alpha$  represented by the weight of the edge between the provider and the newcomer. After receiving a total of  $\mathbf{r} = d\beta$  bits from providers, the newcomer stores  $\alpha$  bits and becomes a new storage node. It is required that after any rounds of repairs, the MDS property that any k coded blocks suffice to recover the original data object always holds. In other words, the data collector can connect to not only the storage nodes that receive data directly from the source, but the storage nodes repaired from newcomers in repairs as well. Besides, the weights of edges attached to the source or the data collector are all set to be infinity.

Therefore, the repair problem in the storage system can be interpreted as a multicast problem in the information flow graph, where the source is multicasting data to all possible data collectors. It is well known in the multicast problem that the maximum multicast rate equals the minimum cut separating the source from any receivers, and this rate can be achieved through network coding<sup>[6]</sup>. Thus, it can be proved that the MDS property holds after any rounds of repairs, if the min-cut in the information flow graph is no less that the size of the original data object. By calculating the minimum min-cut in the information flow graph, given d and  $\beta$  we can derive the minimum value of  $\alpha$ , and then we obtain the tradeoff curve between  $\alpha$  and the total bandwidth consumption r.

## B. Minimum-storage Regenerating codes and minimum-bandwidth regenerating codes

The codes that achieve that the min-cut in the information flow graph equals the amount of the data object is called regenerating codes. Given the tradeoff between storage  $\alpha$  and bandwidth r, two special cases of regenerating codes interest us most, which correspond to the minimum storage space required at storage nodes and the minimum total bandwidth consumption in the repair, respectively.

The regenerating codes that achieve the minimum storage in storage nodes is called Minimum-Storage Regenerating (MSR) codes, where

 $(\alpha_{MSR}, r_{MSR}) = (k^{\frac{M}{k}}, \frac{Md}{k(d-k+1)})$ . Notice that now  $\alpha$  equals to the size of coded blocks of conventional MDS codes, and thus MSR codes can be regarded as MDS codes. However, since  $\frac{Md}{r=k(d-k+1)} \rightarrow \frac{M}{k}$  as  $d \rightarrow \infty$ , MSR codes consume bandwidth in the repair approximately the same as the amount of one coded block, while conventional MDS codes consume bandwidth that equals the size of k coded blocks. In this sense, MSR codes save a significant amount of bandwidth in the repair.

The other extreme points in the tradeoff between storage and bandwidth is called Minimum-Bandwidth Regenerating (MBR)  $\frac{2Md}{codes}$ , where  $(\alpha_{MBR}, r_{MBR}) = (k(2d-k+1), k(2d-k+1))MSR$  codes achieve the minimum bandwidth consumption among regenerating codes. Though MBR codes require more storage than MSR codes, the newcomer only needs to receive exactly the

amount of data it needs to repair, and the storage and bandwidth

both converge to **k** when d is large enough.

To implement regenerating codes, the simplest way is to use random linear coding<sup>[7]</sup> which is inspired by network coding. Dividing the original data object into k blocks, a coded block produced by random linear coding is a random linear combination of the k blocks. The encoding operations are performed on a Galois field  $GF(2^{q})$ . As a Galois field size of  $2^{8}$ corresponds to a byte in the computer, q is usually set to be an integral times of 8 to make encoding operations convenient. Given any k coded blocks and their coding coefficients, the decoding operations are just solving the corresponding linear system with k unknowns (i.e., original blocks) and k equations. When q is large enough, such as 16 or 32, any k coded blocks can be decoded with a very high probability.

On the other hand, the randomized construction of regenerating codes can suffer from a significant computational complexity, especially when parameters are not properly selected<sup>[8]</sup>. In additional, by no means the randomized regenerating codes can guarantee to repair data exactly as the lost data. Even worse, even a very large Galois field cannot ensure that any k code blocks are decodable, but only with a very high probability, due to the randomized coefficients. The number of repairs, however, cannot be easily limited, suggesting that after a large number of repairs data integrity cannot be maintained, as the randomness accumulates gradually in coded blocks.

Therefore, it is necessary to find explicit construction of regenerating codes, especially for MSR and MBR codes. Further, it is desirable that the lost block can be repaired exactly given the explicit construction.

## C. Exact Regenerating codes

The most important tool used to construct exact regenerating codes is interference alignment, which is initially proposed for wireless communication. The basic idea of interference alignment is that the undesired vectors can be eliminated by aligning them onto the same linear subspace. Figure 3 illustrates how interference alignment helps to achieve exact regenerating codes.

We suppose that in Fig. 3 data are encoded by (n=4, k=2, d =3) MSR codes, i.e., any two of the four nodes can recover the original file. In each storage node, each coded block contains two coded segments, such as  $(A_1, A_2)$  in the failed storage node. To recover  $A_1$  and  $A_2$ , the newcomer contacts 3 storage nodes as providers and downloads half of a coded block, i.e., a coded segment from each provider to achieve the bandwidth consumption of MSR codes. Notice that each provider owns coded segments containing components of B1 and B2, which are undesirable to the newcomer. To eliminate  $B_1$  and  $B_2$ , each provider can send a segment in which  $B_1$  and  $B_2$  are aligned onto the same linear subspace of  $B_1 + B_2$ . Clearly,  $B_1 + B_2$  can be eliminated as one unknown and  $A_1$  and  $A_2$  can be decoded by solving three equations with three unknowns.

As for exact MBR codes, Rashmi et al.<sup>[9]</sup> proposed a Product-Matrix construction which is able to explicitly construct (n,k,d) exact MBR codes on a finite field of size n or higher with any choices of n, k, d if  $k \leq d < n$ . The Product-Matrix construction produces vector MBR codes such that a coded block contains

multiplecoded segments, just like the example shown in Fig. 3. As for exact MSR codes, the choices of parameters



## Fig 3: An example of (4,2,3) exact MSR codes. By interference alignment, the loss of (A1,A2) can be repaired exactly since B1 and B2 are eliminated by aligning them onto **B1** + **B2** in three providers.

become more complicated. Suh and Ramchandran<sup>[10]</sup> proposed an explicit construction of scalar exact MSR codes where  $d \ge 2k - 1$ , over a finite field of size atleast 2(n-k). Rashmi et al<sup>[9]</sup> improved the choices of parameters such that  $d \ge 2k-2$ , by constructing exact MSR codes using the Product-Matrix construction, with a larger finite field of size at least n.(d-k+1). In Ref [11], Shah et al. had proved that no scalar exact MSR codes exist when d <2k-3.

Cadambe et al<sup>[12]</sup>. and Suh and Ramchandran<sup>[13]</sup> showed that any choices of (n, k, d) could be achieved asymptotically when constructing vector exact MSR codes, as the field size goes to infinity. Constructing regenerating codes on a very large finite field is impractical due to its overwhelming encoding/decoding overhead. Papailiopoulos and Dimakis<sup>[14]</sup> showed that (n = k + 2), k, d = k+ 1) vector exact MSR codes can be constructed explicitly, combining interference alignment and Hadamard matrices.

Since the exact repair makes much more sense for the systemmatic part than the parity part of exact regenerating codes, we can construct hybrid regenerating codes that only support the exact repair of the systematic part while the parity part is still repaired by the functional repair.  $Wu^{[15]}$  constructed the (n,k,d = k+1) hybrid vector MSR codes when  $2k \le n$ , where the field size (2n – 1)

is greater than  $2^{12n} - 1^{1}$ . Tamo et al<sup>[16]</sup> and Cadambe et al<sup>[17]</sup> both proposed (n,k,d = n-1) hybrid MSR codes for arbitrary n and k.

# D. Cooperative regenerating codes

In some storage systems, such as Total Recall<sup>[18]</sup>, in order to prevent unnecessary repairs incurred by temporary node departures, the system repairs failed nodes in batch when the number of failed nodes reaches a certain threshold. Hu et al.<sup>[19]</sup> first found that if newcomers can cooperate, there exist cooperative regenerating codes that achieve a better tradeoff curve between storage and bandwidth. Still analyzing the min-cut in the information flow graph, Hu et al.<sup>[19]</sup> showed that (n, k, d = n - t, t) randomized Minimum Storage Cooperative Regenerating (MSCR) codes can achieve the bandwidth consumption of  $\frac{M}{k} \cdot \frac{n-1}{n-k}$  with t providers  $(n-t \ge k)$ . Notice that the bandwidth consumption is independent of the number of providers.

A more general result of the bound of bandwidth consumption is shown that per newcomer,  $(\alpha_{MSCR}, \beta_{MSCR}) = (\frac{M}{k}, \frac{M}{k}, \frac{d+t-1}{d+t-k})$ <sup>[20,21]</sup> and  $(\alpha_{MSCR}, \beta_{MSCR}) = (\frac{M}{k}, \frac{2d+t-1}{2d+t-k}, \frac{M}{k}, \frac{2d+t-1}{2d+t-k})$ <sup>[21]</sup>. Shum and Hu<sup>[22]</sup> proposed an explicit construction of exact (n, k, d = k, t = n - k) MBCR codes. Wang and Zhang<sup>[23]</sup> showed that as for all possible values of (n,k,d,t), there exist explicit constructions of exact MBCR on a field of size at least n. On the other hand, when  $d = k \neq n - t$ , (n, k, d, t) scalar MSCR codes can be constructed<sup>[20]</sup>. Le Scouarnec<sup>[24]</sup> discussed the construction of exact MSCR codes with some other choices of parameters when  $d \ge k = 2$ . The existence of exact MSCR codes with other values of parameters still remains an open problem.

## E. Repair-by-transfer regenerating codes

The regenerating codes we have mentioned above require providers to encode their data to align vectors in a specific linear subspace and the newcomer to encode received data to eliminate undesired components. The arithmetic operations performed on a finite field can be expensive, if the field size is large. Thus, the cloud storage systems will favor the repair-by transfer property that in the repair no arithmetic operations are required at providers. With the repair-by-transfer property, the disk I/O overhead can be minimal since only data needed by the newcomer will be read from providers. Moreover, the storage node then can have no intelligence, such that its functionality can be implemented by hardware with a low cost. Some choices of parameters have been considered to construct the corresponding repair-by-transfer regenerating codes. Shum and Hu<sup>[25]</sup> and Hu (n, k = 2, d = n - 1)al.<sup>[26\</sup> constructed et and (n, k = n - 2, d = n - 1) functional repair-by transfer MSR codes, respectively. On the other hand, (n, k = n - 2, d = n - 1)exact MBR codes can be constructed over a finite field of size  $2^{[27]}$ . The existence of exact regenerating codes remains an open problem as for most other choices of parameters. The only known result is that if  $d \ge 2$  and  $t \ge 2$ , any (n, k, d, t) linear exact MBCR codes cannot achieve the repair-by-transfer property<sup>[23]</sup>.

Nevertheless, Rashmi et al.<sup>[28]</sup> proposed an intuitive graphbased construction of repair-by-transfer exact MBR codes, where any missing block can only be repaired from its direct neighbors in the graph. Fractional repetition codes are employed in the construction such that direct neighbors share the same segment and the newcomer only needs to receive replicas of the segments from its neighbors to repair itself, where no arithmetic operations are required not only at providers, but at the newcomer as well. It is shown that any (n, k, d = n - 1) MBR codes can be constructed uniquely with this method, n > k. Though repair-bytransfer regenerating codes are able to achieve the minimum disk I/O overhead, only some specific choices of parameters have instances of corresponding regenerating codes so far. Nevertheless, cloud storage systems can have a wide spectrum of parameter choices due to their own requirements. Therefore, it is desirable that erasure coding can achieve low disk I/O overhead with a wide range of parameter choices, even if some properties, such as the MDS property or the storage efficiency, will be sacrificed.

# F. FMSR (Functionally minimum storage regenerating code)

FMSR codes belong to maximum distance separable (MDS)codes. An MDS code is defined by the parameters(n,k), where k<n. It encodes a file F of size |F| into n pieces of size |F|/k each. An (n,k) MDS code states that the original file can be reconstructed from any k out of n pieces (i.e., the total size of data required is |F|). An extra feature of FMSR codes is that a specific piece can be reconstructed from data of size less than |F|. FMSR codes are built on regenerating codes<sup>[9]</sup>, which minimize the repair traffic while preserving the MDS property.

We consider a distributed storage setting in which a file is striped over n servers using an (n,k)-FMSR code. Each server can be a storage site or even a cloud storage provider, and is assumed to be independent of other servers. An (n,k)-FMSR code splits a file of size |F| evenly into k(n-k) native chunks, and encodes them into n(n-k) code chunks,



Fig 4:Example of how a file is repaired in (4,2)- FMSR codes.
Each of the code chunks P1,...., P8 is a random linear combination of the native chunks. *P*1 and *P2* are distinct random linear combinations of P3,P5 and P7

F

where each native and code chunk has size k(n-k). Each code chunk, denoted by Pi (where  $1 \le i \le n(n-k)$ ), is constructed by a random linear combination of the native chunks, similar to the idea in <sup>[29]</sup>. The n(n-k) code chunks are stored in n servers (i.e, n-k code chunks per server), where the k(n-k) code chunks from any k servers can be decoded to reconstruct the original data. Decoding can be done by inverting the encoding matrix<sup>[30]</sup>. FMSR codes are nonsystematic codes that keep only code chunks rather than native chunks. Nevertheless, FMSR codes are mainly designed for long-term archival applications, where the read frequency is low and each read operation typically restores the entire file.

## G. FMSR- DIP (Functionally Minimum Storage Regenerating Code – Data Integrity Protection)

FMSR-DIP codes are implemented atop NCCloud<sup>[31]</sup>. FMSR-DIP<sup>[32]</sup> codes operate in units of bytes. The notations for FMSR-DIP codes are given below. For an (n-k) -FMSR code, we define  $\{\alpha_{ij}\}1 \le i \le n(n-k), 1 \le j \le k(n-k)$  the set of encoding coefficients that encode k(n-k) native chunks  $\{F_j\}1 \le j \le k(n-k)$  into n(n-k) code chunks  $\{P_i\}1 \le i \le n(n-k)$  Thus, each code chunk Pi is formed by  $P_i = \sum_{j=1}^{k(n-k)} \alpha_{ij}F_j$  [32]

All arithmetic operations are performed in the Galois field  $GF(2^{*})$ . However, byte-level operations may make the implementation inefficient in practice, especially for large files. Here, we describe how FMSR-DIP codes can be extended to operate in units of blocks (i.e., a sequence of bytes) to trade security for performance. In the following, we describe the possible tunable parameters that are supported in FMSR-DIP codes. PRP block size. Instead of permuting bytes, we can permute blocks of a tunable size (called the PRP block size). A larger PRP block size increases efficiency, but at the same time decreases security guarantees. PRF block size. In a byte-level PRF operation, we can simply take the first byte of the AES-128 output as the PRF output. In fact, we can also compute a longer PRF and apply the PRF output to a block of bytes of a tunable size (called the PRF block size). To extend the PRF beyond the AES block size (16 bytes), we can pad the nonce with a chain of input blocks of 16 bytes each, and encrypt them using CBC mode. However, setting the PRF block size to larger than 16 bytes shows minimal performance improvement, as AES is invoked once for every 16 bytes of input in CBC mode and the total number of AES invocations remains the same for a larger PRF block size. Check block size. Reading data from cloud storage is priced based on the number of GET requests. In the Check operation, downloading 1 byte per request will incur a huge monetary overhead. To reduce the number of GET requests, we can check a block of bytes of a tunable size (called the check block size). The checked blocks at the same offset of all code chunks will contain multiple rows of bytes. Although not necessary, it is recommended to set the check block size as a multiple of the PRF block size, so as to align with the PRF block operations.

AECC parameters: The AECC parameters ðn0; k0P control the error tolerance within a code chunk and the domain size of the PRP being used in AECC. Given the same k0, a larger n0 implies better protection, but introduces a higher computational overhead.

*Checking percentage*. The checking percentage \_ defines the percentage of a file to be checked in the Check operation. A larger \_ implies more robust checking, at the expense of both higher monetary and performance overheads with more data to download and check.

# H. Flat XOR Codes

Flat Xor-based<sup>[33]</sup> codes make use of Minimal Erasure List(MEL),a fault tolerance metric for flat codes<sup>[34]</sup>. Second it makes use of Fault Tolerance Vector another fault tolerance metric for flat codes. The reliability of flat xor codes is determined by High-Fidelity Reliability Simulator<sup>[35]</sup>. The HFR Simulator is used to validate the efficacy of the redundancy placement algorithms. Traditionally, the Hamming distance is used to describe the fault tolerance of an erasure code: a code tolerates all sets of erasures smaller than the Hamming distance. The Hamming distance completely describes the fault tolerance of MDS codes, since all erasures at or beyond the Hamming distance result in data loss. Flat erasure codes can be nonMDS: they tolerate some sets of erasures at and beyond the Hamming distance. We previously developed the Minimal Erasures (ME) Algorithm to efficiently analyze a flat erasure code and characterize its fault tolerance  $[^{34]}$ . Consider the following definitions: A set of erasures is a set of erased symbols; an

erasure pattern is a set of erasures that results in at least one data symbol being irrecoverable; and, a minimal erasure is an erasure pattern in which every erasure is necessary and sufficient for it to be an erasure pattern. The ME Algorithm determines the minimal erasures list (MEL) of an erasure code: the list of the code's minimal erasures, which completely describes the fault tolerance of an erasure code. The MEL can be transformed into a minimal erasures vector MEV in which the ith element is the total number of minimal erasures of size i in the MEL. The length of the shortest minimal erasure in the MEL is the Hamming distance of the code, and so the first non-zero entry in the MEV corresponds to the Hamming distance.

For instance, consider (4,4)-RAID 10 specified by the parity bitmaps (1, 2, 4, 8). The first parity symbol for this code, <sup>5</sup>4, is simply a replica of  $S_0$  and so the bitmap is 1 (i.e.,  $S_4 = S_0$  because  $1 = 2^{\circ}$ ). A more complex example is (5,3)-FLAT with parity bitmaps (7, 11, 29). The first parity symbol for this code, <sup>55</sup>, has bitmap 7 because it is computed as the XOR of data symbols  $s_0, s_1$  and  $s_{2(1.6.5)} = s_0 \oplus s_1 \oplus s_2$  because  $7 = 2^0 + 2^1 + 2^2$ . The (4,4)-RAID 10 code is an example of a common RAID technique that simply replicates each data symbol. RAID 10 is a flat erasure code that tolerates any single disk failure. The MEL for the code is  $\{(s_0, s_4), (s_1, s_5), (s_2, s_6), (s_3, s_7)\}$  and the MEV is (0, 4, 0, 0). The MEL for (4,4)-RAID 10 is intuitive: whenever any pair of devices that store the same replicated symbol fails, data is lost. The MEV simply summarizes the count of minimal erasures of each size up to m. The MEL for (5,3)-FLAT is  $(s_4, s_7), (s_0, s_1, s_4), (s_0, s_1, s_7), (s_0, s_2, s_6),$ 

$$(s_1, s_2, s_3), (s_1, s_5, s_6), (s_2, s_4, s_5)$$

 $(s_2, s_5, s_7), (s_2, s_4, s_6), (s_2, s_6, s_7)$ , and, the MEV is (0, 1, 10). This code better illustrates the irregularity that non-MDS flat codes can exhibit. There is no obvious structure or symmetry to the sets of device failures which lead to data loss. The Fault Tolerance Vector (FTV) indicates the probability that data is lost given some number of failures. To construct the FTV, the MEL is transformed into the erasures list (EL). The erasures list consists of every erasure pattern for a code. The EL is a super set of the MEL, and every element in it is either a minimal erasure or a super set of at least one minimal erasure. The erasures vector (EV) is to the EL what the MEV is to the MEL, and is easily determined given the EL. Finally, the EV is transformed into the FTV. Let the ith entry of the FTV is  $e_i/\binom{n}{i}$ . The FTV is the complement of the conditional probabilities vector described by Hafner and Rao<sup>[36]</sup>

The High-Fidelity Reliability (HFR) Simulator<sup>[35]</sup> is similar to the simulator developed by Elerath and Pecht<sup>[37]</sup>. Both are Monte Carlo reliability simulators that simulate disk failure, disk recovery, sector failure, and sector scrubbing, and both can useWeibull distributions for such failure and recovery rates. However, the HFR Simulator is high-fidelity in the sense that it simulates the reliability of non- MDS erasure codes that can tolerate two or more disk failures, with regard to both disk and sector failures. It is nontrivial to extend the methods of Elerath and Pecht in this manner. The difficulty in simulating non-MDS codes is in efficiently determining if a specific set of failures leads to data loss. The HFR Simulator has two modes of bookkeeping that allow it to efficiently determine if a set of device failures leads to data loss: via the MEL, and via the FTV. Using the MEL permits the HFR Simulator to accurately determine if a specific set of failures leads to data loss. Therefore, it is the method we must use to simulate the reliability of a redundancy placement of a flat code on heterogeneous devices. The FTV is a coarse-grained metric that does not capture the details of a specific placement of symbols on heterogeneous devices; however, it describes the fault tolerance of the median placement and provides good reliability.

#### IV. CONCLUSION

Throughout this paper, we give an overview of the various advances in regenerating codes for cloud storage systems. The design objective generally transfers from data integrity to resource overhead such as bandwidth consumption and storage efficiency. The exact regenerating codes help to maintain systematic erasure codes in the storage system such that no decoding operations are required to recover the original file. The repair-by-transfer regenerating codes help to achieve a repair process without arithmetic operations on both the newcomer and the providers. The FMSR codes are used to regenerate the data across a multi-server setting and performs a two-phase checking on the new code chunks generated in the repair operation. Flat XOR-codes—erasure codes in which parity disks are calculated as the XOR of some subset of data disks. These advances reduce the bandwidth consumption of the repair operations.

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#### AUTHORS

**First Author** – V Anto Vins, (M.E)<sup>–</sup>, Prathyusha Institue of Technology and Management, anto.vins@gmail.com . **Second Author** – S. Umamageswari, M.E, Prathyusha Institute of Technology and Management, umasrinivasan72@rediffmail.com . **Third Author** – P.Saranya, M.E, Prathyusha Institute of

Technology and Management, saran.pitam@gmail.com.

# S.H.I.EL.D ROBO-2.0

## **Abhit Kumar**

<sup>\*</sup> Biomedical Department, Babu Banarasi Das National Institute of Technology & Management, Lucknow, India

Abstract- Medical science has left no stone unturned to save humanity from various health diseases, injuries. Large, complex and effective equipment's have been designed to detect injuries, varying from micro to macro. By the help of these LARGE and COMPLEX equipment's such as X-RAY device, COMPUTER RADIOGRAHY and so on, we generate results of the ailment suffered by the patient within 2-3 Hours or so, where the doctor explains the patient about the ailment HE/SHE is suffering the next day, This happens due to vast amount of time taken to compile the result. On an average Doctor's save 6 of their 10 patient's they operated, but other 4 would have survived or cured if they had time in their hand, the reason could be the bulk time taken by the doctor's for identification of the cause of their suffering or lack of accuracy to determine the reason of suffering . So the point of concern in all the factors above is TIME, so why not save time and generate results and operate the patient within or less than 24Hrs of 1<sup>st</sup> stage of detection of the ailment suffered by the patient.

*Index Terms*- Anthropomorphic, bacteria, Hypothetical device, Prosthetics, Thermal Imaging Camera

## I. INTRODUCTION

This research paper is about the coalition of common Medical equipment's and robotics, which will be explained in a form device of hypothetical named а "Secured.Human.Imaging.Electronic.Device Robotics 2.0", a combination of various medical equipment's and camera's about which we know, but only on individual basis. One day or the other Humans tend to suffer various diseases varying from comman viral to major organ disease. Bullet injury's ,Gas leaks and various HUMAN generated hazards are few of the common vet serious issues doctor face while treating patient's of different genre. "ROBO-Robotics", the whole world is filled with biorobot's which performs various functions for Human either in anthropomorphic approach or Telemanipulator (minimalistic approach) [1][12][13][15], Robotics is not an alien topic to Medical science yet we are still not able to fill the Gap between the two. From various generations doctors are performing operation ranging from Low level to High level difficulty. As we know, there are generally very few high quality Docs present in individual hospitals across the globe, hence why not introduce a device which simply Leave the Low level operations to itself so that skilled surgeon's perform the complex one. Imagine a quality doctor performing an operation of a bullet injury in an abdomen region and at the same time a casualty occur of a HIGH level, (e.g. Kidney failure) that doctor wouldn't be available for this one so up to some extent we are risking the Life of patient suffering from failure. I am not objecting the skills of doctor's ,or

underestimating the injury the only thing I am saying is we need a High grade Doctor's for a complex situation like this. S.H.I.EL.D ROBO-2.0 is a 2 level device performing detection and operations varying from low level to a higher level casualty. It is composed of X-ray Device, computer radiography-scanner, Thermal imaging camera, Bio-robotic Dexterous Hand. These are some major and important devices. Our aim is to detect the ailment and cure it as fast as possible by summing up the medical equipments about which we know individually. To analyze their behavior when summed up together is quite fascinating! Further we will study about working of every component and device used in SHIELD ROBO-2.0 and how can the further advancement be made for this HYPOTHETICAL DEVICE to originate from hypothesis to reality which will not only add an extra leaf to medical science but also make the treatment process faster.

## II. 1ST LEVEL OF S.H.I.EL.D ROBO-2.0

The Device is complex hence to ease its complex nature it is divided into 2 levels on the basis of its complexity. The question arises how will the device differentiate between different modes, under this scenario it depend on the condition of the patient, if the doctor know that the patient is infected then in that case the doctor opt for low threat mode on the translucent panel emerged right at the source of the device, the translucent panel is a rectangular glass frame with touch mode enabled, similar to the touch mode that is present in the touch screen mobile phones. This rectangular frame will be the mother for operating and functioning of all three devices, will be enabled by this rectangular frame, which we will call as REC. FRAME. The Rec. frame is attached to the device. The infected person hence will be scanned by 2 thermal imaging cameras one on left hand side and other one on right side, the cameras will capture and provide the real time image display of the infected body on the LCD screen of the computer which is enabled by real time software, a projector of Low resolution at the same time will project the real time image to the patient as well. The working under 1<sup>st</sup> level comprises of 2 cases.

1<sup>st</sup> case : The background condition under which the patient is kept normal, as we know human body temperature is a complex phenomenon .Human are homoeothermic ; they radiate heat which must be lost to the environment to control their internal temperature[7]. Skin act as an interface to the emitted heat and environment. The organs of the body constantly need to adjust to the external environment. Infrared cams produces thermal images which detect even a smallest temperature difference, as small as 0.07 degree, these cams provide visual map of the skin temperature. The IR cams have temperature scales, color images, sound alarm which goes ON when

 $2^{nd}$  case : the above procedure will take less than 45 seconds or so, once the imaging under normal background condition is taken we will soon provide a increase in temperature in a form of steam from 2 pin hole sized steam emitter, the temperature will be increased up to 50°C after we disable the alarm present in IR cams ,and will carefully observe the increase in temperature, as soon as the steam start to convert into moisture the dew point alarm turns on and at that time the increase in temperature will be stopped, After waiting for 3 seconds the KNOB would again be rotated so that a temperature of approx 10°C is emitted from the same emitter used to emit HOT steam after 5 seconds or so the temperature provided will be stopped and the body is allowed to relax, at the same time the image of the human body is being displayed hence it will be determined how the human body react to variation in temperature and is the body have allergy symptoms or not or if allergy is present how is it behaving, by this doctor have the idea about the type of viruses and level of hazard hence the doctor can work on the affected region.

# 2.1 2<sup>nd</sup> LEVEL OF S.H.I.EL.D ROBO-2.0

After the person is analyzed under LEVEL 1.0 the Process is terminated and an immediate printed copy of the result with a heat image of the patient is obtained via scanner and printer both of which is inbuilt in the S.H.I.EL.D ROBO-2.0 device. However the process will further move on to LEVEL 2.0 which is the High threat level, The patient is treated under this level when they acquire injury's or have complaint regarding pain in any part of the body, the injury may vary from (mm) sized muscle tear to a macro one .Under level 2.0 we will use the concept of x-ray scanning and computer radiography. The patient moves from level 1.0 to level 2.0 automatically. The operator however need to set level 2.0 in the Rec.frame initially so that the patient after viral scan automatically moves level 2.0 for X-ray scan and Computer Radiography. The level 2.0 does not end up here S.H.I.EL.D ROBO-2.0 also introduce the concept of operation via Bio-Robots and Anthropomorphic hand, though these devices will be able to perform operation strictly of complexity of lower level only. Hence we can say that level 2.0 also comprise of 2 stages where these stages may or may not be inter-linked to each other depending upon the complexity of the casualty. Level 2 of S.H.I.EL.D ROBO-2.0 can perform both tasks simultaneously according to the requirement.



# III. STAGE 1 (SCANNING)

Under stage 1 those patients are scanned who are suffering from various ailments, the nature of complaint may vary from a severe chest pain to pain caused by the prosthetic attachments (metal nature) present in human body. Patients having **prosthetic** attachment in their body are required to undergo level 1.0 scanning to check the **bacteria** contamination level[5][9][16], this give the idea to the doctor about the effect caused by the artificial attachment to human. The operator will enable LT mode and HT mode simultaneously on the Rec.frame. *It is important to specify that the LEVEL 1.0 AND LEVEL 2.0 are linked to each other* i.e. The device are physically attached, however it is possible to obtain results obtained from individual devices. As discussed earlier the STAGE 1 comprises of 2 scanning concept x-ray and computer radiography.

X-RAY: If we define x-ray in simplest language we can say that it is a device which uses x-rays to scan tools or human body. Going into depth of the definition of x-ray it is clearly defined as "a device which uses X-rays to scan human body by directing them through a tube, onto the human body, some rays get stored in the area of concern due to its thickness or density those rays passed help in displaying image with the help of IMAGE PROCESSING SOFTWARE present in the computer". [5][6][8][9][16]. Under stage 1 those patients are scanned who are suffering from various ailments, the nature of complaint may vary from a severe chest pain to pain caused by the prosthetic attachments (metal nature) present in human body. Patients having prosthetic attachment in their body are required to undergo level 1.0 scanning to check the bacteria contamination level[5][9][16], this give the idea to the doctor about the effect caused by the artificial attachment to human. The operator will enable LT mode and HT mode simultaneously on the Rec.frame. It is important to specify that the LEVEL 1.0 AND LEVEL 2.0 are linked to each other i.e. The device are physically attached, however it is possible to obtain results obtained from individual devices. As discussed earlier the STAGE 1 comprises of 2 scanning concept x-ray and computer radiography, the concept of x-rays plays a major part in our device and the

concept needs to be understood once again ,Going into depth of the definition of x-ray it is clearly defined as "a *device which* uses X-rays to scan human body by directing them through a tube, onto the human body, some rays get stored in the area of concern due to its thickness or density ,the penetration level of ray may vary from the numeric half value layer of person to person."

PROPERTY OF X-RAY						
ENERGY(eV)	FREQUENC	WAVELENGTH				
4×10 <sup>1</sup> - 4×10 <sup>5</sup>	10 <sup>16</sup> - 10 <sup>16</sup>	10 -= -10 -12				
TABLE 2[6][8]						

# IV. SCHEMATIC OF AN X-RAY



The scanning is doable because of 5 provisos:

X-ray source [6][8] : provide x-ray's in the region for

- Scanning
- Collimator[6][8] : Device which restricts the beam of ray so as to irradiate beam to the region of worry
- Anti-scatter grid [6][8]: increases the contrast of tissue by reducing the number of detected x-ray as shown in figure 3.
- Compton scattering [6][8]: incident x-ray photon strikes the electron to generate (photon + electron) with which ionization occurs.



The Rec.frame is the actual brain of the device which controls the panels of different stages and this frame needs to be handled carefully.

S.H.I.EL.D ROBO-2.0 will utilize the same mechanism which have been performed by X-ray devices lately, however the only addition to level 2.0 will be the introduction of robotic operation via Bio-Robot and anthropomorphic hand about which we will study in PHASE 2.The 2<sup>nd</sup> phase of level 2.0 includes as said includes operation via Telemanipulator supported by anthropomorphic hands,

however the <u>operation performed will clearly be of LOW</u> <u>Sophistication level hence it would rule out operations of</u> <u>HEART, BRAIN, or other intricate organs of our system.</u>

## 4. STAGE 2 (SCANNING)

As discussed in the flow chart given above, stage 2 enable the operator to perform operation of LOW difficulty level. Operation performed under stage 2 strictly rules out all the complex operations which include operation related to heart, brain, or any sensitive organ of our system ,also S.H.I.EL.D ROBO-2.0 will perform only those operation that include removal of metal scrap such as bullet's, metal piece's, prosthetic attachment of lower grade, now the question arises how can the operation take place without any doctor as shield robo-2.0 completely rules out any involvement of surgeon's for operation purpose, though the operation will be under the guidance of the doctor ,as stated earlier that the surgeon are required for high grade sensitive operation instead of performing the surgery of lower sophistication level which can be performed by S.H.I.EL.D ROBO-2.0. The operation will be performed by Active Robots with anthropomorphic hand in support, the size of the Telemanipulator will be approx. (0.07~0.09) m and size of anthropomorphic hand will be of approx 0.3m.Rec.frame present at the initial source of ROBO S.H.I.EL.D-2.0 have the draft of the human body coded (inbuilt), the code outlining the anatomy of human body is projected on the Rec.frame when operator enables for stage 2 (operation mode) ,the projected body display's various region where operation is possible.

The operator need to enable the region of operation which will activate and supply the information to the Telemanipulator, Telemanipulator recognizes the supplied information when it scan's the human body before performing operation.

Block diagram given above give us a rough idea about the content that will be displayed in rec. frame's screen, if we observe panel 2, it is displayed with both scanning and operation

mode, since we are discussing stage 2 (operation mode) hence the operator will enable operation mode via touch mode, an immediate panel 3 as a response to the selection will be obtained which will project the outline of the human body in which operation enable area are represented.

# 4.1 REC.FRAME SCREEN DISPLAY



## V. ROBOTICS

Robotic hand vary from fire fighter cutting tool to micro gripper or in industrial field to medical science, especially in the field of medical science robotics have been used at its prime starting from 1983 when the first surgery via robotic was implemented in Toronto. Robotic surgery can be defined as a surgical process involving robotic system. Even though it robotic surgery was used to avoid loop holes in surgery's so that surgeon's can perform open surgery, still believe more in surgery performed by surgeon's (humans), rightly so because the possibility of malfunctioning of robot performing an operation of complex genre is high, but if we limit their ability by reducing the complexity of operation and there functioning then we can still utilize them for various low level operation about which we will be discussing. Our motive will be to study "DEXTEROUS **ROBOTIC HAND**" [1][10][11][15] and there operating, control and grasping approach. The term DEXTEROUS is defined as "capability of changing position and orientation of manipulated object from reference configuration to different one" [1][10][11][15] basically the hand should and will work in arbitrarily chosen position in 3D space.

As discussed in various papers the application of hand can be used for making:

- Anthropomorphic hand (anthropomorphic approach)
- Efficient manipulator (minimalistic approach )

Anthropomorphic Hand:

"Resemblance to human hand is the meaning of anthropomorphic" elaboration of the statement is "making the designing and functioning of hand as human as possible" the goal is achieved when [1][10][11][12][13][14][15]

- Prosthetic hand is developed where prosthetic is defined as "substitute /external implant to a missing part.
- Mimicking the human hand

"When we talk about anthropomorphic hand then a human operator map his own way of manipulation in the robotic hand, however it need to avoid complicated task from being performed (i.e. avoiding complicated task to programmed grasping algorithm) and avoid malfunctioning due to complexity which may cause any serious casualty while performing the operation."

Hand mapped by human operator divided into

- 1. Tele manipulation
- 2. Human teaching

The biggest advantage of anthropomorphic hand is it's usage in a manipulator for a better intuitive control.

Efficient Manipulator: Use of manipulator on daily basis is to displace the object from one point to an arbitrary point in 3-d space in flexible manner where the dexterous hand will be used to perform grasping function; however in SHIELD ROBO-3 we will enhance the usage of the Telemanipulator to scan and perform operation functions on human body. The hand should be made in minimalistic way hence making the "hand look simpler".





Since in SHIELD ROBO -2.0, dexterous manipulation function is needed hence the dexterous hand will be used to form an efficient manipulator , The operator enables the region of operation in panel 3 the working or the process of operation performed under that region will be mapped by the operator which will include the range covered by the hand , angle rotated , the grasping control ,also under panel 3 another command will be prompted about the nature of operation need to be performed (i.e. the operation performed could either be of a bullet injury or simple removal of artificial metal attachment hence by this when the operator enable a certain region the dexterous hand will automatically realize the work it need to perform.

1. Hand will scan the region of operation under this scanning x-rays will be used by the dexterous anthropomorphic hand so that it could find out the POINT where it needs to perform the operation.

2. As we know size of bullet will vary 0.22 caliber to 0.50 caliber similarly metal scrap from certain mm to cm, to counter this problem the panel 4will be generated when the operator will enable for operation mode which will provide option of bullet injury or metal attachment under which it will have range of sizes which will help the anthropomorphic hand to provide a controlled GRASP.

1. Anthropomorphic hand used will be both SHADOW HANDS with sensory guidance include. It is hand whose characteristics are very close to human hand.

SPECIFICATION ABOUT SHADOW HAND[1][15]							
NAM	COMPAN	FING	DOF	SENSORS			
E	Y	ERS					
SHA DO W HAN D	SHADOW ROBOT COMPANY	5	23	TACTILE,H ALLEFFEC T			
TABLE 2							

Under PANEL 4 a heat image of the human body created on the rec. frame, for E.g. in this case the patient suffer from shoulder injury hence the operator opts for shoulder region as the region of operation in panel 3, A panel 4 is generated which provide the options for bullet injury and metal attachment, in this case the operator opts for bullet injury, a sub block is generated which provide options of bullet size ranging from "0.20 caliber to unknown size" along with a heat image of the patient showing the area of injury. The operator opts for a bullet size, Tele manipulator understand and process the information accordingly, the shadow hand is mapped by the operator with algorithms for performing operations initially hence it understand the toil it need to process. The shadow hand needs to be precise and accurate while performing operation and removal task to avoid any casualty and so the algorithm mapped should be appropriate.

Consider a situation when you keep your finger in a cold storage box with temp below 0°C constantly for 2 minutes, your finger possibly will get frosted and no sensation whatsoever would be felt, it would appear as if your finger is not a part of your body anymore ,this happens possibly as the blood which is a fluid connective tissue get frosted because of which no transmission or receiving of signal would be possible between brain and finger i.e. The sense of touch vanishes for some time, Now if apply same concept in shield robo-2.0 i.e. under LEVEL 2.0 operation mode (bullet injury) the patient would definitely suffer from loss of blood the only work that the surgeon needs to perform is to stop the blood flow initially before the injured is transmitted inside shield robo-2.0 device. After all required selection made on the rec. frame by the operator the patient is transmitted via level 1.0 reaches level 2.0 where X-ray scanning is processed and via thermal camera the heat image of the body is captured. The level 2.0 consist of 4 Shadow hands 2 on either side of the human frame.



The hand is composed various sensory guides [1][10][11][12][13][15]:

**1. Tactile sensor**: A transducer that measures the information arises from the physical interaction with the environment, basically a Biological sense from coetaneous touch which is capable of detecting stimuli.

**2. Hall Effect sensor**: A transducer which varies the output voltage in response to a magnetic field used for positioning, speed detecting, current sensing.

**3. Pressure sensor**: A transducer which detect pressure (mechanical form) into an electrical signal for display.

The shadow hand is composed of 24 joints designed to have a human range of movement similar to human hand, 4 fingers have 2 one axis joints and little finger has extra one axis joint attached to metacarpus to provide hand curl movement.

All hands have Hall Effect sensor's [1][12] integrated in every joint to provide precise positional feedback, the hands are electric motor driven [1] .The motor hand is driven by 20 DC motor in forearm. However we will not proceed in detail about the configuration of hand as our aim is to give an overview of it and how it can be utilized in S.H.I.EL.D ROBO-2.0

The dexterous manipulator is composed of 5 fingers and a box like palm however the palm will have a certain level of functioning.

The patient who sustained bullet injury would definitely suffer loss of blood but as discussed earlier the only work surgeon need to do is to stop the loss of blood before transmitting the patient in the shield robo-2.0 device. The palm of the hand is composed of 3 rotatable circular panel connected to each other, each panel has its own type of working.



The palm is composed of 3 circular disks which are important while performing an operation

 $1^{ST}$  disk is the most important of all the 3 disk as it emit X-rays which help the dexterous manipulator to scan and detect the region of operation after the operator has assigned the region of operation in panel 3/4, this function of scanning is initially encoded in the Tele manipulator via algorithms, the scan completed by the manipulator will connect with the heat image generated in the panel 4 which will help the manipulator to identify the exact location of injury sustained, all the transmission and receiving of signal will be within [<=10 minutes ] or so. The diameter of the disk will be [<=0.04] m approx.

 $2^{nd}$  disk is used to emit wind of temperature of range varying from -2°C to 2°C, the temperature required this low is basically for frosting the region of injury the low temperature will minus the excessive blood flow from the body hence the region where the operation need to be performed by dexterous manipulator will get numb. The focal size of the disk will be pin hole sized. The thought is very dangerous and is very uncertain to perform however at the same time risk needs to be taken to achieve a successful task.

 $3^{rd}$  disk is used to emit **LIGHT AMPLIFICATION STIMULATION EMISSION RADIATION (LASER)**[17], as talked about the emission of wind of temperature varying from - $2^{\circ}$ C to  $2^{\circ}$ C from disk2 it numb the area of operation hence the region of operation cited by the dexterous manipulator will have this disk emit laser which will burn the portion .

All the disk have clean and individual wiring which further sum up and get connected to the common rotor, these disk have individual Connection to the tubes which are externally connected to either a X-RAY source or a Gas chamber.

<u>GRASPING</u> [1][11][12][13][14]: Grasp by a human hand depend on the shape of the object, grasp is of 2 types:-

1. For heavy objects large force is needed hence the grasp required for them by the dexterous manipulator is ROBUST GRASP.

2. For light object "DEXTEROUS GRASP" is needed. In SHIELD ROBO-3 Dexterous grasp is required by the dexterous manipulator. As our focus is on dexterous grasp hence our emphasis is on dexterity and sensitivity

<u>Control</u>: Control is implemented in the robotic hand when a suitable operation and grasp choice is made hence in SHIELD ROBO-2.0 both the term is mapped in the

Dexterous hand, the grasp choice made is initially mapped in the manipulator via **algorithm** hence the dexterous hand will know the amount and control for the grasp is required.

2 main types of control:

1. Position Control

2. Force Control

Both the control are inter-related i.e. positional control is used in a situation when little force is needed to be generated basically for "good hand movement in AIR", however for manipulation task control amount of force is needed [1][11][12][13][14], and sensitize it to a level where the dexterous hand is able to peel a minor portion of the skin off from the area and grasp and remove the bullet, 2 fingers will be used to grasp a bullet.

Both the control are inter-related i.e. positional control is used in a situation when little force is needed to be generated basically for "good hand movement in AIR", however for manipulation task control amount of force is needed.[1][11][12][13][14]

<u>POINT OF CONTACT</u>: For dexterous manipulation, contact between hand and object is very important. [1][11][13][15]



After the manipulator performs the operation function the patient is rested for 3-4 hours or so, after the time of rest is completed the patient is further moved for computer radiography to analyze the after effects of operations.

Uses the concept of radiography technique in which EM radiation such as x-ray is used to view internal structure of an opaque object, the x-ray generated via x-ray generator, certain amount of x-ray is observed due to the half value layer of the muscle and bone and some rays pass through it the x-ray captured by the detector which provide the 2-D image .The only difference is that the computer radiography uses imaging plate composed of photo stimulable phosphor. The imaging plate is placed under the area of concern, the imaging plate is run through special laser scanner or CR reader that read and digitizes the image. Hence role of CR is to scan the patient after operation and project the image of the operated area. However the radiography is also considered an advancement to x-ray.

The patient as well who are suffering from severe pain in any of the body area and which was not detected by x-ray. It can be as soft as tissue damage or torn muscle of a very minor nature. Then the patient is recommended for CR the patient will remain in LEVEL 2.0 scanning mode, the operator will enable the scanning mode via CR on the Rec.frame, the x-ray image received on phosphor plate which is further extracted via laser, and the image is a RAW IMAGE. This raw image processed for quality improvement. Final image is in **DIGITAL IMAGING COMMUNICATION IN MEDICINE (DICOM)**, the DICOM image is further sent to PACS. [3][4][5][16].



## VI. SECURITY

The term "secured" in SHIELD ROBO-2.0 is used for the security provided by the device, the security is provided by the Bio-metric panel inbuilt with voice recognizer, pattern and finger print scanner as this will help to avoid any intrusion or casualty caused by other present in hospital other than operator itself. Successful scan will unlock the device and provide full access to the device, non-recognized pattern or thumb impression if input more than 3 times then DEVICE alarm goes in ON state.



# SECURITY PANEL: Using the concept of THUMB SCANNING/VOICE RECOGNIZING

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## AUTHORS

**First Author** – Abhit Kumar, Biomedical Department, Babu Banarasi Das National Institute of Technology & Management, Lucknow, India, +91-8563887558, abhitkumar94@gmail.com

# Bulk Queueing System with Multiple Vacations Set Up Times with N-Policy and Delayed Service

# **R.Vimala Devi**

Department of Mathematics, Govt. Arts College, Villupuram

Abstract- In this paper M<sup>(X)</sup> / G(a,b) /1 queueing system with multiple vacations ,set up time with N-policy and delayed service. If the queue size is <a after a service completion, the server goes for multiple vacations also after serving M batches continously even if sufficient numbers are there in there queue the server goes for a vacation with probability  $\alpha_j$  or resume service with probility  $(1-\alpha_j)$ . when the server returns from a vacation and if the queue length is still < N he leaves for another vacation and so on, until he find N (N>b) customers in the queue .(ie) the server finds at least N customers waiting for service , then he requires a setup time R to start the service. After the setup he servers a batch of b customers where  $b \ge a$ . various Characteristics of the queueing system are presented in this paper.

*Index Terms*- Bulk arrival, delayed service, multiple vacations, setup time, steady state probability.

#### I. INTRODUCTION

In the area of optimal design and control of queues, the N-policy has received great attentation. According to this policy, the server ideals until a fixed number N of customers arrives in the queue at the moment the server is ' switched on ' and servers exhaustively the queue until it empties. The server is then "switched off " and remains idle until N customers accumulate again in the queue .Given the costs of turning the server on and having customers a waiting in the queue, an optimal value of N can be determined that minimizes the expected cost of operating the queue. This model is found to be applicable in analyzing numerous real world queueing situations such as flexible manufacturing systems, service systems, computer and telecommunication system. In many production systems it is assumed that when all the jobs are served, the machine stays idle until next job arrives .If there is a cost associated with operating the machine. It is plausible that a rational way to operate the system is to shut down the machine When the queue length is zero and bring it up again as the queue length grows to a predetermined level of, Say N( $\geq 1$ ), Jobs. Such a control mechanism is usually good when the machine start-up and shut- down costs are high.

The objective of this paper is to analysis a situation that exists in a pump manufacturing industry. A pump manufacturing industry manufactures different types of pumps, which require shafts of various dimensions. The partially finished pump shafts arrive at the copy turning center from the turning centre. The operator starts the copy turning process only if required batch quantity of shafts is available because the operating cost may increase otherwise. After processing, if the number of available shafts is less than the minimum batch quantity, then the operator will start doing other work such as making the templates for copy turning, checking the components. Hence, the operator always shuts down the machine and removes the templates before taking up other works. When the operator returns from other work and finds that the shafts available are more than the maximum batch quantity, the server resumes the copy turning process, for which some amount of time is required to setup the template in the machine. Otherwise the operator will continue with other work until he finds required number of shafts.

The above process can be modeled as  $M^X/G(a, b)/1$ queueing system with multiple vacations, setup times with Npolicy and delayed service. Various authors have analysed problems of server vacations with several queueing combinations. A literature survey on queueing systems with server vacations can be found in Doshi. Lee has developed a procedure to calculate the system size probabilities for a bulk queueing model. Several authors have analysed the N-policy on queueing systems with vacation. Kella provided detail discussions concerning N-policy queueing systems with vacations. Lee et al. http://www.sciencedirect.com/science/article/pii/S0 307904X05000193 - bib4 have analysed a batch arrival queue with N-policy, but considered single service with single vacation and multiple vacations. Chae and Lee, studied a  $M^X/G/1$ vacation model with N-policy and discussed heuristic interpretation of mean waiting time. Reddy et al. have analysed a bulk queueing model and multiple vacations with setup time. They derived the expected number of customers in the queue at an arbitrary time epoch and obtained other measures. The queue is analysed by Takagi, considering closedown time and setup time. The performance measures are also obtained

#### II. MATHEMATICAL MODEL

\* Let  $\lambda$  be the poisson arrival rate ,X be the group size random variable of the arrival,  $\mathbf{g}_{\mathbf{k}}$  be the probability that 'k' customers arrive in a batch and X(z) be its probability generating function. Let S(.), V(.), and R(.) be the cumulative distributions of the service time, vacation time and setup time respectively. Further s(x), v(x) and r(x) are their respective probability density functions.

\*  $S^{0}(t)$  denotes the remaining service time at time 't' and  $V^{0}(t)$ , and  $R^{0}(t)$  denote the remaining vacation time, and setup time at time 't' respectively. Let us denote the Laplace transforms (LT) of s(x), v(x), and r(x) as  $\widetilde{S}$ ,  $\widetilde{V}$ , and  $\widetilde{R}$  respectively.

The supplementary variable technique was introduced by Cox was followed by Lee introduced an effective technique for solving queueing models using supplementary variables and this technique is used for solving the proposed model.

We define,

Y(t) = 0; if the server is on vacation or doing setup,

j; where j is the number of batches served up to t, since the commencement of a current busy period, if a service is going on at t  $(1 \le j \le M)$ 

 $\begin{aligned} Z(t) &= j; & \text{if the server is on jth vacation at time t.} \\ N_{s}(t) &= & \text{number of customers in the service.} \\ N_{q}(t) &= & \text{number of customers in the queue.} \end{aligned}$ 

The probabilities for the number of customers in the queue and service are defined as follows:

$$\begin{split} &P_{ij}(x,t)dt = P\{N_{s}(t) = i, N_{q}(t) = j, x \leq S^{0}(t) \leq x + dt, \ Y(t) = 0\}, \quad a \leq i \leq b, j \geq M, \\ &Q_{jn}(x,t)dt = P\{N_{q}(t) = j, x \leq V^{0}(t) \leq x + dt, Y(t) = 1, Z(t) = j\}, \ _{n\geq 0, \ j\geq 1,} \\ &R_{n}(x,t)dt = P\{N_{q}(t) = n, x \leq R^{0}(t) \leq x + dt, Y(t) = 2\}, \ _{n\geq N.} \end{split}$$
Analysis

The steady state queue size equations are obtained as

$$-P_{01(x)}^{1} = \lambda P_{01(x)+} \sum_{i=a}^{b} R_{i(0) s(x)}$$
(1)

$$-P_{i1(x)}^{1} - \lambda P_{i1(x)+} \sum_{k=1}^{i} P_{i-k(x)} \lambda g_{k+} R_{b+i(0) s(x)}, i \ge_{1}$$
(2)

$$-P_{0j(x)}^{1} - \lambda P_{0j(x)+} \sum_{i=a}^{b} P_{i,j-1}(0) (1 - \alpha_{j-1}) s(x) \qquad 2 \le j \le M$$
(3)

$$-P_{ij(x)=-}^{1}\lambda P_{ij(x)+}\sum_{k=1}^{i}P_{i-k,j}(x)\lambda g_{k} + (1-\alpha_{j-1})P_{i+b,j-1}(0)_{s(x),-2} \le j \le M, i \ge 1$$
(4)

$$-p_{bj(x)=-}^{1} \lambda p_{bj(x)+} \sum_{i=a}^{b} p_{i,b+j-(0) s(x)+} \sum_{k=1}^{i} p_{i,j-1-(x)} \lambda g_{k} \qquad 1 \le i \le N-b-1$$
(5)

$$-P_{bj(x)}^{1} - \lambda P_{bj(x)+} \sum_{i=a}^{b} P_{i,b+j} (0) s(x) + \sum_{k=1}^{i} P_{i,j-1} (x) \lambda g_{k} + R_{b+i} (0) s(x) \quad i \ge N - b$$
(6)

$$-Q_{01(x)}^{1} = -\lambda Q_{01(x)+} \sum_{j=j}^{M} P_{0j} (0) v(x)$$
(7)

$$-\mathbf{Q}_{i1(x)=}^{1} \lambda \mathbf{Q}_{i1(x)+} \quad \Sigma_{k=1}^{i} \mathbf{Q}_{i-k 1} (0) \lambda \mathbf{g}_{k} + \Sigma_{j=1}^{M} \mathbf{P}_{i,j} (0) \mathbf{v}(x) \quad , 1 \leq i \leq a-1$$
(8)

$$-Q_{i1(x)=}^{1} \lambda Q_{i1(x)+} \sum_{k=1}^{i} Q_{i-k 1} (x) \lambda g_{k} \sum_{j=1}^{M} P_{i,j} (0)^{\alpha_{j}} v(x) , i \ge a$$
(9)

$$-\mathbf{Q}_{0n(\mathbf{x})=}^{1} \lambda \mathbf{Q}_{0n(\mathbf{x})+} \mathbf{Q}_{0n-1(0)\mathbf{v}(\mathbf{x})}, n \geq 2$$

$$-\mathbf{Q}_{0n(\mathbf{x})+}^{1} \lambda \mathbf{Q}_{0n-1(0)\mathbf{v}(\mathbf{x})}, n \geq 2$$

$$(10)$$

$$(11)$$

$$-Q_{in(x)=-}^{-\Lambda} Q_{in(x)+} \Delta_{k=1}^{-1} Q_{i-k n}(x) \lambda g_{k} + Q_{0n-1}(0) v(x) , n \geq 2, 1 \leq 1 \leq a-1$$
(11)

$$-\mathbf{Q}_{in(x)=}^{1} \ \lambda \mathbf{Q}_{in(x)+} \ \Sigma_{\mathbf{k}=1}^{i} \mathbf{Q}_{i-\mathbf{k} n} \ {}_{(x) \ \lambda} \mathbf{g}_{\mathbf{k}} \ n \ge 2, \ n \ge N$$

$$(12)$$

$$-R_{i(x)=}^{1} \lambda R_{i(x)+} \sum_{k=1}^{n-N} R_{i-k} (x) \lambda g_{k} + \sum_{l=1}^{\infty} Q_{i1(0) r(x)} \ge a, n \ge N$$
(13)

# III. QUEUE SIZE DISTRIBUTION

The Laplace -Stieljes transform of transform of  $P_{ij}(x)$ ,  $Q_{in}(x)$  and  $R_i(x)$  are defined respectively as follows:

$$\widetilde{P}_{ij}(\theta) = \int_0^\infty e^{-\theta x} P_{ij(x) dx}, \ \widetilde{Q}_{in}(\theta) = \int_0^\infty e^{-\theta x} Q_{in(x) dx}, \ \widetilde{R}_n(\theta) = \int_0^\infty e^{-\theta x} R_{n(x) dx}$$
(14)

Then the Laplace-Stieltjes transform of  $P'_{ij}(x)$ ,  $Q'_{in}(x)$  and  $R'_{i(x)}$  are defined

respectively as follows:

$$\int_{0}^{\infty} e^{-\theta x} p_{ij}^{1}_{(x) dx,} = \left[ e^{-\theta x} P_{ij}(x) \right]_{0}^{\infty} - \int_{0}^{\infty} (-\theta e^{-\theta x}) P_{ij(x) dx} = \theta \widetilde{P}_{ij}(x) - P_{ij}(0)$$

$$\int_{0}^{\infty} e^{-\theta x} q_{ij}^{1}_{(x) dx,} = \left[ e^{-\theta x} q_{in}(x) \right]_{0}^{\infty} - \int_{0}^{\infty} (-\theta e^{-\theta x}) q_{in(x) dx} = \theta \widetilde{q}_{in}(\theta) - q_{in}(0)$$

$$\int_{0}^{\infty} e^{-\theta x} R_{ij}^{1}_{(x) dx,} = \left[ e^{-\theta x} R_{in}(x) \right]_{0}^{\infty} - \int_{0}^{\infty} (-\theta e^{-\theta x}) R_{in(x) dx} = \theta \widetilde{R}_{in}(\theta) - Q_{in}(0)$$

Taking Laplace - Stiltje's transform on both sides of the above equations we get,

$$\theta \widetilde{P}_{0,1}(\theta) - P_{0,1}(0) = \lambda \widetilde{P}_{0,1}(\theta) - \sum_{i=a}^{b} R_i(0) \widetilde{S}(\theta)$$
<sup>(15)</sup>

$$\theta \widetilde{P}_{i,1}(\theta) - P_{i,1}(0) = \lambda \widetilde{P}_{i,1}(\theta) - \lambda \sum_{k=1}^{i} \widetilde{P}_{i-k,1}(\theta) g_k - R_{b+i}(0) \widetilde{S}(\theta); i \ge 1$$
(16)

$$\theta \widetilde{P}_{0,j}(\theta) - P_{0,j}(0) = \lambda \widetilde{P}_{0,j}(\theta) - \lambda \sum_{i=a}^{b} \widetilde{P}_{i,j-1}(0)(1-\alpha_{j-1})\widetilde{S}(\theta); 2 \le j \le M$$
(17)

$$\theta \widetilde{P}_{i,j}(\theta) - P_{i,j}(0) = \lambda \widetilde{P}_{i,j}(\theta) - \lambda \sum_{k=1}^{i} \widetilde{P}_{i-k,j}(\theta) g_k - P_{i+bj-i}(0) (1 - \alpha_{j-i}) \widetilde{S}(\theta); 2 \le j \le M ; i \ge 1$$
(18)

$$\theta \widetilde{P}_{bj}(\theta) - P_{bj}(0) = \lambda \widetilde{P}_{bj}(\theta) - \sum_{m=a}^{b} P_{mb+j}(0) \widetilde{S}(\theta) - \sum_{k=1}^{j} \widetilde{P}_{bj-k}(\theta) \lambda g_{k} \quad 1 \le j \le N-b-1,$$
(19)

$$\theta \widetilde{P}_{bj}(\theta) - P_{bj}(0)\lambda \widetilde{P}_{bj}(\theta) - \sum_{m=a}^{b} P_{mb+j}(0)\widetilde{S}(\theta) - \sum_{k=1}^{j} \widetilde{P}_{bj-k}(\theta)\lambda g_{k} + R_{b+j}(0)\widetilde{S}(\theta)$$

$$j \ge N - b$$
(20)

$$\theta \tilde{q}_{0,1}(\theta) - q_{0,1}(0) = \lambda \tilde{q}_{0,1}(\theta) - \sum_{j=1}^{M} P_{0j}(0) \tilde{v}(\theta)$$
(21)

$$\theta \tilde{q}_{i,1}(\theta) - q_{i,1}(0) = \lambda \tilde{q}_{i,1}(\theta) - \lambda \sum_{k=1}^{i} \tilde{q}_{i-k,1} g_k - \sum_{j=1}^{M} p_{ij}(\theta) \tilde{v}(\theta) \quad ; 1 \le i \le a-1$$

$$(22)$$

$$\theta \tilde{q}_{i,1}(\theta) - q_{i,1}(0) = \lambda \tilde{q}_{i,1}(\theta) - \lambda \sum_{k=1}^{i} \tilde{q}_{i-k}(\theta) g_k - \sum_{j=1}^{M} p_{ij}(\theta) \alpha_j \tilde{v}(\theta) \quad ; i \ge a$$

$$(23)$$

$$\theta \tilde{q}_{0,n}(\theta) - q_{0,n}(0) = \lambda \tilde{q}_{0,n}(\theta) - q_{0,n-1}(0)\tilde{v}(\theta) \ ; n \ge 2$$
<sup>(24)</sup>

$$\begin{split} \theta \tilde{q}_{i,n}(\theta) - q_{i,n}(0) &= \lambda \tilde{q}_{i,n}(\theta) - \lambda \sum_{k=1}^{i} \tilde{q}_{i-k,n}(\theta) g_k - q_{i,n-1}(0) \tilde{v}(\theta) \quad ; n \ge 2 \quad ; 1 \le i \le a-1 \\ \theta \tilde{q}_{i,n}(\theta) - q_{i,n}(0) &= \lambda \tilde{q}_{i,n}(\theta) - \lambda \sum_{k=1}^{i} \tilde{q}_{i-k,n}(\theta) g_k \quad ; n \ge 2, i \ge a \end{split}$$
(26)

$$\theta \widetilde{R}_{i}(\theta) - R_{i}(0) = \lambda \widetilde{q}_{i}(\theta) - \lambda \sum_{k=1}^{i-a} \widetilde{R}_{i-k}(\theta) g_{k} - \sum_{j=1}^{\infty} q_{i,1}(0) \widetilde{r}(\theta) \quad ; i \ge a$$

$$(27)$$

## **Queue Size Distribution**

Lee H. S has developed a new technique to find the steady state probability generating function of the number of customers in the system at an arbitrary time.

To apply this technique, the following probability generating function are defined.

$$\begin{split} \widetilde{P}_{j}(z,\theta) &= \sum_{i=0}^{\infty} \widetilde{P}_{ij}(\theta) z^{i}, P_{j}(z,0) = \sum_{i=0}^{\infty} \widetilde{P}_{ij}(0) z^{i}; \ a \leq j \leq M \\ \widetilde{Q}_{n}(z,\theta) &= \sum_{i=0}^{\infty} \widetilde{q}_{in}(\theta) z^{i}, \ Q_{n}(z,0) = \sum_{i=0}^{\infty} \widetilde{q}_{in}(0) z^{i}; \ n \geq 1 \\ \widetilde{R}_{n}(z,\theta) &= \sum_{i=a}^{\infty} \widetilde{R}_{i}(\theta) z^{i}, \ R(z,0) = \sum_{i=a}^{\infty} \widetilde{R}_{i}(0) z^{i} \end{split}$$

$$(28)$$

Multiply equation (15) by  $z^0$  and (16) by  $z^i$  (i \ge 1) summing up from i=0 to  $\infty$  and using (28)

we have

$$Z^{b}(\theta - \lambda + \lambda x(z))\widetilde{P}_{1}(z,\theta) = Z^{b}P_{1}(z,0) - \left[R(z,0) - \sum_{i=a}^{b-1} R_{i}(0)(z^{b} - z^{i})\right]\widetilde{S}(\theta)$$
<sup>(29)</sup>

Multiply equation (17) by  $Z^0$  and (18) by  $Z^i$  ( $i \ge 1$ ), Summing up from i=0 to  $\infty$ , we have

$$Z^{b}[\theta - \lambda + \lambda x(z)]\tilde{P}_{j}(z,\theta) = Z^{b}P_{j}(z,0) - \left[\sum_{i=a}^{b-1} P_{i\,j-1}(0)(z^{b} - z^{1}) + P_{j-1}(z,0)\right](1 - \alpha_{j-1})\tilde{S}(\theta)$$

$$,2 \le j \le M$$
(30)

 $\label{eq:Multiply (17) by Z^0, (19) by Z^i (i \leq i \leq N-b-1), (20) by Z^i (i \geq N-b) \\ Summing up from (17) by Z^i (i \leq i \leq N-b-1), (20) by Z^i (i \geq N-b) \\ Summing up from (17) by Z^i (i \leq i \leq N-b-1), (20) by Z^i (i \geq N-b) \\ Summing up from (17) by Z^i (i \leq i \leq N-b-1), (20) by Z^i (i \geq N-b) \\ Summing up from (17) by Z^i (i \leq i \leq N-b-1), (20) by Z^i (i \geq N-b) \\ Summing up from (17) by Z^i (i \leq i \leq N-b-1), (20) by Z^i (i \geq N-b) \\ Summing up from (17) by Z^i (i \leq i \leq N-b-1), (20) by Z^i (i \geq N-b) \\ Summing up from (17) by Z^i (i \leq i \leq N-b-1), (20) by Z^i (i \geq N-b) \\ Summing up from (17) by Z^i (i \leq i \leq N-b-1), (20) by Z^i (i \geq N-b) \\ Summing up from (17) by Z^i (i \geq N-b-1), (20) by Z^i (i \geq N-b) \\ Summing up from (17) by Z^i (i \geq N-b-1), (20) by Z^i (i \geq N-b) \\ Summing up from (17) by Z^i (i \geq N-b-1), (20) by Z^i (i \geq N-b) \\ Summing up from (17) by Z^i (i \geq N-b-1), (20) by Z^i (i \geq N-b) \\ Summing up from (17) by Z^i (i \geq N-b-1), (20) by Z^i (i \geq N-b) \\ Summing up from (17) by Z^i (i \geq N-b-1), (20) by Z^i (i \geq N-b-1) \\ Summing up from (17) by Z^i (i \geq N-b-1), (20) by Z^i (i \geq N-b-1) \\ Summing up from (17) by Z^i (i \geq N-b-1), (20) by Z^i (i \geq N-b-1) \\ Summing up from (17) by Z^i (i \geq N-b-1) \\$ 

i = 0 to  $\infty$  and by using (28), We have

$$(\theta - \lambda + \lambda x(z))\tilde{P}_{b}(z,\theta) = P_{b}(z,0) - \frac{\tilde{s}(\theta)}{z^{b}} \left[ \sum_{m=a}^{b} (P_{m}(z,0) - \sum_{i=a}^{b-1} P_{ij-1}(0)z^{1} \right) + R(z,0) \right]$$
(31)

Multiply equation (21) by 
$$z^0$$
 and (22) by  $z^i$  (i≥1) summing up from i=0 to  $\infty$  and using (28) we have  
( $\theta$ - $\lambda$ + $\lambda x(z)$ )  $\widetilde{Q}_1(z, \theta) = \widetilde{Q}_1(z, 0) \widetilde{V}(\theta) \left[ \sum_{i=0}^{a-1} \sum_{i=1}^{M} P_{ij}(0) z^i - \sum_{i=0}^{\infty} \sum_{i=1}^{M} P_{ij}(0) \alpha_j z^i \right]$ 
(32)

Multiply equation (24) by  $Z^0$ , (25) by  $z^i$  (1 $\leq$ n $\leq$ N-b-1)(1 $\leq$ i $\leq$ a-1) and (26) by  $z^i$ (n $\geq$ N-b),(i $\geq$ a) summing up from i=0 to  $\infty$  using (28) we have.  $(\theta - \lambda + \lambda x(z))\widetilde{Q}_n(z, \theta) = Q_n(z, 0) - [\sum_{i=0}^{N-1} Q_{i n-i}(0)Z^i]\widetilde{v}(\theta)$   $n \geq_2 (33)$ 

Multiply equation (27) by  $z^{i}$  ( $i \ge a$ ) Summing up from i=0 to  $\infty$  and using (28) we have

$$(\theta - \lambda + \lambda \mathbf{x}(\mathbf{z}))\widetilde{\mathbf{R}}(\mathbf{z}, \theta) = \mathbf{R}(\mathbf{z}, 0) - \left[\sum_{l=1}^{\infty} Q_l(\mathbf{z}, 0) - \sum_{i=0}^{N-1} Q_{li}(0) \mathbf{Z}^i\right] \widetilde{\mathbf{R}}(\theta)$$
(34)

Let 
$$C_i = \sum_{i=j}^{M} P_{ij}(0)(1-\alpha_j)$$
,  $d_i = \sum_{n=1}^{\infty} q_{in}(0)$ ,  
Let  $\widetilde{P}(z, 0) = \sum_{j=1}^{M} \widetilde{P}_j(z, \theta)$ ,  $P(z, 0) = \sum_{j=1}^{M} P_j(z, 0)$ 

$$\widetilde{Q}(z,\theta) = \sum_{n=1}^{\infty} \widetilde{Q}_n(z,\theta), \quad Q(z,0) = \sum_{n=1}^{\infty} Q_n(z,0)$$

By substituting 
$$\theta = \lambda - \lambda x(z)$$
 in (29)-(34)  

$$Z^{b}P_{1}(z,0) = \left[R(z,0) - \sum_{i=a}^{b-1} R_{i}(0)(z^{b} - z^{i})\right]\tilde{S}(\lambda - \lambda x(z))$$
(35)

$$Z^{b}P_{j}(z,0) = \left[\sum_{i=a}^{b-1} \widetilde{P}_{i\,j-1}(0)(z^{b}-z^{i}) + P_{j-1}(z,0)\right](1-\alpha_{j-1})\,\widetilde{S}(\lambda-\lambda x(z))$$
(36)

$$Z^{b}P_{b}(z,0) = \left[\sum_{i=a}^{b-1} P_{i}(z,0) - \sum_{m=a}^{b} \sum_{j=0}^{b-1} P_{mj}(0) z^{j} + R(z,0)\right] \tilde{S}(\lambda - \lambda x(z))$$
(37)

$$Q_{1}(z,0) = \left[\sum_{i=0}^{a-1} \sum_{j=1}^{M} P_{ij}(0) x^{i} - \sum_{i=a}^{\infty} \sum_{j=1}^{M} P_{ij}(0) \alpha_{j} z^{i}\right] \widetilde{V}(\lambda - \lambda x(z))$$
(38)

$$Q_{n}(z,0) = \left[\sum_{i=0}^{N-1} Q_{i\,n-1}(0) \, z^{i} \widetilde{V}(\lambda - \lambda x(z)\right]$$
(39)

$$\mathbf{R}(\mathbf{z},\mathbf{0}) = \left[\sum_{l=1}^{\infty} \mathbf{Q}_{l}(\mathbf{z},\mathbf{0}) - \sum_{i=0}^{N-1} \mathbf{Q}_{li} \mathbf{z}^{i}\right] \widetilde{\mathbf{R}}(\lambda - \lambda \mathbf{x}(\mathbf{z}))$$

$$\tag{40}$$

Using the expressions of  $P_1(z, 0), P_j(z, 0), P_b(z, 0), Q_1(z, 0)Q_n(z, 0)$  and R(z, 0) from (35)- (40)

using (35) in (29) we have

$$z^{b}\widetilde{P}_{1}(z,\theta) = \left[R(z,0) - \sum_{i=a}^{b-1} R_{i}(0)(z^{b} - z^{i}]\left(\frac{\hat{s}(\lambda - \lambda x(z)) - \hat{s}(\theta)}{\theta - \lambda + \lambda x(z)}\right)$$
(41)

.

$$z^{b}\widetilde{P}_{j}(z,\theta) = \left[\sum_{i=a}^{b-1}\widetilde{P}_{ij-1}(0)\left(z^{b}-z^{i}\right) + P_{j-i}(z,0)\right]\left(1-\alpha_{j-1}\right)\left(\frac{\hat{s}(\lambda-\lambda_{x}(z))-\hat{s}(\theta)}{\theta-\lambda+\lambda_{x}(z)}\right)$$
(42)

Using (37) in (31) we have  

$$\mathbf{z}^{\mathbf{b}} \widetilde{\mathbf{P}}_{\mathbf{b}}(\mathbf{z}, \mathbf{\theta}) = \begin{bmatrix} \frac{\widetilde{\mathbf{s}} - \lambda - \lambda \mathbf{x}(\mathbf{z}) - \widetilde{\mathbf{s}}(\mathbf{\theta})}{\mathbf{\theta} - \lambda + \lambda \mathbf{x}(\mathbf{z})} \end{bmatrix}_{\mathbf{f}(\mathbf{z})}$$
(43)

Where

$$\begin{split} & \int_{f(x)=}^{b-1} P_m(z,0) - \sum_{m=0}^{b} \sum_{j=0}^{b-1} P_{mj}(0) z^i + R(z,0) \\ & \sum_{m=a}^{b-1} \sum_{j=0}^{b} P_{mj}(0) z^j + \widetilde{R}(\lambda - \lambda x(z)) \big[ \sum_{l=1}^{\infty} Q_l(z,0) - \sum_{i=0}^{N-1} Q_{1i}(0) Z^i \big] \end{split}$$

Using (38) in (32) we have

$$\widetilde{Q}_{1}(z,\theta) = \left(\sum_{i=0}^{a-1} \sum_{j=1}^{M} P_{ij}(0) z^{i} - \sum_{i=a}^{\infty} \sum_{j=1}^{M} P_{ij}(0) \alpha_{j} z^{i}\right) \left(\frac{\widetilde{v}(\lambda - \lambda x(z)) - \widetilde{v}(\theta)}{\theta - \lambda + \lambda x(z)}\right)$$

$$(44)$$

Using (39) in (33) we have

$$\widetilde{Q}_{n}(z,\theta) = \sum_{i=0}^{N-1} Q_{in-i}(0) z^{i} \left( \frac{\widetilde{v}(\lambda - \lambda x(z)) - \widetilde{v}(\theta)}{\theta - \lambda + \lambda x(z)} \right)$$
(45)

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$$\widetilde{R}(z,0) = \left[\sum_{l=1}^{\infty} Q_l(z,0) - \sum_{i=0}^{a-1} Q_{li}(0) z^i\right] \left(\frac{\widetilde{R}(\lambda - \lambda_X(z)) - \widetilde{R}(\theta)}{\theta - \lambda + \lambda_X(z)}\right)$$
(46)

Let P(z) of the queue size at an arbitrary time epoch is the sum of PGF of queue size at service completion epoch and vacation completion epoch then

$$P(z) = \widetilde{P}(z,0) + \widetilde{Q}(z,0) + \widetilde{R}(z,0)$$
(47)

Substituting  $\theta$ =0 in equations (41)-(46).

$$P(z) = \frac{\begin{pmatrix} \left(\tilde{s}\left(\lambda-\lambda(x)-1\right)\sum_{i=a}^{b-1}(z^{b}-z^{i}\right)(c_{i}-R_{i})+(z^{b}-1)\tilde{R}\left(\lambda-\lambda x(z)\right)\\ \left(\tilde{v}\left(\lambda-\lambda x(z)\right)-1\right)\alpha_{j}\sum_{i=a}^{M}p_{i}z^{i}+(z^{b}-1)\tilde{R}\left(\lambda-\lambda x(z)\right)(\tilde{v}\left(\lambda-\lambda x(z)\right)-1\right)\\ \sum_{i=a}^{N-1}Q_{i}z^{i}\\ (z^{b}-\tilde{s}\left(\lambda-\lambda x(z)\right)(-\lambda+\lambda x(z)) \qquad (48)$$

Equation (48) has N+b unknowns  $p_0$ ,  $p_1$ ,  $p_2$ ,  $p_3$ , ...,  $p_{b-1}$ ,  $q_0$ ,  $q_1$ , ...,  $q_{N-1}$ . The following theorems are proven to express  $q_i$  in terms  $p_i$  in such a way that the numerators has only b constants. By Rouche's theorem of complex variables, it can be proved that  $(z^b - 1)\tilde{s}(\lambda - \lambda x(z))_{has b-1}$  zeros inside and one of the unit circle  $|z|_{=1}$ . since P(z) is analytic within and on the unit circle, the numerator must vanish at these points, which gives b equations with b unknowns.

#### **Steady state Condition**

The probability generating function has to satisfy P(1)=1. In order to satisfy this condition, applying L' Hospital's rule and evaluating limit  $z \rightarrow 1$  of P(z) and equating the expression to 1, we have

$$E(S)(\sum_{a}^{b-1}(Ci_{R_{i}})(b-i))_{+b E(V)}\sum_{i=0}^{a-1}(C_{i}+\sum_{j=1}^{M}P_{j}(z,0)\alpha_{j})_{=b-\lambda E(X)E(S)}$$
(50)

Since left hand side of (50) are the probabilities of 'i' customers being in the queue it follows that left hand side must be positive. Thus P(1)=1 is satisfied iff  $(b - \lambda E(X)E(s))>0$ .

# $\lambda E(X)E(S)$

If  $\rho = b$  then  $\rho < 1$  is the condition to be satisfied for the existence of steady state.

## Particular Case;

When setup time is zero and  $\alpha_j = 0$  for j=1,3,...M equation (48) reduces to

$$P(z) = \frac{\left[\left(\tilde{s}\left(\lambda - \lambda x(z) - 1\right)\sum_{i=a}^{b-1} (z^{b} - z^{i})(c_{i}) + (z^{b} - 1\right)(\tilde{\forall}(\lambda - \lambda x(z)) - 1)\sum_{i=a}^{N-1} Q_{i}z^{i}\right]}{\left(z^{b} - \tilde{s}\left(\lambda - \lambda x(z)\right)(-\lambda + \lambda x(z))}$$
(51)

Equation (48) gives the queue size distribution of  $M^X/G(a,b)/1$  queueing system with multiple vacations.

#### IV. CONCLUSION

An M x /G(a,b)/1 queue with multiple vacations setup times with N- policy and delayed service has been studied. The PGF of queue size at an arbitrary time epoch is obtained . Some performance measures are also derived As a future work expected queue length, busy period ,Idle period and Cost analysis will be discussed.

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#### AUTHORS

**First Author** – R.Vimala devi,Department of Mathematics,Govt. Arts College,Villupuram,vimaladevir2011@gmail.com

**Correspondence Author** – R.Vimala devi,Department of Mathematics,Govt. Arts College,Villupuram, vimaladevir2011@gmail.com 9786004674

# Effect of N, P and their interaction on Physico- Chemical Parameters of Guava (Psidium guajava) cv. L-49 under Malwa Plateau Conditions

# Sharma, Vijesh Kumar; Rajesh Tiwari and Preeti Chouhan

KNK College of Horticulture, Mandsaur, RVSKVV, Gwalior (M.P.)

*Abstract*- The results were obtained from the investigation shows that the individual application of nitrogen and phosphorus and their interaction significantly influence the physico- chemical properties of guava cv. L-49. Treatments with higher doses of nitrogen were found very effective in improve the physico-chemical parameters of guava fruit. The maximum fruit diameter (7.40 cm), fruit length (7.31 cm) and pulp weight (200.01g) was recorded by combined application of 600 g N and 400 g P<sub>2</sub>O<sub>5</sub> (N<sub>2</sub>P<sub>2</sub>) per tree. The effect of treatment interaction was non significant on the TSS, acidity and tss/acidity ratio. The maximum total sugars (7.987%) were recorded in N<sub>1</sub>P<sub>2</sub>, non-reducing sugar (4.097%) was recorded in N<sub>1</sub>P<sub>0</sub> treatment combination.

Index Terms- Guava, Physico-chemical, Nitrogen and Phosphorus

## I. INTRODUCTION

uava (Psidium guajava L.), is one of most popular fruits  $\mathbf{J}$ grown in tropical, sub-tropical and some parts of arid regions of India, which belongs to the family Myrtaceae. It is the fifth most important fruit in area after mango, banana, citrus and apple and fifth most important fruit in production after banana, mango, citrus and papaya. Nature has endowed it liberally to tolerate the drought and flood condition and adoptability to a wide range of soil and climatic conditions. Its cultural requirement is also very limited. Besides other factors of crop production, nutrients play an important role in the production of guava. Medeiros et al. (2004) also reported that, the application of N fertilizer provided an increment in the diameter of the guava fruits. The total soluble solids, ascorbic acid, reducing sugar, non-reducing sugar, total sugar and pectin content, as well as TSS: acid ratio in fruits linearly increased with increasing rates of nitrogen fertilizer (Lal and Sen, 2001). Fruit quality was best when the trees received N: P2O5: K2O at 600:300:300 g/tree (Wagh and Mahajan, 1987).

#### II. MATERIAL AND METHODS

The experiment was conducted at the Department of Fruit Science, K.N.K. College of Horticulture, Mandsaur (M.P.) during 2010-2011. The soil of the experimental plot is black in colour and having 165.20, 15.75 and 520.40 kg nitrogen, phosphorus and potassium per hectare along with pH of 7.9. The

experiment was laid out on six year old guava tree cv. L-49 planted at the distance of 6 m x 6 m. Nitrogen and phosphorus were applied in the form of urea (46% N), and single super phosphate (16%  $P_2O_5$ ) respectively. There were three levels of each of nitrogen (0, 300 and 600 g N/tree) and phosphorus (0, 200 and 400 g  $P_2O_5$ /tree) applied. Each treatment was replicated thrice with one plant in each replication. Full dose of phosphorus along with half dose of nitrogen were applied in the month of June, while remaining half dose of nitrogen was applied in the October month.

The data on physico- chemical parameters of fruits were recorded. Physico- chemical parameters of fruits were determined using to average size fruits collected randomly from each replication. The TSS (<sup>0</sup>Brix) was recorded with the help of a hand refractometer. Acidity was estimated by simple acid– alkali titration method as described in A.O.A.C. in (1970). Sugars in fruits were estimated by the method suggested by Nelson (1944). Assay method of ascorbic acid was followed given by Ranganna (1977). The estimation of pectin was according to the method of Kertesz (1951).

#### **III. RESULTS AND DISCUSSION**

# Effect of N, P and their interaction on physical parameters:

The physical parameters were significantly influenced by the nitrogen and phosphorus. In the nitrogen application the maximum fruit length (6.92 cm) and diameter (7.02 cm) at harvest, volume of fruit (187.18 ml), pulp weight (174.75 g) and seed weight (9.00 g) was observed in N<sub>2</sub> (600 g N/tree) at harvest which was significantly higher than the N<sub>1</sub> (300 g N/tree) and control. The physical characteristics of fruit is an expression of the plant's vegetative activity, it may be presumed that the nitrogen treatment at optimum level leads to increase the shoot and leaf development that is ultimately capable of manufacturing greater amount of food materials and the same when translocated into the fruit bearing areas leading to enhancement in weight and size of the fruits. Singh (1985), Dubey *et al.* (2001), Yadav (2002) Medeiros *et al.* (2004) and Meena *et al.* (2005) also reported the similar results in the guava.

The phosphorus also significantly influenced the physical parameters. The maximum fruit length (6.48 cm) and diameter (6.71 cm) at harvest, volume of fruit (174.57 ml), pulp weight (162.95 g) and seed weight (8.04 g) was observed in  $P_2$  (400 g  $P_2O_5$ /tree) which was significantly higher than the  $P_1$  (400 g  $P_2O_5$ /tree) and control, except fruit diameter and; seed weight,

which was at par with the  $P_1$ . The experimental findings are accordance with the results reported by Singh and Rajput (1977). The increase in fruit size by addition of adequate quantity of phosphorus was possibly due to its beneficial effects, on the vegetative growth. This might be indirectly contributed towards increase in the fruit size.

The interactions between N and significantly influenced the physical parameters. The nitrogen particularly at higher level interacted positively with phosphorus. The maximum fruit length (7.31 cm) and fruit diameter (7.40 cm) at harvest, pulp thickness (2.58 cm) and pulp weight (200.01 g) were recorded in N<sub>2</sub>P<sub>2</sub> (600  $g N + 400 g P_2O_5$ ) which was significantly different from other levels of NP and control. The pulp thickness was at par with  $N_2P_1$  (600 g N + 200 g  $P_2O_5$ ). The increase in physical parameters of the fruit may be due to the positive interaction of nitrogen with the phosphorus. Nitrogen is constituent of proteins, enzymes and chlorophyll which is associated with the photosynthesis and growth and phosphorus plays an important role in the photosynthesis besides being a constituent of nucleoproteins. Optimum vegetative growth increases the synthesis of food materials. These activities of nitrogen and phosphorus might have been interacted positively and stimulated the physical characters of the guava fruit positively.

## Effect of N, P and their interaction chemical parameters:

The N and P nutrients and their interactions significantly influenced the chemical constituent's viz. TSS, reducing, nonreducing and total sugars, pectin, TSS/acid ratio and ascorbic acid of the fruit over the control.

The application of nitrogen significantly influenced the chemical characteristics of fruit over the control. In the application of nitrogen the highest TSS/acid ratio (35.653), ascorbic acid content (205.484 mg), pectin content (0.803%), total soluble solids (10.185 <sup>0</sup>Brix) and non-reducing sugar (3.953%) was recorded in N<sub>2</sub> (600 g N/tree) treatment, which was significant to the control, were as TSS/acid ratio and TSS was at par with N<sub>1</sub> (300 g N/tree). The maximum total sugar (7.929%) and reducing sugar (4.112%) was recorded in N<sub>1</sub> (300 g

N/tree) treatment which was significantly higher than the N<sub>2</sub> (600 g N/tree) and control. The explanation of significance of above mentioned chemical parameters are that, the nitrogen had no direct effect on the chemical parameters of the fruit but it may help in the uptake of other nutrients which improve the quality of fruits. These results are accordance with the findings of Singh (1985), Tassar *et al.* (1989), Bhatia *et al.* (2001), Lal and Sen (2001) and Meena *et al.* (2005) in guava.

The application of phosphorus also had significant effect on chemical characteristics of fruit over the control. In the application of phosphorus the maximum TSS/acid ratio (35.918), ascorbic acid (197.082 mg), pectin (0.755%), total soluble solids (10.046 <sup>0</sup>Brix), total sugars (7.809%), reducing sugar (3.886%) and non-reducing sugar (3.924%) was recorded in P<sub>2</sub> (400 g  $P_2O_5$ /tree) treatment which was significantly higher than  $P_1$  (200 g P2O5/tree) and control except total sugars, reducing sugar and non-reducing sugar which was at par with  $P_1$  (200 g  $P_2O_5$ /tree). The overall improvement in the fruit quality as a result of improvement in various chemical characteristics by application of phosphorus may be explained by the fact that phosphorus enters into the composition of phospholipids and nucleic acids, the latter combines with proteins and result in the formation of nucleo proteins which are important constituents of the nuclei of the cells. The chain reactions in these components might have possibly caused improvement in quality. Similar results were also reported by Singh and Rajput (1977) and Tassar et al. (1989) in guava.

The interaction of N and P also had significant effect on chemical characteristics of fruit over the control. In the NP interaction maximum ascorbic acid (206.433 mg) and pectin (0.830%) was recorded in  $N_2P_2$  (600 g N + 400 g  $P_2O_5$ ) which was significant over the control. The maximum total sugars (7.987%) in  $N_1P_2$  (300 g N + 400 g  $P_2O_5$ ), reducing sugar (4.253%) in  $N_1P_0$  (300 g N + 0 g  $P_2O_5$ ) and non-reducing sugar (4.097%) was obtained in  $N_2P_0$  (600 g N + 0 g  $P_2O_5$ ) which was superior to the control. These results are accordance with the findings of Singh *et al.* (1992) and Singh *et al.* (1993) in guava.

Table 1: Effect of N, P and their interaction on physical parameters of guava fruit

Treatment	Fruit length (cm) at harvest	Fruit diameter (cm) at harvest	Volume of fruit (ml)	Specific gravity	Pulp Thick- ness (cm)	Pulp weight (g)	Pulp Per- centage (%)	Seed weight (g)	Seed/ pulp ratio
$N_0$	5.68	6.12	132.77	0.975	2.37	123.27	95.05	6.31	0.052
$N_1$	6.24	6.50	159.76	0.981	2.45	148.88	95.01	7.72	0.053
$N_2$	6.92	7.02	187.18	0.981	2.38	174.75	95.12	9.00	0.052
S. Em. ±	0.023	0.065	3.642	0.002	0.057	3.501	0.121	0.193	0.001
C.D. at 5%	0.065	0.184	10.336	NS	NS	9.936	NS	0.547	NS
$P_0$	6.03	6.39	146.22	0.979	2.36	136.07	94.88	7.19	0.054
P <sub>1</sub>	6.33	6.53	158.92	0.980	2.34	147.87	95.01	7.80	0.053
P <sub>2</sub>	6.48	6.71	174.57	0.978	2.50	162.95	95.28	8.04	0.050
S. Em. ±	0.023	0.065	3.642	0.002	0.057	3.501	0.121	0.193	0.001
C.D. at 5%	0.065	0.184	10.336	NS	NS	9.936	NS	0.547	NS
$N_0P_0$	5.41	6.02	118.83	0.967	2.40	108.55	94.50	6.29	0.058
$N_0P_1$	5.78	6.23	137.90	0.983	2.43	130.15	95.84	5.51	0.044
<b>C.D.</b> at 5%	0.112	0.319	NS	NS	0.282	17.209	0.595	0.947	0.006
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S.Em.±	0.039	0.112	6.308	0.004	0.099	6.064	0.210	0.334	0.002
$N_2P_2$	7.31	7.40	213.35	0.978	2.58	200.01	95.74	9.30	0.047
$N_2P_1$	6.87	6.91	181.19	0.981	2.34	167.86	94.59	9.63	0.057
$N_2P_0$	6.57	6.74	167.00	0.984	2.21	156.37	95.02	8.08	0.052
$N_1P_2$	6.27	6.62	168.79	0.980	2.64	157.75	95.28	7.68	0.050
$N_1P_1$	6.34	6.45	157.67	0.977	2.24	145.61	94.61	8.26	0.057
$N_1P_0$	6.10	6.42	152.83	0.985	2.48	143.29	95.13	7.21	0.051
$N_0P_2$	5.85	6.11	141.57	0.976	2.27	131.11	94.82	7.14	0.055

Table 2: Effect of N, P and their interaction on chemical parameters of guava fruit

Treatment	TSS ( <sup>0</sup> Brix)	Acidity (%)	TSS/ acid ratio	Total sugars (%)	Reducing sugar (%)	Non- reducing sugar (%)	Ascorbic acid content (mg/100g pulp)	Pectin (%)
N <sub>0</sub>	8.639	0.286	30.562	7.593	3.688	3.905	182.403	0.653
N <sub>1</sub>	9.806	0.285	34.709	7.929	4.112	3.817	200.002	0.706
N <sub>2</sub>	10.185	0.289	35.653	7.707	3.753	3.953	205.484	0.803
S. Em. ±	0.178	0.005	0.891	0.021	0.002	0.022	0.216	0.002
C.D. at 5%	0.504	NS	2.530	0.061	0.006	0.061	0.612	0.006
P <sub>0</sub>	9.222	0.281	33.024	7.624	3.785	3.840	195.093	0.680
P <sub>1</sub>	9.361	0.295	31.982	7.795	3.883	3.911	195.714	0.728
P <sub>2</sub>	10.046	0.284	35.918	7.809	3.886	3.924	197.082	0.755
S. Em. ±	0.178	0.005	0.891	0.021	0.002	0.022	0.216	0.002
C.D. at 5%	0.504	NS	2.530	0.061	0.006	0.061	0.612	0.006
$N_0P_0$	8.417	0.267	31.840	7.380	3.521	3.859	181.323	0.622
$N_0P_1$	8.583	0.295	29.233	7.578	3.813	3.764	182.667	0.665
$N_0P_2$	8.917	0.295	30.613	7.821	3.730	4.091	183.220	0.672
$N_1P_0$	9.250	0.283	32.875	7.817	4.253	3.563	199.630	0.644
$N_1P_1$	9.750	0.290	33.912	7.983	3.963	4.020	198.782	0.711
$N_1P_2$	10.417	0.282	37.339	7.987	4.120	3.867	201.593	0.762
$N_2P_0$	10.000	0.293	34.356	7.677	3.580	4.097	204.324	0.774
$N_2P_1$	9.750	0.300	32.801	7.823	3.873	3.950	205.693	0.807
$N_2P_2$	10.806	0.273	39.801	7.620	3.807	3.813	206.433	0.830
S.Em.±	0.308	0.008	1.544	0.037	0.004	0.037	0.374	0.004
C.D. at 5%	NS	NS	NS	0.105	0.011	0.106	1.060	0.011

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#### AUTHORS

**First Author** – Sharma, Vijesh Kumar, KNK College of Horticulture, Mandsaur, RVSKVV, Gwalior (M.P.) **Second Author** – Rajesh Tiwari, KNK College of Horticulture,

Mandsaur, RVSKVV, Gwalior (M.P.)

**Third Author** – Preeti Chouhan, KNK College of Horticulture, Mandsaur, RVSKVV, Gwalior (M.P.)

# Acute Respiratory Infection among Children and Health Seeking Behaviour in India

# Laxmi Kant Prem Prakash

Centre for the Study of Regional Development (CSRD), School of Social Science (SSS), Jawaharlal Nehru University, New Delhi, India - 110067

Abstract- The paper an attempt has been made to analysis the status of acute respiratory tract infection among children in india. The efforts has been also made to analyze the influence of socioeconomic status of parent where children suffereing from acute respiratory infection. Data has been extracted from National Family Health Survey (2005-06) and District Level Health Survey (2007-8). Cross tabulation and binary logistic regression techniques have been computed to fulfill the requirement of the objectives of the present paper with the help SPSS software. In addition, thematic mapping has been also done with the help of Arc GIS technique. The study reveals that wealth index is a significant factor and it has a positive impact on the treatment seeking behavior of parents. But less educated mother is not significant. In addition, religion, caste and tribes are also significant factors. Sex of child and age of the mother is also important factors to determine health treatment. A great variation found in health seeking behaviors among various sections of the society in the country. Therefore, intervention should focus on economically and socially backward section of the society, especially the rural area should be prioritized.

*Index Terms*- Acute respiratory infection, Treatment seeking behaviours, wealth index, education, and sex of child

### I. INTRODUCTION

A cute Respiratory Infection (ARI) is identified as the most fatal disease among children throughout the world. There are two types of Acute Respiratory Infection, first one is Acute 'Lower Respiratory Infection' (ALRI ) that comprise Bronchitis and Pneumonia, and second one is 'Acute Upper Respiratory Infection' (AURI) comprise Tonsillitis, Pharyngitis, Laryngitis, Sinusitis, Otitis media and 'common cold'. Pneumonia is most dangerous disease than other respiratory diseases in childhood. About 40 percent child mortality of the world occurs due to Acute Respiratory Infection, in only four Asian countries- (1) India, (2) Bangladesh, (3) Indonesia, and (4) Nepal (WHO 2008). Furthermore, as per 'Pneumonia Progress Report (2011)' 75 percent pneumonial deaths occur in only 15 countries of the world. All these countries belong to underdeveloped or developing country of Asia or Africa. India countribut 69 percent, Pakistan (69 percent), Indonesia (66 percent), Bangladesh (37 percent), Uganda (73 percent), Tanzania (59 percent), Nigeria (45 percent), etc. Second largest disease among children is Diarrhea with (16 percent), followed by Malaria (7 percent), Measles (4 percent), Non communicable disease (4 percent), other infectious disease and parasitic disease (9 percent), injuries (4 percent), HIV/AIDS (2 percent), neonatal death (37 percent) (Global Burden Disease 2008). But dispointing sotry is that only 65.1 percent people take treatment for their respiratory infected children and rest of 34.9 percent does not take any treatment (Reports National Family Health Survey- 2005-06). The percentage of treatment seeking behaviours is not equally distributed among various sections of the society. The poorest section of the society, Illiterate, and rural people are far from proper and adequate modern treatment in the country

Actually, 'Health Seeking Behaviour' is a complex procedure. It is a decision making process to seek prefect treatment for health (J. Olenja, 2003). The health seeking behavior is not governed by a single factor rather than many factors. It is a result of individual or household thinking, activeness, sensitiveness, awareness and willingness. It is observed that socioeconomic, socio-cultural and demographic factors are often ignored while formulating health policies or any schemes for providing health care facilities to people. As a result, new schemes for providing health care services could not achieved its goal. It is also far from the community acceptance (Sing and Gupta, 1996). Thus, health seeking behaviour is directed by socioeconomic, socio-cultural, and demographic factors, influence the health behaviour (Babar T. Shaik and Jaunita Hatcher 2004).

Therefore, the aim of this study is to observe the status and regional variation of prevalence of acute respiratory infection among children in india. The efforts also made to analyses how does socioeconomic status of family play an important role to take treatment while their children suffering from 'Acute Respiratory Infections' in India.

# Causes of Death among Children in India (2012)



Source- WHO- 2012, Global Health Observerty Data Repositry

### II. DATABASE AND METHODOLOGIES

The data has been derived from India's third round National Family Health Survey (NFHS-III 2005-06). National Family Health Survey, and District Level Health Survey (DLHS-III, 2007-8) under the 'Ministry of Health and Family Welfare' Government of India'. The 'National Family Health Survey' collected information from national representatively sample of 109041 households, 1294385 women aged 15-49 years and 74369 men aged 15-49 years. It covers 99 percent of India's population living in 29 states.

Received any Treatment – No or Yes has been selected as dependen variable. Total 117508 women were asked whether they sought any treatment while their child suffered from Acute Respiratory Infection during the survey. 76509 women replied 'Yes' they had received treatment which accounted 65.1 percent, whereas, 40998 women said 'No' they did not took any treatment accounting 34.9 percent of the country. Field work has been conducted in two phases from November 2005 to August 2006.

The cross tabulation and Binary logistic regression model has been also performed to estimate the effect of predictor variables on received any treatment. In addition, thematic mapping has been also done with the help of Arc GIS technique.

### III. FINDING

About 11.4 percent children hav been reported suffering from acute respiratory infection in India( District Level Health Survery -III, 2007-8). There is wide variation in prevalence of ARI across the state. The W. Bengal reported the highest percentage of ARI with 24.9 percent followed by Orissa(16.9 percent), Uttar Pradesh(16.9 percent), Bihar(14.3 percent), percent), Madhya Pradesh(12.9 Assam(12.0 percent), Maharashtra (12.0 percent), Jammu and Kashm(11.7 percent) on the other the hand, Mizoram (2.1 percent), Chandigrah (4.1 percent), Damman Diu (4.8 percent), Himachal Pradesh (5.1 percent), Chhattisgarh (5.2 percent), Gujrat (5.7 percent), Panjab(6.0 percent) (District Level Health Survery -III, 2007-8).

Tabl	Table-1.Prevalence of Acute repiratory infection among Children by States in India (2007-8) ( in Percentage)							
S.N	State	ARI	S.N	State	ARI	S.N	State	ARI
1	W.Bengal	24.9	13	Manipur	10.9	25	Dadarnagar haweli	6.5
2	Orissa	16.9	14	Jharkhand	10.7	26	Lakhatadeep	6.4
3	Uttar Pradesh	16.9	15	Uttaranchal	10.7	27	Meghalaya	6.4
4	Bihar	14.3	16	Karnataka	8.7	28	panjab	6
5	Madhya Pradesh	12.9	17	Tripura	8.6	29	Gujarat	5.7
6	Assam	12.0	18	Pandicheri	8.4	30	Chhattisgarh	5.2
7	Maharashtra	12.0	19	Haryana	8.3	31	Himachal Pradesh	5.1
8	Jammu and Kashmir	11.7	20	Goa	8.1	32	Damman Diu	4.8
9	Sikkim	11.7	21	Tamil Nadu	8.1	33	Chandigrah	4.1
10	Arunachal Pradesh	11.6	22	Delhi	7.8	34	Mizoram	2.1

Andhra	
12 Kerala 11.5 24 Pradesh 6.5	

Sources-District Level Health Survey (DLHS-III, 2007-8)



Sources-District Level Health Survey (DLHS-III, 2007-8)

	Number of Cases	Received Treatment	(Fvn)R
Wealth Index		NULIVU HEALIICII	(тур)р
Poorest®	12393	55 7	
Poorer	10692	61.3	1 159***
Middle	8068	66.5	1.335***
Richer	6221	70.7	1.465***
Richest	3625	78.2	1.909***
Education level			
No education®	21332	60.6	
Incomplete primary	3708	62.0	-0.996
Complete primary	2951	64.1	-0.999
Incomplete secondary	10540	70.2	1.149***
Complete secondary	1150	73.5	1.081
Higher	1317	77.1	1.229***
Religious group			
Hindu®	31455	64.0	
Muslim	7816	68.3	1.295***
Christians	857	61.1	875*
Sikh	238	85.7	2.478***
All others	633	56.9	767***
Caste/ Tribes			
Scheduled Caste®	8471	64.1	
Scheduled Tribes	4416	53.4	769***
Other Backward Caste	15669	65.6	-0.957
All Other	12442	68.0	.8-97***
Sex of child			
Male ®	21119	66.6	
Female	19879	63.4	864***
Age of Mother			
15-19®	3417	64.3	
20-24	14657	65.8	-0.955
25-29	13339	65.6	-0.94
30-34	6287	64.4	-0.951
35-39	2498	61.5	874*
40-44	616	66.6	1.216*
45-49	185	47.1	576***

*Sources*-NFHS-III (2005-6), *p*<0.10, \*\**p*<0.05, \*\*\**p*<0.01, ® Reference Category

# IV. TREATMENT SEEKING BEHAVIOURS

Table 1.2 shows that the poorest people experience lowest health treatments by 55.7 percent, whereas, the richest people uses the highest treatment with 78.2 percent. There is a wide difference (of 22.5 percent) between poorest and richest section of the society. Secondly 61.3 percent of the poorer section followed, by middle (66.5 percent) and richer (70.7 percent) sections of the society.

Women with no education seek the lowest treatment with 60.6 percent, followed by Incomplete Primary (62.0 percent), Complete Primary (64.1 percent), Incomplete Secondary (70 percent) and Complete Secondary (73.5 percent). On the other hand, higher educated mother demonstrated highest treatment seeking with 77.1 percent.

Other religious groups demonstrated lowest treatment seeking behaviors while on the other hand, Sikhs take the highest health treatment. Secondly, Muslims seek treatment of 68.3 percent, followed by Hindus (64.0 percent) and Christians (61.1 percent).

Generally, higher caste receives maximum treatment with 68.0 percent as compared with SC/ST/OBC. This is accompanied by Other Backward Caste (65.6 percent) and Scheduled Caste (64.1 percent). The lowest one is recorded by Scheduled Tribes with 53.4 percent.

Male children provided more treatment, 66.6 percent as compared to female children by 63.4 percent.

The mothers belonging to 40-44 years age group seeks the highest treatment, whereas mothers of age-group 45-49 years, exhibit the lowest percentage of health seeking. The second highest age group is 20-24 years (65.9 percent), followed by 30-34 years (64.4 percent), 15-19 years (64.3percent), 35-39 years (61.5 percent).

# Logistic Regression Analysis

Table-1 shows that wealth index is a significant factor and it has a positive impact on the treatment seeking behavior of parents. People with higher wealth index seek more treatment than people with lower wealth indexes. Poorer, middle, richer and richer classes, respectively 1.15, 1.33, and 1.46, 1.90 times more likely to take treatment than poor people. Education of mother appears to be an imperative factor in health treatment. This report shows mixed relationship with Acute Respiratory Infection in children. Incomplete Primary and Complete Primary education are not significant and it has a negative impact on the health seeking behavior of parents and both of them are 0.99 times less likely to seek treatment than uneducated people accordingly. On the other hand, Complete Primary, Incomplete Secondary, Complete Secondary and Higher education are significant determinants which have a positive impact on health seeking behavior and they are 1.14, 1.08 and 1.22 times more likely to seek treatment than uneducated mother.

The logistic regression result also reveals that religious group is also a significant determinant to health care treatment. It also showed a mixed relationship with Acute Respiratory Infection. Muslim and Sikh religious groups showed positive effect and they are 1.29 and 2.47 times, more likely to take treatment than Hindu population. Christians and all other religious groups reported negative effects on treatment seeking behaviour of parents. They demonstrated 0.87 and 0.76 times, respectively seeking less treatment than the Hindu population.

Moreover, caste and tribes are also noteworthy determinant and it negatively affects treatment seeking behavior. Scheduled Tribes, Other Backward Caste, and all other caste groups are 0.76, 0.95 and 0.89 times more likely to seek treatment in comparison to Scheduled Caste..

Female children are 0.86 times less likely to seek treatment when compared to male children. In addition, the age of the mother appears to be significant determinants except '20 to 24 years age group' which has a negative impact on treatment seeking behavior on the other hand, mothers of 40-49 years agegroup has a positive effect and it is 1.21 times less likely to seek treatment than mothers of 15-19 years age group. Mothers of age-group 20-24, 25-29, 30-34, 35-39 and 45-49 years are 0.95, 0.94, and 0.95, 0.87 and 0.57 times respectively less likely to seek treatment than 15-19 years age-group old mothers

### V. DISCUSSION

The finding of the present study clearly reveals that economic status (wealth index) of household affects positively on the treatment seeking behaviors of parent while their children are infected from acute respiratory infection. Jean Christopher Fotso and Barthelemy Kuae Defo (2005) ,Geissler P.W. et al. also observed same finding. In their studies he proved that the women belonging to a wealthier socioeconomic control group experienced higher health treatments than lower socioeconomic quintile group women. Since, the people having low wealth index face financial constraints, low educational attainment resulting in ignorance of sick children (Thelma E.Tupasi 1988). Poverty not only, excludes people from the benefits of health care systems, but also restricts them from participating in the decision.

Educated mother seeks more treatment in comparison to illiterate women. The study also shows that the highest treatment have been taken by higher educated women, whereas the lowest treatment have been by illiterate women for their ARI infected children. Mother education has a strong positive influence on child survival in most of the developing country (Irma T. Elo 1992) Bhanu E. Nirula (1994). There is direct relationship exists between education and health seeking behaviors. Educated of mothers have better knowledge of nutrition, illness of children and treatment (George Kosimbei, 2005). A higher educated woman supports to increase family income and also strengthens own position in the family. Education improves the mental ability of women to communicate with doctors or other health workers in a better way (Qystein Kradal, 2004). In addition, education changes the ideology, attitudes and behaviors of individuals. It enhances the awareness of good health practices. Educated women have a greater possibility of using modern health facilities and easily adopt modern medicines and health practices (Shireen J. Jejeebhoy, 1995)

The maximum treatment taken by the Sikh population group, whereas, the lowest treatment taken by the Christian population group. Since most of Christian people are tribes in india that lives in the forest covered area. The health infrastructures, transportation and communication and other things are not developed. Hindus and Muslims population groups demonstrate moderate pattern regarding treatment seeking behaviors. There is variation in various religious groups when health care utilization is taken into consideration Those people who belong to Hindu religion uses maximum health care services, whereas other Muslims religion groups uses fewer health care services (Niraula 1994). Furthermore, caste and tribes are significant factors that influence health seeking behaviors of parents. The scheduled tribes people less likely to seek treatment for their sick children, than other caste groups (Bhanu, B. Nirula, 1994).

There is sex differential also exist in health treatment behavious of parent. Male children are more preferences brought to health services center for treatment than female children. *Bhanu, B. Nirula (1994)* noticed that higher caste groups seek higher health treatment than lower caste groups in the society. There is a negative association exist between age of the mother and treatment seeking behavior. Middle age group women are more likely to take treatment than older age group women in the country. Older age group mother more likely to seek treatment

for their sick children than younger one. Young mothers have less knowledge and experience of child health care practices (Ghosh, Saswata 2005

#### VI. CONCLUSION

After the above discussion, it has proved that poverty and illiteracy is the main obstacle in the way of immediate treatment of children. Therefore, special attention should be given to poor section of the society. Educational level particular female education should be enhanced so that immediately and perfect treatment could use. Minority and deprived section of the society should be brought under the health programs. Female children and younger mother should be more emphasized in the health policy.

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#### AUTHORS

**First Author** – Author is a research scholor in 'Centre for the Study of Regional Development, (CSRD) School of Social Science (SSS), in Jawharalal Nehru university, New Delhi, India, 110067, E-mail- laxmi.jnu10@gmail.com

# Factors Affecting Customer Demand of Financial Services Offered By Commercial Banks in Nairobi County

Boaz Wamwayi Inganga<sup>1</sup>, Dr. Agnes Njeru<sup>2</sup>, Kepha Ombui<sup>3</sup>, Ondabu Ibrahim Tirimba<sup>4</sup>

Master of Business Administration, Jomo Kenyatta University of Science and Technology<sup>1</sup> Project Supervisor, Jomo Kenyatta University of Science and Technology<sup>2</sup> Project Supervisor, Jomo Kenyatta University of Science and Technology<sup>3</sup> Research Fellow and PhD Finance Candidate at Jomo Kenyatta University<sup>4</sup> tirimba5@gmail.com4

*Abstract*- The demand for retail banking services is concerned with the demand for the financial services offered in retail/ commercial banks. The general objective of this particular study was to examine the factors affecting customer demand for financial services offered by commercial banks in Nairobi County. The researcher used both primary and secondary data sources. The target group for this study was bank customers from a select 13 of the 43 commercial banks operating in Nairobi County as registered by the Central Bank of Kenya that is; Barclays Bank, CFC Stanbic, Chase Bank, Commercial Bank of Africa, Co-operative Bank of Kenya, Diamond Trust Bank, Equity Bank, Gulf Africa bank, I&M Bank, Kenya Commercial Bank, NIC Bank, Standard Chartered Bank and the United Bank of Africa. From these 13 Banks, a sample population of 115 respondents was drawn for investigation. This sample was selected using stratified random sampling technique. Both open and closed ended questionnaires were used and the data was analyzed by SPSS version 17. The study results revealed that; many respondents reported earnings above Ksh20,000, there was under saving, many investors had accounts that were opened with nil requirements for bank balances, Interest rates on the other hand were cheaper for short term credit services, 51% of respondents operated savings accounts, 32 % operated checking accounts and 14% salary accounts.

### Index Terms- Interest rates, savings, bank facilities, bank balances, customer demand

### I. INTRODUCTION

**P**opulation increases as well as an increase in individual Per capita income levels have generally fuelled strong appetites for financial services in the Banking sector globally. Banks worldwide have continued to grow and have become among the main pillars of several economies both in developed and developing countries (World Bank, 2013). The growth in the demand of retail banking services in Africa has been spurred largely by the emerging middle class in the continent an income category which has tripled over the past 30 years to 355 million or more than 34% of the continents population. This has led to the sudden shift by domestic, regional and international banking groups to focus their efforts to expand the menu of services to meet the growing needs of this affluent class (AFDB, 2012). Retail Banking in Sub-Saharan Africa is projected to grow by 15% per annum by 2020 which will then bring the sectors contribution to GDP to about 19% from 11% in 2009 (AFDB, 2012).

Kenya's financial sector is the third largest in Sub-Saharan Africa after South Africa and Nigeria respectively (World Bank, 2013). The sector comprises of a large Banking sector, the securities market and the large and growing pensions and insurance industry. The Banking sector dominates the financial sector comprising of 43 Commercial Banks, 1 Mortgage finance company, 9 deposit taking Microfinance Institution, 7 representative offices of Foreign Banks, 107 foreign exchange bureaus and 2 credit bureaus (CBK, 2012). According to CBK (2012), there exist 44 Commercial Banks and Mortgage Finance Institutions in Kenya. Out of this, 31 are locally owned and include 3 Banks with significant shareholding by the Government and state owned Corporations, 27 Commercial Banks and 1 Mortgage Finance Institution.

Bank customers in Kenya often cite the cost of credit as a stumbling block in getting access to formal credit and often look for cheaper sources of credit such as 'chamas', investment groups, Sacco's and shylocks among others which offer low cost of credit to potential customers. Deposit rates also play a crucial role in influencing customers when opening deposit accounts such as savings accounts. The interest rate on deposits charged by the different Commercial banks in Kenya has been heavily criticized for being extremely low compared to the interest rate charged when they lend money (World Bank, 2013). The average deposit rate charged by banks in currently stands at 6% on average compared to 17% the average lending rate charged by banks in Kenya (CBK, 2012).

There are several factors that exist which affect customer demand for financial services offered by Commercial Banks and they include income levels, savings Levels (Ando A, 1963)availability of bank branches, and availability of bank agents, transaction costs charged by banks (Allen .F, 2013) banking products, customers saving level and efficiency of services offered by banks among others. This study therefore will shed light on the factors that affect customer demand in financial services offered by Commercial Banks in Nairobi County.

On the matter of determining factors for financial services demand, these appear to vary. However, the common thread in most studies remains that this demand is a function of income, savings and transaction costs however different studies focus on a variety of other independent determinants of financial service demand. (Dick A, 2002) study focused on the costs associated with financial service access, such us; opening balances in America. His findings were that American consumers were less responsive to opening balances than they were to deposit rates. (Beck T, 2008) in their study associated the large fixed transaction costs peculiar to traditional (paper) banking service expansion to be correlated with a consumer perception of cost related inconvenience and hence lower bank service demand.

There are minimal studies to the authors' knowledge that have solely focused on the determinants of demand for the specific financial services offered by commercial banks by retail banking customers with specific reference to the determining factors; - income level of customers, savings level of customers, transaction costs charged by commercial banks and commercial bank accessibility in Kenya. Conversely, this documents utility to bank customers is unique in the provision of information on the bank products offered in commercial banks in Kenya and its provision of an insight into the functional properties of these banking services. Therefore, this study attempted to explore the different factors which influence and affect customers for the demand for commercial banking services which remains an under-researched area of study with the objective of establishing the factors affecting customer demand in financial services offered by Commercial Banks in Nairobi County.

The study will cover approximately 13 of the 43 Commercial Banks registered by the Central Bank of Kenya under cap 488 of the Banking Act operating in Nairobi County. The respondents of the study will be Commercial Bank customers and staff operating in Nairobi County. The study is significant because of the following reasons and to the following parties:

- I. Commercial Banks: By enabling them retain and increase the number of customers based on the findings of the research study thus increasing completion.
- II. Commercial Bank Customers: By enabling Commercial Bank Customers to make informed choices with regards to the different bank
- III. Researchers: By acting as a guide to future researchers and will aid the expansion of this study focus on commercial banks and perhaps other financial institutions such as Saccos and Insurance Companies in future.
- IV. Policy Makers: Will enable them to make sound legislations and policies involving banking and financial matters such as the issue of interest and deposit rates.

# II. LITERATURE REVIEW

# 2.1 Theoretical Framework

# 2.2.1 Classical theory of demand

Banking services are demanded in a similar manner to any other service and the prices assosiated with the issuance of such service are the prime determinants of demand. Prices on the other hand are settled by market forces of supply and demand model. It is concluded that in a competitive market, the unit price for a particular good will vary until it settles at a point where the quantity demanded by consumers (at current price) will equal the quantity supplied by producers (at current price), resulting in an economic equilibrium for price and quantity (McConnel, 2008).

McConnel (2008) gives the four basic laws of supply and demand are as follows; If demand increases and supply remains unchanged, a shortage occurs, leading to a higher equilibrium price; If demand decreases and supply remains unchanged, a surplus occurs, leading to a lower equilibrium price; If demand remains unchanged and supply increases, a surplus occurs, leading to a lower equilibrium price; If demand remains unchanged and supply decreases, a shortage occurs, leading to a higher equilibrium price. Demand is often depicted graphically as a negatively sloping curve asymptotic to the x axis (which is representative of the quantity of products demanded). It represents the amount of some good that buyers are willing and able to purchase at various prices, assuming all determinants of demand other than the price of the good in question, such as income, tastes and preferences, the price of substitute goods, and the price of complementary goods, remain the same. Following the law of demand, the demand curve is almost always represented as downward-sloping, meaning that as price decreases, consumers will buy more of the good (McConnel, 2008). Just like the supply curves reflect marginal cost curves, demand curves are determined by marginal utility curves. Consumers will be willing to buy a given quantity of a good, at a given price, if the marginal utility of additional consumption is equal to the opportunity cost determined by the price, that is, the marginal utility of alternative consumption choices.

Thus a demand schedule is defined as the willingness and ability of a consumer to purchase a given product in a given frame of time. (McConnel, 2008) Aforementioned, the demand curve is generally downward-sloping however there may be rare examples of goods that have upward-sloping demand curves. Two different hypothetical types of goods with upward-sloping demand curves are Giffen goods (an inferior but staple good) and Veblen goods (goods made more fashionable by a higher price) (Binger, 1998) Two distinctions ought to be made between the individual and market demand curves. The latter is obtained by summing the quantities demanded by all consumers at each potential price (Binger, 1998). The determinants of demand include Income, Tastes and preferences, Prices of related goods and services, Consumers expectations about future prices and incomes and the number of potential consumers among others (Binger, 1998). When consumers increase the quantity demanded at a given price, it is referred to as an increase in demand. Increased demand can be represented on the graph as the curve being shifted to the right. At each price point, a greater quantity is demanded, as from the initial curve to the new curve.

The price of money (interest rate) quite often influences customers when deciding to take a loan. The higher the price of money, the lower the demand for money in the economy, the opposite is true. (World Bank, 2013) reported that small medium sized enterprises cite the cost of credit as being the major stumbling block in getting access to credit inferring to the high cost of borrowing or interest rate in the economy which keeps them away from formal financial instructions.

# 2.2.2. Theory of Consumer Choice

In microeconomics, the theory of consumer choice relates preferences (for the consumption of both goods and services) to consumption expenditures; ultimately, this relationship between preferences and consumption expenditures is used to relate preferences to consumer demand curves (McConnel, 2008). The link between personal preferences, consumption, and the demand curve is one of the most closely studied relations in economics. Consumer choice theory is a way of analyzing how consumers may achieve equilibrium between preferences and expenditures by maximizing utility as subject to consumer budget constraints (Binger, 1998).

The fundamental theorem of demand states that the rate of consumption falls as the price of the good rises; this is called the substitution effect. Clearly, if one does not have enough money to pay the price, then they cannot buy any of those items. As prices rise, consumers will substitute away from higher priced goods and services, choosing less costly alternatives. Subsequently, as the wealth of the individual rises, demand increases, shifting the demand curve higher at all rates of consumption; this is called the income effect. As wealth rises, consumers will substitute away from less costly inferior goods and services, choosing higher priced alternatives (Binger, 1998).

Economists' modern solution to the problem of mapping consumer choices is analysis. (Binger, 1998) For an individual, indifference curves and an assumption of constant prices and a fixed income in a two-good world will derive the following situation where the consumer can choose any point on or below the budget constraint line represented as a diagonal line. In other words, the amount spent on both goods together is less than or equal to the income of the consumer. The consumer will choose the indifference curve with the highest utility that is within his budget constraint. Every point above his budget line is outside his budget constraint (beyond his means) so that the best that he can do is the single point on his indifference schedule that is tangent to his budget constraint (understood as a price that is agreeable to his budget).Income effect and price effect deal with how the change in price of a commodity changes the consumption of the good. The substitution effect is the effect observed with changes in relative price of goods. This effect basically affects the movement along the demand curve (McConnel, 2008).

The utility of graphical representation of such utility curves is that they can be used to predict the effect of changes to the budget constraint. If the price of a single good in this 2 good representation of demand increases, the budget constraint will pivot/ rotate such the quantity demanded for the less expensive good increases and that which is demanded for the price affected good reduces such that the consumer maintains a utility similar to his previous utility subject to his budget constraint. Notice that because the price of one of the goods does not change, the consumer can still buy the same amount that good if he or she chooses. On the other hand, if the consumer chooses to buy only the more expensive good, he or she will be able to buy less of it because its price has increased (McConnel, 2008). The theory of consumer choice examines the trade-offs and decisions people make in their role as consumer sas prices and their income changes (Binger B, 1998). To maximize the utility with the reduced budget constraint, the consumer will reallocate consumption to reach the highest available indifference curve which his budget line is tangent to such that in the instance that a good is a normal good, consumption and utility derived from consumption declines as the price of that good increases and such the concept of marginal rate of substitution is introduced (McConnel, 2008).

Every price change can be decomposed into an income effect and a substitution effect; the price effect is the sum of substitution and income effects. The substitution effect is a price change that alters the slope of the budget constraint but leaves the consumer on the same indifference curve. In other words, it illustrates the consumer's new consumption basket after the price change while being compensated as to allow the consumer to be as happy as he or she was previously. Then the income effect from the rise in purchasing power from a price fall reinforces the substitution effect. If the good is an inferior good, then the income effect will offset in some degree the substitution effect. If the income effect for an inferior good is sufficiently strong, the consumer will buy less of the good when it becomes less expensive, a Giffen good (Armendiaz, 2005) (commonly believed to be a rarity). The money income of the consumer causes changes in purchasing power as well as a change in quantity demanded brought by a change in real income (which

increases consumer utility). Graphically, as long as the prices remain constant, changing the income will create a parallel shift of the budget constraint. Increasing the income will shift the budget constraint right since more of both can be bought, and decreasing income will shift it left.

# 2.3 Conceptual Framework

The conceptual framework illustrates the relationship between the independent variables which include Transactions costs (ATM costs, Interest and deposit rates & withdrawal fees), Savings level and Household or individual income level and the demand for Commercial Banking Services which is the dependent variable. Figure 2.1 below illustrates the conceptual framework which will be used in the study.



Incom change for labor or services or from the sale of goods or properties (Zeller, 2001). In cross sectional studies, income levels are often observed to be intimately related to financial sector development and by extension the demand for financial services in both developed and developing countries. This is explained thus; that the volume and sophistication of the financial services demanded is much greater in the higher income economies than in the lower income economies and as such developed countries are better able to achieve economies of scale in banking (Allen, 2013). In micro studies where household surveys are utilized, a peculiar phenomenon begins to emmerge whereby negative income growths correlate with positive demand for financial services in particular loans or credits for purposes of household consumption smoothing or among micro and small enterprises to subsidize the operational costs of the enterprise (Zeller, 2001).

It is most often assumed in economic theory that higher incomes strongly correlate with a higher demand for financial services (Ando, 1963) this is perhaps explained by the fact that higher incomes imply that the demand for consumer durables have been met and that basic expenses such as utilities and food constitute a lower percentage of income such that money demand is increasingly for precautionary and asset storage value and hence the demand for portfolio banking services. However, lower incomes also tend to coincide with a greater interest and demand for financial services albeit of a different kind i.e. credit.

In the kind of financial services demanded among income groups, there is an observed bias for credit services and informal and semiformal financing options. They are constrained in terms of financing options such that (La Ferara E, 2003) observed among low income earners that 25% of home credit users and 23% of payday credit users are among this group of individuals without an alternative source of credit. The illegal lending sector on the other hand was being used by approximately 3% of low income earners, a figure that tended to increase significantly in more deprived income groups.

# 2.3.2 Savings Levels

A savings culture is often associated with robust demand for financial services. According to Ando & Modgliani (1963), the life cycle hypothesis assumes that the prime earning years of an individual is often the period in which demand for banking services is highest (Ando, 1963) established the existence of a positive correlation between demographics and savings levels as retirees dispose off assets to afford utilities and recreation and as the middle aged individuals in their earning prime differ consumption. Thus, very much like the Keynesian theory the life cycle hypothesis sticks to the definition of savings as deffered consumption. Sticking to this theme, the share of conumption in income tends to be much lower in higher income groups than in lower income groups. This is probably because their transitional income is much higher than in lower income groups who because of such factors as limited emloyment

options precipitated by possibly limited levels of education and skill which results a situation whereby there is little avenue for any additional income streams (Dick, 2002).

For the lower income quintiles, savings levels relates to the demand for financial services especially the demand for credit services as credit is etched onto the reality of low income existence credit often offers the only means through which management of cash flow is possible. In the UK (La Ferara E, 2003) observed that 7 in 10 low income households absolutely have no savings and could not raise any sufficient money in times of an emmergency such as an adverse income shock such as a lay off.

Banking demand influenced by savings in Sub-Saharan Africa is not limited to individual demand for such banikng services such as savings accounts due to the prevalence of group savings rather than individual savings culture. In Ghana and Kenya, Commercial Banks have established linkages with informal actors such as Chamas in Kenya and Susu's in Ghana where 4,000 Susu's were collecting an average monthly value of \$15 worth of savings on average per individual and servicing 200,000 clients in the country in 2003 (Binger, 1998)

Atieno (1997) asserts that, In Kenya various account services have been launched such as the Chama accounts by NIC-Bank and Cooperative Bank in order to tap into this group savings culture. This is because the incentive behind group savings is often that of investments, asset purchases e.g. land that often have to be formaly financed due to the large purchasing costs and collateral requirements as well as the reluctance of MFI's and infomal financial institutions to give large volume or long term credits (Armendiaz, 2005). (La Ferara, 2003) on the other hand observed that in the UK where 78% of lower income households had no savings at all, demand for financial services especially credit services is often driven by the lack of safety nets and that the reality of life on a low income and for many was the only way of funding purchases. In the UK over 10 Million of households in the low income brackets used commercial credit facilities to finance expenditure and only about 0.5 million were using social credit to finance their expenditure (Whtley, 2011). Bank deposits to GDP ratio in Sub-Saharan Africa stood at 25% on average compared to other countries outside Subsaharan Africa where the ratio averaged about 40% (IMF, 2012). This suggests that there exists a comparativley lower savings culture in Subsaharan Africa as compared to other developing countries outside the continent.

# 2.3.3 Transaction Costs

Both households and firms pay transaction costs each and every time they decide to buy or sell financial assetts. These costs consist of service charges, commissions, bid/ask spreads and the time required to effect a transaction. (Hess, 1995) argues that if transaction costs were to matter "households would be biased towards the size of asset portfolio it already owns rather than towards that which it would have otherwise owned minus the transaction cost" and that such households would trade less often on their assets. He adds that when actual and optimal portfolio amounts differ, households can; earn lower expected rates of return, bear uncompensated diversifiable risk and have non-optimal amounts of liquidity (that is; higher than is optimal preference to hold money).

Data in Kenya is sketchy to say the least but in economies such as the USA, there was an observable correlation between increased transaction costs and lower asset volumes traded by households between 1970 through 1986 so that transaction cost increases significantly reduced the buying and selling of financial commodities/assets by households (Hess, 1995). Transaction costs such as transport costs to financial institutions, transaction charges such as deposit charges, withdrawal and ATM charges, Interest rates on credit cards, interest rates on loans, account operating costs such as the costs for various services such as mobile banking charges, account inquiries charges, internet banking charges as well as operating balance charges incurred on opening a bank account impact the demand for financial services for instance; due to the small volume nature of deposits in Kenya and in Sub Saharan Africa in general, such costs can frequently erode the convenience of banking services.

On an annual basis for instance (Whtley, 2011) spoke of a £630 million behavior induced cost to low income consumers of financial services. In Kenya where alternative institutions such as SACCO's, MFI's and Mobile money offer substitute financial services similar to commercial banks for individuals, households and micro enterprises transaction cost differences are of pivotal influence on whether commercial banking services are competitive enough to effectively demand. This is apparently evident by the sharp acceleration in mobile money services subscription relative to bank service uptake in Kenya (CBK, 2012)

### 2.3.4 Demand for Banking Services

Commercial banks may be described as institutions that engage in the following services.; processing of payments through e-money transfers, issuing of bank drafts and bank charges, accepting money on term deposits and lending by overdrafts, installments, provision of documents such as standby letter of credit, guarantees, performance bonds, securities underwriting, commitments and other forms of sheet exposures, safe keeping of documents and other documents in safety deposit boxes, sales, distribution of brokerage with or without advice, cash management and treasury, merchant banking and private equity financing, etc. In general, there are three broad categories of financial services/ banking services i.e. loans (credit services), savings services such as deposit accounts and insurance services that retail banking consumers may demand which are demanded for various reasons such as financial smoothing (Ellison et al., 2011) or for portfolio services such as the income life cycle hypothesis explains (Ando A, 1963).

Unsecured loans are monetary type loans that are not secured against the borrowers assets. Such type of credits/ loans are most typically credit card debt, credit lines and corporate credit lines, overdrafts among others which may be available under many different guises and credit packages (Schindler, 2007). As previously discussed, different income groups demand different financial services from commercial banks. For lower income group where cash flow management and consumption smoothing/ financial smoothing is a concern, it is typical that their major utility in using commercial banking services would be for the sake of credit/ loan facilities. For higher income groups interested in capital gains and equity banks offer a variety of agency services such as advisory services to cater to that niche, thus the demand for banking services may be perceived as a multivariate type of demand.

# 2.4 Empirical Review

Paradigm has shifted over the years on the determinants of household demand for financial service from the typical perspective on loans (when focus was on MFI's in the 80's) to the forgotten half i.e. demand for savings services and later the emergence of demand for finance in the 90's. Consensus has however been reached that consumers stand to benefit from a wider range of financial services than just credit services (Armendiaz B, 2005). Demand for financial services is looked at from the perspective of income generation and financial smoothing such as investment, savings and credit deposits that earn interest to credit demand, insurance demand and short-term credits demand (Zeller J, 2005). It is imperative that it is understood that literature strands that focus on the demand for financial services in developing countries are rarely correlated to each other. (Allen .F, 2013) The consensus is out on whether demand for financial services in emerging markets is driven by prices or by discourse. In emerging markets a key characteristic observation has been the large significance of the informal sector whereby it is popular discourse that by incorporating the un-institutionalized capital and actors of the informal sector into the financial services at market prices to grapple with and more curious still; the effective functioning of alternative financial services providers such as informal credit and insurance markets such that the benefits of formal financial services do not exceed the relatively greater fixed costs associated with such products to the consumer (Beck, 2010).

An alternative view is that limited financial literacy serves as a more significant barrier to demand than the high fixed cost issue associated with formal financial services and especially traditional banking services such that if an individual is unfamiliar with a product/ service they will have no cause to demand for it. This assumption while not mutually exclusive from the first assumption has had significantly divergent repercussions as far as suggested strategies for the mitigation of low demand for financial services in the developing world as evidenced by the actions of financial sector actors. Households with low financial literacy tend to have the following financial habits; low pension/retirement savings, they borrow at high interests, and participate less in the financial system relative to the actions of their more financially literate counterparts (Lustradi, 2006).

In Indonesia, a ratio of Educational expenditure to GDP has been used in a prior survey of the phenomena by the Micro-Finance Innovation Centre for Resources and Alternatives (MICRA) as an indicator of financial literacy through population literacy. At the time of the study, the ratio of educational expenditure to GDP in Indonesia was one of the lowest in the world however; contrary to theoretical assumption the banking industry in the country was of significant geographical reach. Moreover, at the time Indonesian banks offered savings accounts with minimal deposit requirements the equivalent of \$0.53 and a return on deposits (interest earning capability) for deposits exceeding \$1.06. This compared to a per capita income of \$1,306 the banking penetration at the time of the study in the country was at 41% of the total population and 32% of the rural households in Indonesia that have a bank account (Cole S, 2009).

To evaluate the importance of financial literacy in households decisions to use banking services; the study offered its unbanked respondents a two hour long financial literacy class with \$14 subsidies to observe whether they would indeed open bank accounts. In 2007, India ranked ahead of the USA at 38<sup>th</sup> place worldwide in terms of bank branch penetration with approximately 10 bank branches per 1,000km<sup>2</sup> compared to the USA in 39<sup>th</sup> place with 9.81 branches per 1,000km<sup>2</sup>. As a measure of financial literacy, the questionnaire survey instrument employed the following questions to gauge the respondent's level of financial understanding/knowledge. Which are as follows: Suppose you borrow Rp. 100,000 from a money lender at an interest rate of 2% per month, with no repayment for three months. After three months, do you owe less than Rp. 102,000, exactly Rp. 102,000, or more than Rp. 102,000? If you have Rp. 100,000 in a savings account earning 1% interest per annum, and prices for goods and services rise 2% over a one-year period, can you buy more than, less than, or the same amount of goods in one year as you could today with the money in the account? Is it more risky to plant multiple crops or one crop? And suppose you need to borrow Rp. 500,000. Two people offer you a loan. One loan requires you to pay back Rp. 600,000 in one month; the second loan requires you to pay back in one month Rp. 500,000 plus 15% interest. Which loan represents a better deal for you? The mean share of correct answers was 52% in Indonesia, and 34% in India. It should be noted that all questions were multiple choice, two with two possible answers, and two with three possible answers. Thus, random guessing would yield an average score of 42%, which is in fact higher than the average score in India, where many respondents answered do not know rather than guess. The percentages of do not know" answers ranged from 6% to 38% in India and from 4% to 16% in Indonesia. The inflation questions elicited the most do not know responses in both countries. Looking at individual questions, a majority of people in both surveys responded correctly to the compound interest question (59% correct in India and 78% in Indonesia).

Discerning interest rate versus lump sum loan repayments seemed to be most difficult for Indian respondents (only 24% in India) whereby the diversification question yielded (31% correct answers in the Indian survey and 28% in Indonesia) (Cole S, 2009). Different authors identify seasonal income fluctuations as major determinants on the demand for financial services in their studies. (Beck T, 2008) such that borrowing derived from adversity is identified as being integral to the livelihood systems in developing countries such that in Burkina Faso loans and credits are used to solve inventory constraints in businesses as well as for expenditure smoothing in times of economic shock. (Zeller M, 2001) In comparison to the literature on credit demand, there are significantly fewer contributions on the savings behaviour of households in developing countries and in contrast studies tend to focus on rural demand. Also studies in developed countries that focus on formal savings demand often tend to observe savings patterns over a lifetime and such studies often regard age as an explanatory factor behind savings level (i.e. life cycle income hypothesis) and as such observations in developing countries often tend to contradict such theoretical expectations (Spio K, 1996).

Other studies on the demand for financial services tend to focus on the concept of credit rationing and its impact on both formal and informal demand for credit services. (Atieno, 1997) which thus leads to a combined study of the demand for formal and informal loans. An important insihght into these studies is that credit rationing is not the sole determinant of demand for either formal or the informal financial services (credit services) but that there are other explanatory factors at work such as; the distinct underlying motivation of customers in applying for loans (i.e. either for investment or for financial smoothing the latter having been identified as the major motivation behind informal credit services).

Other studies observe that countervailing impacts such as education levels, number of dependants, asset holdings, credit history, and secure land rights affect the demand of either demand for formal financial services such as banking is or the demand for informal financial services with the exception of asset holdings which affect the demand for both formal and informal financial services. (Bensako, 2010) Variables such as connections to financial institutions exhibit a positive and significant demand impact on the demand for both formal and informal loans. Others on the other hand are of the opinion that land holdings affect the probability of using banking services such as credit services more often than labor increase and that this difference in probability effect is significant (Beck, 2008).

# 2.5. Critique of Existing Literature

One of the critiques of the existing literature on consumer demand for commercil banking services is thus; That there is a shortage of empirical data on the banking sector in the African region (Allen, 2013); that studies on banking in Africa and in the developing world tend to be difficult to comparein cross-country terms and that there is often a confusion in the terms used and the difference in meanings between terms from one study to the next; That cross country comparisons are difficult to establish due to the lack of panel data until recently as well as due to the lack of simmilarity between research instruments applied (i.e. macro data and household surveys) (Guerin, 2011); that studies of banking demand tend to focus on both the informal and formal sector and their different banking institutions (Beck et al., 2010).

### 2.6. Research Gaps

Various studies have focused on comparative studies between the formal and the informal financial sector(La Ferrara 2008; Schindler, 2007). Some have focused on cross country comparisons between the uptake of one financial service or another (Allen .F, 2013) however, none have focused on customer demand for financial services offered by commercial banks in Nairobi county Kenya.

### III. METHODOLOGY

The researcher will use mixed research design technique. This type of research design combines the collection and analysis of qualitative and quantitative data. Mixed research design uses both research strategies and research approaches. Research strategy is a procedure for achieving a particular intermediary research objective such as sampling, data collection or data analysis. A research approach refers to an integrated set of research principles which are roadmaps that are associated with particular research interests. Examples of research approaches include experiments, surveys and correlation studies among others where each approach is specifically suited to address a particular analytic interest (Mugenda & Mugenda, 1999). The mixed research design technique will be utilized to overcome the limitations of a single research design and to address questions under study at different levels so as to understand the different factors affecting customer demand for financial services offered by Commercial Banks in Nairobi County.

The accessible population or the respondents will be customers from the 13 out of the 43 specific Commercial Banks branches selected for the study and operating in Nairobi County (CBK, 2012). A sample of (30%) 13 banks of the total 43 Commercial Banks operating in Nairobi County were selected for the purpose of this study. The researcher used Non-probability sampling specifically purposive sampling technique to select the 13 Commercial Bank branches operating in Nairobi County which were relevant to the research study. The target populations of the study are the different commercial bank customers. Table 1 below illustrates the sampling frame developed by the researcher of the 13 selected Commercial Banks operating in Nairobi County.

In this study, the sampling frame will be drawn from 13 of the total 43 Commercial Banks operating in Nairobi County. The researcher managed to visit and interview the Commercial Bank Branch Managers of the 13 selected Banks and it is from this interview that the estimate number of bank customers from each branch was derived. The sampling frame in Table 1 indicates that there is an estimate of about 78,000 customers from the 13 selected commercial bank branches under study. According to Mugenda & Mugenda (1999) when the population of a study is more than 10,000 individuals, 384 of them are recommended for as the desired sample size given that the Z statistic is 1.96 at 95% confidence level as shown in the following formula.

$$N=\frac{Z^2Pq}{d^2}$$

Where:

N = The desired sample size (When population is less than 10,000)

Z = The standard normal deviate at the required confidence level

P = The proportion in the target population estimated to have characteristics being measured

q = 1-p

d = The level of statistical significance set

$$384 = \frac{1.96^2(0.5)(0.5)}{(0.05)^2}$$

Since resources and time are a major constraint in deciding the sample size, the above procedure will help guide the researcher in determining the sample size. Therefore, as indicated above, the study will use a sample of 30% of the desired sample size (384) as the actual sample size. Therefore the actual sample size that the study will consider will be 115 respondents from the 13 selected Commercial Bank branches under study.

Table 1 below shows the commercial bank name, branch name & location, the number of mangers from each commercial bank, the estimate number of customers from each commercial bank and the desired actual sample size for the study. The desired sample size for each Commercial Bank will be haphazardly selected during the survey. Using purposive sampling technique, a sample of 35 managers will be interviewed from the 13 Commercial Banks during the survey.

No	<b>Commercial Bank</b>	Branch Name & Location	Managers	Customer No	Sample Size
1	Barclays Bank of Kenya	Hurlingham-Yaya Center	2	28,000	15
2	CFC Stanbic Bank	Westlands-Chiromo Rd	3	2,000	5
7	Chase bank	Riverside-Kileleshwa	2	2,000	5
3	Commercial Bank of Africa	Upperhill-CBA HQ	3	2,000	10
4	Cooperative Bank of Kenya	Ngong Rd-NBC Center	3	4,000	12
5	Diamond Trust Bank	Parklands-3rd Avenue	2	2,000	5
6	Equity Bank	Westlands-Woodvale Grove	2	18,500	15
8	Gulf African Bank	Upperhill-Gemina Plaza	3	2,000	5
9	I&M Bank	Westlands-Sarit Center	2	2,500	10
10	Kenya Commercial Bank	Westlands-Sarit Center	6	6,000	13
11	NIC Bank	The Junction-Dagoretti Corner	2	2,000	5
12	Standard Chartered Bank	Westlands-Chiromo Road	3	5,000	10
13	United Bank of Africa	Upperhill-NHIF Building	2	2,000	5
	То	tal	35	78,000	115

### Table 3. 1: Sampling Frame

A structured questionnaire was used to obtain the data. A Pilot study of 10% (12respondents) of the desired sample size of 115 respondents will be carried out at Barclays Bank of Kenya: Hurlingham Branch: Yaya Center. According to Mugenda & Mugenda (1999) the purpose of the pilot study is mainly to pretests the instrument to ensure that the items in the instrument are stated clearly and have the same meaning to all the respondents. The pretest will also enable the researcher asses the clarity of the instrument and asses the time taken to administer the instrument. The reason for choice of Barclays Bank of Kenya: Hurlingham Branch: Yaya Center

is because it has similar characteristics and features as the other Commercial Bank Branches operating in Nairobi County. The pretest will be subjected to the internal consistency technique using the Kunder-Richardson (K-R) 20 Formula which is as follows:

 $\mathbf{KR}_{20} = (\mathbf{K}) (\mathbf{S}^2 - \sum \mathbf{s}^2) / (\mathbf{S}^2) (\mathbf{K} - 1)$ 

Where:

 $KR_{20}$ = Reliability coefficient of internal consistency

K = Number of items used to measure the concept

 $S^2$  = Variance of all scores  $s^2$  = Variance of individual items

A high coefficient will imply that items correlate highly among themselves indicating that there exists consistency among the items in measuring the concept of interest (Mugenda & Mugenda, 1999).

Data was analyzed using quantitative analysis. The first step described and summarized the data by use of descriptive statistics. This enabled the researcher to meaningfully describe the distribution of results depending on the variables in the study and the scale of measurements used. Descriptive statistics such as Measures of central tendency (Mean, Mode and Median) and Measures of variability (range, standard deviation, frequency distribution, histograms, frequency polygons, bar charts, percentages and relationships) was used in analyzing the data. Inferential statistics on the other hand was used to make inferences about the population based on results obtained from samples. In this study, the researcher used use Chi-square tests which will attempt to establish the relationship between independent variables and the dependent variable which are categorical in nature for example age and the type of bank account held by a customer among others. The reason for choice of Chi-Square analysis is because the technique can be used on data that has been measured on nominal scale and can be used to see the difference between two or more groups of categories. Chi-Square technique is a non-parametric technique and therefore no assumptions about the data or parameters in the population can be made. The questionnaires were coded and the data will be keyed into the computer using Statistical Package for Social Science (SPSS V-17) as well as STATA (10/12) Statistical Software. The statistical software's was used to analyze both descriptive. The researcher was presented using charts, graphs and tables. Charts

# IV. FINDINGS, SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

# 4.1 General and Background Information

# 4.1.1 Response Rate

The study achieved an appropriate number of respondents for the findings to be statistically significant to inference the study population. To achieve this, the study administered 150 questionnaires with 119 of them being appropriately filled for analysis. This response constitutes 79 percent of responses. This response rate was considered appropriate for analysis -as supported by Mugenda and Mugenda (2003) who posit that that a response rate of 70% and above is excellent. Further, the study managed to survey the target 13 banks as indicated in this research and which are operational in Nairobi County. The banks sampled include Barclays bank, CBA, CFC, Chase bank, cooperative bank, diamond trust bank, equity bank, Gulf bank, M bank, NIC bank, Standard Chartered bank, and UBA bank and I&M Bank.

# 4.1.2 Gender of Respondents

The study sought to establish the gender of the respondents. Therefore, the respondents were asked to indicate their gender. 44 (37%) of the respondents were female and 75 (63%) of the respondents were male as shown in figure 4.1. Gender is an important societal component and has been correlated to some factors like the nature of consumption. With reference to the study, the gender of the respondents determines their demand for bank services.



# Figure 4. 1: Gender of respondents

# 4.1.3 Age Group Distribution of The Respondents

To further understand the demographics of the repodents the study sort to identify the age group of the responents. Majority of the repodents fall in the ctegory of youth (18-35 years), 37% of the responents identified with the 18-27 years age group, 40% identified 28-37 years group, 19% identified with 38-47 years group and 3% identified with 48 and above years age group as shown in figure 4.2 below.



# Figure 4. 2: Age group distribution of respondents

# 4.1.4 Level of Education

The level of education of the respondents was pertinent to the study and it informs the decision making process of the respondents while further significantly contribute to the income level of the respondents. The study got responses from highly educated persons in the society as majority of the respondents had degrees, masters, and doctorate level of education. This is because 69% of the respondents had degrees, 18% had masters, and 2% had doctorate level of education. 2% of the respondents had certificate level of education and 10% of the respondents had a diploma as shown in figure 4.3.



# Figure 4. 3: Level of Education

# 4.1.5 Occupation of the Respondents

65 (55%) of the respondents were employed either by the sampled backs or elsewhere, 28 (24%) of the respondents were selfemployed and only 26 (22%) were unemployed as shown by table 4.1 below. It is noteworthy that majority of the respondents had an identified monthly income from their employment and business from those who were self employed. Further, the unemployed respondents recorded s significant level of income. The occupation dictates the income level, which is pertinent to the demand for the services provided by the banks.

# Table 4. 1:Occupation of the Respondents

OCCUPATION	FREQUENCY	PERCENTAGE
EMPLOYED	65	55%
SELF EMPLOYED	28	24%
UN EMPLOYED	26	22%
TOTAL	119	100%

# 4.1.6 Bank Distribution of Respondents

The study established a fair distribution of responses with respect to the different banks sampled. The minimum number of respondents established by the study was 5 respondents (4%) and a maximum of 15 respondents (13%) as shown in table 4.2 below. The distribution reduces bank bias and informs the unbiased and objective deduction of the main demand determinants of the study.

#### **COMMERCIAL BANK** FREQUENCY PERCENTAGE 15 13% BARCLAYS BANK 10 8% **CBA BANK** 5 4% CFC BANK 8 7% CHASE BANK 11 9% COOPERATIVE BANK 5 4% DIAMOND TRUST BANK 15 13% EQUITY BANK 5 4% **GULF BANK** 10 8% **I&M BANK** 13 11% KCB BANK 5 4% NIC BANK 10 8% STANDARD CHARTERRED BANK 7 6% **UBA BANK** 119 100% TOTAL

# Table 4. 2: Distribution of Respondents with respect to Banks

### 4.2 Income Level of Respondents

### 4.2.1 Level of Income of the Respondents

One of the main objectives of the study is to examine the effect of income levels on the demand of financial services. Thus, the study enquired the level of income of the respondents to establish a correlation. 26 (22%) identified with the 0-20,000 category of income, 24 (20%) identified with the 20,000-40,000 category, 19 (16%) identified with the 40,000-60,000 category, 11 (9%) identified with 60,000 -80,000 category, 13 (11%) identified with 80,000-100,000 category and 26 (22%) identified with the 100,000 and above category as shown in figure 4.4 below. The study got respondents from different income levels to broaden the scope of correlation.



# Figure 4. 4: Level of Income of Respondents

# 4.2.2 Monthly Income and the Demand for Loans

One of the main services sort after from the banks is the loan facility that they offer. According to Allen (2013), there is a strong correlation between income and the demand for financial services. The responses offered by respondents support the literature reviewed. All the respondents who had a form of income admitted to have sort for the loan service from their respective banks. The statistics also show that there is a higher demand for the short-term loan facility than the other loan facilities.



### Figure 4. 5: Percentage Distribution of Loans

The study further extrapolated the demand of the loan on the different levels of income. A correlation exists between the level of income and the loan facility demanded. The majority of the respondents who had a lower cadre of income (0-60,000) indentified with the short-term loan facility while majority of those with a mid level of income (60,000-100,000) identified with the medium term loan facilities and majority of those with high income (100,000 and above) identifying with the long-term loan facility as shown in table 4.3. Thus, the higher the income of the respondents the higher the demand of financial services and the higher the number of loan facilities available to him or her.

Table 4. 3:Distribution of	of Demand of	the Loan	facilities	along Inco	me Levels

IEVEL OF INCOME	SHORT-TERM LOAN		MEDIUM-T	ERM LOAN	LONG-TERM LOAN		
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	
0-20000	26	100%	0	0%	0	0%	
20000-40000	23	96%	1	4%	0	0%	

40000-60000	12	63%	7	37%	0	0%	
60000-80000	2	18%	9	82%	0	0%	
80000-100000	0	0%	5	38%	8	62%	
100000 & above	1	4%	10	38%	15	58%	

The study further sort to enquire the frequency to which the respondents had requested for the respective loan service from the bank. Majority identified that they had requested the respective service once in the past year with a scaling down response trend observed on the other frequencies of twice to four times as shown in figure 4.6



# Figure 4. 6:Distribution Frequency of Loan Requests

# 4.3 Savings level Information

#### 4.3.1 Level of Savings of the Respondents

Ando and Modigliani (1963) acknowledged that a savings culture is strongly correlated with a robust demand of financial services. Thus the study sort to test the correlation in order to explain the high demand of financial services by the respondents. Thus, the respondents were expected to respond to their savings levels with all identifying that they had a saving culture. The distribution of savings however differed depending on the level of income. Majority 57% identified with the 0-10,000 category whereas 2% identified with the 80,000-90,000 categories as shown in table 4.4 below. It is indeed noteworthy that the levels of savings were not significantly high with reference to the level of income as some of the respondents under-saving given the recommended 10% of the income benchmark.

RANGE OF MONTHLY SAVINGS	Frequency	Percentage
0-10000	68	57%
10000-20000	15	13%
20000-30000	10	8%
30000-40000	1	1%
40000-50000	4	3%
50000-60000	6	5%
60000-70000	6	5%
70000-80000	7	6%
80000-90000	2	2%
TOTAL	119	100%

# Table 4. 4: Level of Savings of Respondents

#### 4.3.2 Type of Saving Instruments used by Respondents

Further, the study sort to identify the preferred mode of savings by the respondents. Majority 82% of the respondents identified with the savings account, 12% identified the deposit account and 6% identified SACCOs' as their main preference as shown in figure 4.7



# Figure 4. 7: Preferred Savings Instruments

#### 4.4 Transaction Costs Information

### 4.4.1 Transport costs Incurred by Respondents

The study sort to interrogate whether the correlation between the various transactions costs and the demand for the financial facilities. Hessy (1995) extrapolated from data in the USA that the higher the transaction cost the lower the demand the bank facilities. Thus, the study sort to establish whether such correlation exists in the current Kenyan market. One of the main costs interrogated by the study is the transport cost. Majority of the respondents identified minimal transport costs as 51% of the respondents cited that the transport cost back and forth the bank ranged from 0 to 1000 shillings, 17% identified with 1000-2000 categories as shown in table 4.5 below. The nature of response revealed that transport cost was not high as identified by many respondents thus could not deter the respondents from demanding the services provided by the bank.

Range of Transport Costs	Frequency	percentage
0-1000	61	51%
1000-2000	20	17%
2000-3000	10	8%
3000-4000	2	2%
4000-5000	6	5%
5000 & above	4	3%
Not applicable	16	13%
TOTAL	119	100%

#### Table 4. 5: Distribution of Transport Costs

#### 4.4.2 Bank Charges

The study further interrogated whether bank charges as a function of transaction costs influenced the demand of bank services. 28% identified that they incur 0-1000 shillings in bank charges a month, majority 32% of the respondents cited they incur an average cost of between 1000 and 2000 shillings a month, 14% identified with the 2000-3000 shillings category, 8% identified with 3000-4000 shillings category, 12% identified with the 4000-5000 shillings category, 3% identified with 5000 and above category and only 3% did not respond to the question as shown in table 4.6 below. It is noteworthy that from the response the bank charges do not weigh in on the demand for bank facilities as most of the service fees were low thus majority of the respondents identifying with the lower range cadre of charges.

Table 4. 6: Range of Bank Charges Experiences by Respondents

<u>, 1</u> , <u>, 1</u>		
Range of Bank Charges	Frequency	Percentage
0-1000	33	28%
1000-2000	38	32%
2000-3000	17	14%
3000-4000	9	8%
4000-5000	14	12%
5000 & above	4	3%

No Response	4	3%
TOTAL	119	100%

# 4.4.3: Opening Bank Account Fees

Another major transaction cost that customers have to incur is the charges required to open a bank account. In an effort to interrogate whether the opening fees deter the demand for bank services the respondents were asked to identify the cost they incurred when opening their bank accounts. Majority (34%) of the respondents cited that there was no cost incurred when opening the bank account with 29%, 11%, 2%, 12%, 13% identifying with 500-1000, 1000-1500, 1500-2000, 2000-2500 and over 3500 categories respectively as shown in figure 4.8. the findings further disqualify opening bank account fees as a transaction cost that influences the demand for bank facilities.



Figure 4. 8: Opening Bank Account Fees

# 4.4.4 Opening Bank Account Balance

The study also sorts to identify the amount required by the banks as an account balance in the offset of opening a bank account. Majority identified zero balance (30%) and 500-1000 (37%) as shown in figure 4.9 below. This further demonstrates that opening bank balance is not a deterrent to the demand of bank services as the costs are at a bare minimum.



# Figure 4. 9: Opening Bank Account Balance Required

# 4.4.5: Interest Rates

As earlier identified by the research the most sort after bank facility is the loan facility. Thus, the respondents were requested to cite the interest rate they were charged on their loans. Thus from the 54% (64) who had identified they had requested for the short term loan facility majority (42%) identified that they had been charged an interest rate of between 14% and 16% with others citing the rates as shown in table 4.7 below. From the response interest rates on the loans served as a big deterrent to the demand for bank facilities. The demand for money had driven the vast majority to request for the loan facility despite the high interest rates charged by the banks. **Table 4. 7: Interest Rates Charges on the Respondents Short Term Loans** 

<b>Range of Interest Rates</b>	Frequency	Percentage
0-12%	12	19%

12%-14%	12	19%
14%-16%	27	42%
16%-18%	11	17%
18%-20%	2	3%

Further those who cited to have requested for a medium-term loan (32, 27%), 31% and 22% of them cited to have been charged interest rate of 14%-16% and 16%-18% categories respectively as shown in table 4.8 below. The rate is also considerably high when bench marked with the rate provided by the central bank of Kenya. The high interest rate deterred those with lower cadres of income from accessing the medium term loan facilities while also aggregating to the reduced demand for bank facilities.

Table 4. 8: Interest Rat	es Charged on the Re	espondents' Mediun	n-Term Loans
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Range of Interest Rates	Frequency	Percentage
0-12%	8	25%
12%-14%	5	16%
14%-16%	10	31%
16%-18%	7	22%
NO RESPONSE	2	6%

Those respondents who cited to have requested for a long-term loan (23, 19%) also concurred on the high interest rates experienced on the loans. 65% of them cited that they had to bare an interest rate of between 16% and 18% as shown in table 4.9 below. The response further affirms the contention that the interest rates discouraged the increase in demand for bank facilities as the rates are too high and those who seek the facility do so due to an increase in the demand for money.

Range of Interest Rates	Frequency	Percentage
0-12%	2	9%
12%-14%	2	9%
14%-16%	2	9%
16%-18%	15	65%
18%-20%	2	9%

# Table 4. 9: Interest Rates Charged on the Respondents Long-Term Loans

# 4.4.6 Credit Cards

The study sort to interrogate the cost of provision and maintaining a credit card. In the current global predisposition, the credit card has gained popularity as a bank facility to its customers. However, the increase in demand for the facility has not been felt in Kenya given the responses that the study received. 66% of the respondents cited that they do not have a credit card and only 34% of the respondents cited to have sourced the provision of a credit card as shown in figure 4.10 below.



# Figure 4. 10: Percentage Response on Credit Cards

The study went a step further and interrogated the cost of manitaning the credit card per month in Kenya. A vast majority cited that the facility had a cost implication with 34% citing that the charge was over 3500 per month while the same response was experienced on

the 500-1000 category of response with other responses responding as shown in figure 4.11 below. Indeed the cost implication has lowered the demand and adoption of the credit card as a facility offered by the banks.



# Figure 4. 11: Credit Card charges Per Month

# 4.4.7: Cost of Electronic Banking Services

The pull towards seeking the services offered at the bank has been expanded to include modern day technology advances. Two such mainstream services offered by banks today are internet banking and mobile banking. From the response, mobile banking has a preference over internet banking as 75% of the respondents cited to have subscribed to mobile banking whereas only 20% of the respondents used the internet banking facility as shown in figure 4.12 below. Mobile banking especially in Kenya has gained significant popularity as it allows for customer convenience by removing the location barrier as people can bank money from any part of the country.



### Figure 4. 12: Subscription to Auxiliary Bank Services

The study further sort to interrogate the cost of maintaining these auxiliary services offered by the bank. 55% of the respondents who admitted to the use of mobile banking said that they bore a burden of between 500 and 1000 shillings a month, with 16% citing that the cost to them was zero shillings as shown in figure 4.13 below. It is indeed noteworthy that two forces of demand influence the response. Consumer preference to the mobile banking product has increased the demand for the product regardless the cost and the low cadre of cost that the banks charge for this service.



# Figure 4. 13: Cost of Mobile Banking

The cost of internet banking as an auxiliary service has not received preference like the mobile banking. However, 46% of those respondents who use the service cite that the cost is zero shillings with 17% and 17% identifying the cost to fall under 500-1000 and 1000-1500 shillings categories respectively as shown in figure 4.14 below. Thus, despite the low cadre of cost maintenance of internet banking the uptake of the product has not inspired uptake in comparison with mobile banking. The main economic reason behind this phenomenon is consumer preference. As earlier highlighted mobile banking has received significant preference over other auxiliary banking services.



# Figure 4. 14: Cost of Internet Banking

### 4.4.8 Interest Earned on Deposits

Banks encourage deposits by offering suitable return interest on the deposits. Households are pulled towards an economic venture if it has viable returns. Thus, suitable and or favorable interest on bank deposits would pull people to the utility of financial services available. However, the returns made from deposits with reference to the responses received are rather discouraging. 39% of the responses cited to have only received 500-1000 shillings in terms of interest, 18% of the respondents cited to have received an amount between 1000-1500 as interest on deposits as shown in table 4.10 below. The low interest earned discourages households from seeking the services of financial facilities like banks thus reducing the demand for the facilities.

Range of Interest Earned from Deposits	Frequency	Percentage
NIL	18	15%
500-1000	47	39%
1000-1500	21	18%
1500-2000	5	4%
2000-2500	5	4%
2500-3000	3	3%

# Table 4. 10: Response on Interest Earned from Deposits

Total	119	100%
No Response	2	2%
3500 & Above	12	10%
3000-3500	6	5%

# 4.5 Demand for Commercial Banking Services

In order to understand the demand side of the services requested from commercial banks the study sort to identify which of the services was most sort for by customers.

# 4.5.1 The type of Account Operated

The respondents were asked which bank account they operated as a measure of preference. 51% cited that they operated a savings account, 32% cited that they preferred the utility of a current account, 14% of the respondents cited the utility of salary accounts and only 3% cited the preference of business account as shown in figure 4.15.



# Figure 4. 15: Type of Bank Accounts Operated

# 4.5.2 Number of Bank Accounts Operated by Respondents

To further understand the needs preference the respodents were asked the number of accounts they operated in their prefered type of bank account. From the four respondents who cited the utility of a business account two of them had two such accounts and the other two had three such accounts. 74% of the respodents who cited that they had a current account operated one such account and 21% of them had two such accounts. 65% of the respondents who cited to have a salary account had one such accounts and 80% of the respodents who cited to have a salary account had one such accounts and 80% of the respondents who cited to have a shown in table 4.11 below.

Tuble 411	Tuble 4. 11. Trainber of Dunk Recounts owned by Respondents								
	Business Account Current Account		t Account	Salary Account		Savings Account			
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	
None	0	0%	2	5%	0	0%	2	3%	
One	0	0%	28	74%	11	65%	48	80%	
Two	2	50%	8	21%	6	35%	10	17%	
Three	2	50%	0	0%	0	0%	0	0%	

### Table 4. 11: Number of Bank Accounts owned by Respondents

### 4.5.3 Most urgent Financial Need

The demand for financial needs may also be tailored to meet the immediate financial needs of the customer. Thus, the respondents were asked which their immediate financial needs were. 34% of them highlighted school fees, 26% of them highlighted household expense, 12% of them highlighted mortgage payment, and 21% highlighted the financing of small businesses as demonstrated in figure 4.16 below.



# Figure 4. 16: Immediate Urgent Financial Needs

# 4.5.4 Reason for Opening an Account with that Specific Bank

Certain competitive advantages can also significantly improve the demand for financial services offered by many banks. Thus, the study enquired from the respondents from the already identified edges which of them pulled them to that specific bank. 35% of them cited service efficiency, 28% of them cited customer service, 25% cited location, and 12% of them cited competitive rates as shown in figure 4.17 below.





The researcher further sort to identify which services pulled the customer to the bank. 34% of the respondents cited savings services, 28% of them cited credit, and loan facilities, 27% of them cited deposit and inventory facilities and 7% of them stated financial payment services as highlighted by figure 4.18 below.



Figure 4. 18: Services Demanded from the Bank

# V. CONCLUSION

# 5.1 Introduction

This chapter presents summary, conclusions, and recommendations, which include the areas for further research, based on the results of the study. The findings were thematically based on the objectives of the study thus the summary conclusion and recommendation deductions in this chapter are consequently arranged in the same prose.

# 5.2 Summary

The study had a sufficient response rate that adequately represents area of interrogation. The 79% response rate and the effective sampling of 13 banks targeted for response clearly legitimizes the findings of the study. Further the study got responses from a dynamic set of respondents in terms of level of income, occupation, level of education and age group which further ensures the richness and sufficient knowledge base of the responses received to deduce feasible economic patterns pertinent to the study.

One of the specific objectives of the study was to examine the effect of income levels on the demand for financial services in Nairobi County. The respondents came from different occupations thus different levels of income. However, irrespective to the level of income the study correlated the demand for financial services with income. This means that every respondent irrespective of the level of income demanded for a financial service. Further, one of the main services offered by the banks is the loan facility. All the respondents in the study cited to have demanded for this service from their respective banks. However, the level of income was a limitation to the loan facility requested. Those with lower incomes were able to only access short term loans, those with mid level incomes would access both medium and short-term loans, whereas those with higher incomes were spoilt for choice but majority picked a preference to the long-term loans.

The second specific objective explored the effects of savings on the demand for financial services offered by commercial banks in Nairobi County. All the respondents admitted to having savings. However, the level of savings was not commensurate to their income levels, thus the savings registered by most respondents was not up to the recommended standard of ten percent of the income. Therefore, since most of the people with incomes have a certain level of savings most will demand the basic depository and savings services offered by the banks. However since the saving culture is still wanting, secondary services offered by the bank that are supported by savings are not on high demand like mortgages and investments. It is also noteworthy that SACCO's are increasingly becoming a preference to many as a savings facility this also has a reduced impact on the demand of financial services offered by the banks in the County.

The third specific objective sort to interrogate the impact of transaction costs on demand for financial services. Most of the transaction costs that the study considered did not deter consumers to consume the financial services offered. Transport costs, bank charges, opening bank account fees and opening bank balance in all the banks were generally very friendly which had a positive impact in terms of demand for bank accounts in the county. However, the interest rates were considerably high thus having a negative impact on the demand for the loan facilities offered by the banks. The study also interrogated other auxiliary services offered by the banks. Credit cards were not particularly popular among the respondents due to the high charges associated with them. Secondly, the use of "plastic money" is not particularly popular in the County thus the reduced demand. Other services like internet banking and mobile banking had a significant demand. The demand pull for these services especially mobile banking were more of necessity in nature. Most respondents identified with mobile banking because of the convenience in banking it brings along. Thus, the charges had a less impact on the demand for the service.

Finally, the study interrogated the type of services that the respondents demand most from the banks. The savings account and the current accounts are the most demanded from the banks. Further, household expenses school fees and small business financing were the top most priority for most of the respondents. Further, service efficiency and customer service were identified by most respondents as the main reasons why the respondents were drawn to their respective banks. The services that the respondents demanded most from the bank were savings services, credit and loan services and deposit and inventory services. This identification serves the purpose of guiding the study in which areas can be used to increase the demand-pull.

### 5.3 Conclusions

The implication of the present study should be a strengthened motivation for empirical focus and methodological developments in the measurement and valuation of customer demand and financial services. From the summary, the study established the following conclusions:

### 5.3.1 Income levels

Income created a need for financial services. Further, the level of income is a significant determinant on the nature of financial services demanded from the bank. Thus the higher the income the higher the ability to access more and better financial services offered by the banks in the County.

### 5.3.2 Savings Level

The culture of savings in the county was not well built. Further most of the services offered by the banks did not encourage the culture, as the returns on the savings were negligible. Further SACCO's have reduced the appetite for savings facilities offered by the banks. Therefore, the banks need to do more to encourage the culture in the county.

#### 5.3.3 Transaction Costs

Some of the transaction costs encouraged the demand-pull, as they were realistic and fair. However, interest rates charged on the loans are still considerably high thus discouraging the consumption of loans. Further, the use of liquid cash and the high maintenance costs have reduced the appetite for credit cards in the county. Mobile banking has increased the demand for financial services offered by the banks in the county. Internet banking costs are considerably low thus encouraging utility; however, the risks involved in the utility of the facility have discouraged the uptake of the service.

#### 5.4 Recommendations

The recommendations made in this section were derived from the conclusions about the study findings as presented in the previous sections. It is further noteworthy that the recommendations are derived are intended to assist in increasing the demand for financial services offered by the banks in the County and indeed in the country.

#### 5.4.1 Policy Recommendations

Policy intervention recommendations include:

- i. The banks need to review the interest rates charged on loans. A downward review of the rates would increase the appetite for the facility among its customers thus contributing to an increased demand for the services.
- ii. The banks should also increase the returns on savings held by customers in the banks. This would thus entice customers to save more with the banks and in turn contribute to an increased demand for their facilities.
- iii. The Government should increase the security parameters on cyber theft in order to unlock the financial demand potential of the facility which will in turn increase the demand for financial services
- iv. The banks should encourage and entice retail outlets, like supermarkets and hotels to use "plastic money" which will in turn increase the uptake of other services like credit cards.

#### 5.4.2 Recommendations for Further Research

The researcher recommends key areas as follow-ups to the current study:

- i. A study to be done on the correlation aspects of income and the demand for financial services using macro data.
- ii. A study should also be done on the problems facing the savings culture in the county.

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# Novel 1, 3, 4 - thiadiazole derivatives synthesis by MAOS

# I.R.Siddiqui and Juhi Nazaan

Dept. Of Chem. University of Allahabad, Allahabad (India.)

Abstract- 1,3,4-thiadiazole nucleus is therapeutically interesting candidate as anti-inflammatory, antimicrobial drug analgesic, anticonvulsant, antihypertensive, antiepileptic, antiviral, antineoplastic and antitubercular agents. Therefore thiadiazole derivatives IVa-k were synthesized. The structures of the synthesized compounds were confirmed by spectral data and elemental analysis. The synthesized compounds were screened for antifungal activity by using Minimum Inhibitory Concentration (MIC) by serial dilution method against Staphylococcus aureus ATCC 9144, Becillus Cereus ATCC 11778, Escherichia coli ATCC 25922, Pseudomonas aeruginosa ATCC 2853. , Aspergillus niger and Aspergillus flavus.

*Index Terms*- Quinoline-4- carboxylic acid, thiosemicarbazide, phosphorous oxychloride, pyridine,  $CS_2$ , phenol isothiocyanates, chloroform and concentrated  $H_2SO_4$ , liq. ammonia MAOS, TLC technique, Antimicrobial activity, Minimum Inhibitory Concentration (MIC) by serial dilution method.

# I. INTRODUCTION

The problem of multi-drug resistant microorganisms has reached on alarming level around the world. So for the treatment of microbial infections; the synthesis of new antiinfectious compounds has become an urgent need. Widespread antibiotic resistance, the emergence of new pathogens in addition to the resurgence of old ones, and the lack of effective new therapeutics exacerbate the problems of antimicrobial resistance<sup>1</sup>.

There are number of five membered heterocyclic containing nitrogen and sulphur atom, have turned out to be a potential chemotherapeutic and pharmacotherapeutic agents but the interesting biological activities of a novel heterocyclic compound like thiadiazole has stimulated considerable research work. The biological profile of 1, 3, 4-Thiadiazole derivatives is very extensive. The broad and potent activities of thiadiazole categories such as anti-inflammatory $^{2-3}$ , anticonvulsant $^{7-10}$ , antihypertensive $^{11-13}$ , antimicrobial<sup>4-6</sup> analgesic<sup>14</sup>. antiepileptic, antiviral<sup>15</sup>, antineoplastic and antitubercular agents<sup>16</sup>, carbonic anhydrase inhibiting effect<sup>17</sup>, anti-depressant<sup>18</sup>, anti-oxidant properties<sup>19</sup>, it also plays a prominent role in nature. For example, the thiazolium ring present in vitamin B1 serves as an electron sink and its coenzyme form is important for the decarboxylation of  $\alpha$ -ketoacids. Furthermore, 1,3,4thiadiazoles exhibit broad spectrum of biological activities, possibly due to the presence of toxophoric N2C2S moiety<sup>20</sup>. They find applications as antibacterials, antitumor agents, pesticides, herbicides, dyes, lubricants, and analytical reagents<sup>21-</sup>

Since thiadiazole nucleus is present as a core structural component in an array of drug and their derivatives has established them as pharmacologically significant scaffolds. In this study, an attempt has been made with recent research findings on this nucleus, to review the structural modifications on different thiadiazole derivatives for various pharmacological activities.

Microwave assisted organic synthesis (MAOS) continues to affect synthetic chemistry significantly by enabling rapid, reproducible and scaleable chemistry development with improvement in yield and quality of products <sup>26</sup>. Microwave heating is able to heat the target compounds without heating the entire furnace or oil bath, which saves time and energy. It is also able to heat sufficiently thin objects throughout their volume, in theory producing more uniform heating <sup>27-30</sup>. Microwave assisted organic synthesis is an enabling technology for accelerating drug discovery and development processes. This technology has made an impact in several areas of drug discovery related to organic synthesis <sup>31</sup>.

#### II. EXPERIMENTAL SECTION

#### Materials and methods Materials

The reaction was carried out with analytical reagent grade chemicals and were used as received without further purification. The glasswares used were made of pyrex glass. NMR spectra were recorded on a Bruker Advance DPX-400400 FT spectrometer (400 MHz for <sup>1</sup>H NMR, 100 MHz for <sup>13</sup>C) using CDCl<sub>3</sub> as solvent and TMS as an internal reference. Mass spectra were recorded on a JEOL SX-102 (FAB) mass spectrometer at 70 eV. Elemental analyses were carried out in a Coleman automatic carbon, hydrogen and nitrogen analyzer. Silica gel-G was used for TLC. Melting points were determined by open glass capillary method and are uncorrected. The chemical shifts were reported in  $\delta$  units relative to TMS used as an internal standard. Both microbial studies (antibacterial and antifungal activities) were assessed by Minimum Inhibitory Concentration (MIC) by serial dilution method.

### Synthesis of compounds

I. Synthesis of 5- Quinolin -4- yl- [1, 3, 4] thiadiazol -2- yl amine:

Appropriate substituted quinoline-4- carboxylic acid (0.05 M) and thiosemicarbazide (0.05 M) were taken into a beaker to this phosphorous oxychloride (25mL) was added and made paste. A funnel was hanged in the beaker and covered with a watch glass. The reaction mixture was subjected to the microwave irradiation at 480 W for 3-6 min, with a pulse rate of 30 sec, each in a domestic microwave oven. The solvent was removed by distillation and residue was cooled and triturated with crushed ice. The resultant product was filtered, washed with small portions of cold water and dried. It was purified by recrystallization from hot alcohol.

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II. Synthesis of 4 -( 5- Isothiocyanato- [1, 3, 4] thiadiazol -2yl) – quinoline:

Mixture of I (9.5mmol) was dissolved in pyridine (7.2mmol) and iodine (6.0mmol) at 0-5°C. It was dissolved to stir for 20min and then carbondisulphide (5.5mmol) was added to the above reaction mixture at 0-5°C. Resulted reaction mixture was allowed to stir for 4hr at 0-5°C and the reaction was monitored by TLC. After completion of reaction excess of  $CS_2$  and pyridine were removed by vacuum distillation to obtain crude product.

III. Synthesis of 5-quinolin -4- yl- [1, 3, 4,] thiadiazole -2isonicotinoylthiosemicarbazide:

When a mixture of compound (II) (0.15 mole) and substituted phenol isothiocyanates (0.15 mole) dissolved in few drops of absolute ethanol was subjected to microwave irradiation at 160W for 5 min then compound (III) was the product. After

#### Scheme 1

completion of the reaction, reaction mixture was concentrated and kept overnight at room temperature. The needle shaped crystals of thiosemicarbazides was obtained with an excellent yield.

IV. Synthesis of Bis – (5-quinolin -4– yl- [1, 3, 4,] thiadiazol -2- yl) – amine:

Compound (III) (0.10 mole) was dissolved in chloroform and concentrated  $H_2SO_4$  (0.10 mole) and subjected to microwave irradiation in the resonance cavity of the microwave power system for 1.30 minutes and neutralized with concentrated liq. ammonia. After completion of reaction, the mixture was poured into crushed ice, the solid separated was filtered, washed with water and re-crystallized from methanol yielded the pure compound.



# Compound IV(a-k):

# Compound IV(a)

Yield:82 %; m.p:96 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>/TMS)  $\delta$  :8.87-7.48 (m, 6H, ArH), 4.07 (s, 1H, - NH-), 8.60-7.20 (m, 6H, ArH); <sup>13</sup>CNMR (100MHz, CDCl<sub>3</sub>/TMS)  $\delta$ :150.5, 148.6, 143.7, 129.2, 127.6, 126.5, 126.3, 119.3 ; EIMS: (m/z): 439.07 (M+). Anal. calcd. For C<sub>22</sub>H<sub>13</sub>N<sub>7</sub>S<sub>2</sub> C: 60.12, H: 2.98, N: 22.31, S: 14.59 %

#### Compound IV(b)

Yield:90 %; m.p:112 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>/TMS)  $\delta$  :8.07-7.33 (m, 5H, ArH), 4.02 (s, 1H, - NH-), 8.68-7.26 (m, 6H, ArH); <sup>13</sup>CNMR (100MHz, CDCl<sub>3</sub> / TMS)  $\delta$ :156.2, 150.5, 149.3, 148.6, 145.2, 143.7, 130.3, 129.2, 128.1, 127.6, 127.4, 126.5, 126.3, 124.6, 120.1, 119.3; EIMS: (m/z): 473.03 (M+). Anal. calcd. For C<sub>22</sub>H<sub>12</sub>ClN<sub>7</sub>S<sub>2</sub> C: 55.75, H: 2.55, Cl: 7.48, N: 20.69, S: 13.53 %

#### Compound IV(c)

Yield:94 %; m.p:120 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>/TMS)  $\delta$  :8.02-7.38 (m, 5H, ArH), 4.04 (s, 1H, - NH-), 2.57 (s, 3H, CH<sub>3</sub>), 8.88-7.42 (m, 6H, ArH); <sup>13</sup>CNMR (100MHz, CDCl<sub>3</sub> / TMS)  $\delta$ :159.8, 150.5, 148.6, 148.5, 143.7, 142.9, 129.2, 129.0, 128.6, 127.6, 127.1, 126.5, 126.3, 125.2, 124.5, 121.3, 119.3, 21.6 ; EIMS: (m/z): 439.07 (M+). Anal. calcd. For C<sub>23</sub>H<sub>15</sub>N<sub>7</sub>S<sub>2</sub> C: 60.91 , H: 3.33 , N: 21.62 , S: 14.14 %

### Compound IV(d)

 $\begin{array}{l} \hline \label{eq:Yield:90\%; m.p:92 °C; } {}^{1}H \ NMR \ (400 \ MHz, \ CDCl_{3}/TMS) \\ \hline \delta : 8.88-7.62 \ (m, \ 6H, \ ArH), \ 4.07 \ (s, \ 1H, \ - \ NH-), \ 2.75 \ (s, \ 3H, \ CH_{3}), \\ \hline 8.05-7.36 \ (m, \ 5H, \ ArH); \\ {}^{13}CNMR \ (100MHz, \ CDCl_{3}/\ TMS) \\ \hline \delta : 159.8, \ 150.5, \ 148.6, \ 148.5, \ 143.7, \ 142.9, \ 129.2, \ 129.0, \ 128.6, \ 127.6, \\ \hline 127.1, \ 126.5, \ 126.3, \ 125.2, \ 124.5, \ 121.3, \ 119.3, \ 21.6 \ ; \ EIMS: \ (m/z): \ 439.07 \ (M+). \ Anal. \ calcd. \ For \ C_{23}H_{15}N_7S_2 \ C: \ 60.91 \ , \ H: \ 3.33 \ , \\ N: \ 21.62 \ , \ S: \ 14.14 \ \% \end{array}$ 

#### Compound IV(e)

Yield:92 %; m.p:98 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>/TMS)  $\delta$  :8.09-7.33 (m, 5H, ArH), 4.03 (s, 1H, - NH-), 2.55 (s, 3H, CH<sub>3</sub>), 8.05-7.40 (m, 5H, ArH); <sup>13</sup>CNMR (100MHz, CDCl<sub>3</sub> / TMS)  $\delta$ :159.8, 156.2, 149.3, 148.5, 145.2, 142.9, 130.3, 129.0, 128.6, 128.1, 127.4, 127.1, 126.5, 125.2, 124.6, 124.5, 121.3, 120.1, 21.6; EIMS: (m/z): 487.04 (M+). Anal. calcd. For C<sub>23</sub>H<sub>14</sub>ClN<sub>7</sub>S<sub>2</sub> C: 56.61, H: 2.89, CI: 7.27, N: 20.09, S: 13.14 %

#### Compound IV(f)

Yield:96 %; m.p:116 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>/TMS) δ:8.05-7.34 (m, 5H, ArH), 4. 7 (s, 1H, - NH-), 2.62 (s, 3H, CH<sub>3</sub>), 8.02-7.28 (m, 5H, ArH); <sup>13</sup>CNMR (100MHz, CDCl<sub>3</sub> / TMS) δ:159.8, 148.5, 142.9, 129.0, 128.6, 127.1, 125.2, 124.5, 121.3, 21.6; EIMS: (m/z): 467.10 (M+). Anal. calcd. For  $C_{24}H_{17}N_7S_2$  C: 61.65, H: 3.66, N: 20.97, S: 13.72 %

### Compound IV(g)

Yield:98 %; m.p: 110°C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>/TMS)  $\delta$  :8.85-7.47 (m, 6H, ArH), 4.4 (s, 1H, - NH-), 8.09-7.52 (m, 5H, ArH); <sup>13</sup>CNMR (100MHz, CDCl<sub>3</sub> / TMS)  $\delta$ :156.2, 150.5, 149.3, 148.6, 145.2, 143.7, 130.3, 129.2, 128.1, 127.6, 127.4, 126.5, 126.3, 124.6, 120.1, 119.3; EIMS: (m/z): 4737.03 (M+). Anal. calcd. For C<sub>22</sub>H<sub>12</sub>ClN<sub>7</sub>S<sub>2</sub> C: 55.75, H: 2.55, Cl: 7.48, N: 20.69, S: 13.53 %

#### Compound IV(h)

Yield:79 %; m.p:82 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>/TMS)  $\delta$  :8.02-7.58 (m, 5H, ArH), 4.9 (s, 1H, - NH-), 8.03-7.33 (m, 5H, ArH); <sup>13</sup>CNMR (100MHz, CDCl<sub>3</sub>/TMS)  $\delta$ :156.2, 149.3, 145.2, 130.3, 128.1, 127.4, 126.5, 124.6, 120.1; EIMS: (m/z): 506.99 (M+). Anal. calcd. For C<sub>22</sub>H<sub>11</sub>Cl<sub>2</sub>N<sub>7</sub>S<sub>2</sub> C: 51.97, H: 2.18, Cl: 13.95, N: 19.29, S: 12.61 %

### Compound IV(i)

Yield:76 %; m.p:90 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>/TMS)  $\delta$  :8.02-7.36 (m, 5H, ArH), 2.55 (s, 3H, CH<sub>3</sub>), 4.4 (s, 1H, - NH-), 8.10-7.48 (m, 5H, ArH); <sup>13</sup>CNMR (100MHz, CDCl<sub>3</sub> / TMS)  $\delta$ :159.8,156.2, 149.3, 148.5, 145.2, 142.9, 130.3, 129.0, 128.6, 128.1, 127.4, 127.1, 126.5, 125.2, 124.6, 124.5, 121.3, 120.1, 21.9; EIMS: (m/z): 487. 04 (M+). Anal. calcd. For C<sub>23</sub>H<sub>14</sub>ClN<sub>7</sub>S<sub>2</sub> C: 56.61, H: 2.89, CI: 7.27, N: 20.09, S: 13.14 %

### Compound IV(j)

Yield:73 %; m.p:118 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>/TMS)  $\delta$  :8.02-7.36 (m, 6H, ArH), 4.0 (s, 1H, - NH-), 7.93-7.36 (m, 4H, ArH), 8.02-7.38 (m, 5H, ArH); <sup>13</sup>CNMR (100MHz, CDCl<sub>3</sub> / TMS)  $\delta$ :158.1, 150.5, 148.8, 148.6, 144.9, 143.7, 137.8, 132.4, 129.4, 129.2, 128.5, 127.6, 126.5, 126.3, 123.4, 119.3, 118.1; EIMS: (m/z): 549.06 (M+). Anal. calcd. For C<sub>28</sub>H<sub>16</sub>ClN<sub>7</sub>S<sub>2</sub> C: 61.14, H: 2.93, Cl: 6.45, N: 17.82, S: 11.66 %

### Compound IV(k)

Yield:77 %; m.p:89 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>/TMS) δ :8.05-7.47 (m, 5H, ArH), 4.9 (s, 1H, - NH-),7.97-7.39 (m, 4H, ArH), 8.05-7.40 (m, 5H, ArH); <sup>13</sup>CNMR (100MHz, CDCl<sub>3</sub> / TMS) δ:158.1, 156.2, 149.3, 148.8, 145.2, 144.9, 137.8, 132.4, 130.3,

129.4, 129.2, 128.5, 128.1, 127.6, 127.4, 126.5, 126.3, 124.6, 123.4, 120.1, 118.1; EIMS: (m/z): 583.02 (M+). Anal. calcd. For  $C_{28}H_{15}Cl_2N_7S_2$  C: 57.54, H: 2.59, Cl: 12.13, N: 16.77, S: 10.97 %

Entry	Solvent	Microwave (min)	Product yield %
1	Ethanol	10.00	45
2	Nitromethane	2.00	50
3	Chloroform	1.30	96
4	Methanol	15.00	33
5	Water	20.00	20

Table 1: Solvent optimization for the synthesis of Bis – (5-quinolin -4– yl- [1, 3, 4,] thiadiazol – 2	<b>2- vl) - amine</b>
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As the results from **table 1**, it was revealed that the yield of the product was found to be excellent in the case of chloroform while it is poor with other solvents such as ethanol, nitromethane, methane and water.

Entry	Solvent	Catalyst	Product Yield%
1	CHCl <sub>3</sub>	$H_2SO_4$	90
2	CHCl <sub>3</sub>	POCl <sub>3</sub>	43
3	CHCl <sub>3</sub>	$H_3PO_4$	11
4	CHCl <sub>3</sub>	PPA	46

Table 2: Catalyst optimization for the synthesis of Bis – (5-quinolin -4– yl- [1, 3, 4,] thiadiazol – 2- yl) – amine

It was demonstrated from **Table 2** that though the yield of the product increases to an appreciable quantity in different catalytic systems, interestingly solvent CHCl<sub>3</sub> and catalyst  $H_2SO_4$  was found to be the most efficient in the reported synthetic protocol. This efficient method for the synthesis of the potential protocol is in context of green chemistry involving microwave irradiation technique, which is the most convenient way to form the substituted of Bis – (5-quinolin -4– yl- [1, 3, 4,] thiadiazol – 2- yl) – amine. **IV(a-k)** 

In an attempt to expand the scope of the reaction, a series of derivatives were synthesized using many variants of acids in the first step and acid hydrazide in the second step of the reaction. The results are summarized in **Table 3**.

Table 3: M.W	promoted synthesis of Bis –	(5-quinolin -4-	yl- [1, 3, 4,] thiadiazol	-2- yl) – amine
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Entry	R and R'	Product	Time(min)	Yield (%)
1.	Н		1.20	82
2.	2-Cl		1.15	90
3.	2-CH <sub>3</sub>		1.15	94
4.	2'-CH <sub>3</sub>		1.25	90
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5.	2-Cl, 2'-CH <sub>3</sub>	CI, N-N N-S H S CH <sub>3</sub>	1.20	92
6.	2-CH <sub>3</sub> , 2'-CH <sub>3</sub>		1.30	96
7.	2'-Cl		1.20	98
8.	2-Cl, 2'-Cl		1.20	79
9.	2-CH <sub>3</sub> , 2'-Cl		1.30	76
10.	H, 2'		1.25	73
11.	2-Cl, 2'		1.30	77

 $Plausible \ mechanism \ for \ the \ formation \ of \ Bis - (5-quinolin \ -4- \ yl- \ [1, 3, 4,] \ thiadiazol \ -2- \ yl) \ - \ amine$ 



### Antimicrobial activity:

Pharmacological evaluation is one of the most important factors for the determination of activity of compounds. Evaluation part of the work should be variable and easy to perform. Since last few years, prevalence of infectious diseases has increased to a great

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extent. Antimicrobial agents are the most commonly used to treat the different types of infectious diseases. Few of the compounds were tested *in vitro* for antimicrobial activity at concentrations of 200  $\mu$ g/mL. The data was compared to the standard ciprofloxacin for bacteria and fluconazole for fungi.

### Antibacterial activity

For antibacterial studies microorganisms employed were *Staphylococcus aureus* ATCC 9144, *Becillus Cereus* ATCC 11778, *Escherichia coli ATCC 25922, Pseudomonas aeruginosa ATCC 2853.* 

### Antifungal activity

For an antifungal activity, Aspergillus niger and Aspergillus flavus were used as organism.

Both microbial studies were assessed by Minimum Inhibitory Concentration (MIC) by serial dilution method. For this, the compound whose MIC has to be determined is dissolved in serially diluted DMF. Then a standard drop of the culture prepared for the assay is added to each of the dilutions, and incubated for 18–20 hrs at 35<sup>o</sup>c. MIC is the highest dilution of the compound, which shows clear fluid with no development of turbidity.

Table 4	: Antibacterial	activity of co	mpounds (IVa	-k)
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Compounds	Microorganisms			
	S. aureus	B. Cereus	E.coli	P. aeruginosa
IV(a)	13.00	11.33	15.47	14.22
IV(b)	13.31	12.33	14.62	13.38
IV(c)	12.21	10.40	14.22	12.83
IV(d)	12.10	11.20	13.67	12.80
IV(e)	13.20	11.33	14.50	13.22
IV(f)	11.13	10.00	13.50	12.25
IV(g)	15.22	14.20	18.40	16.13
IV(h)	16.23	15.56	20.48	18.47
IV(i)	14.22	12.83	15.56	13.50
IV(j)	16.20	14.68	17.51	15.40
IV(k)	18.40	15.87	20.65	16.15
Ciprofloxacin	26.52	24.58	28.31	25.83

Table 5: Antifungal activity of compounds (IVa-k)

Compounds	Microorganisms		
	Aspergillus niger	Aspergillus flavus	
IV(a)	14.68	12.34	
IV(b)	16.44	14.42	
IV(c)	13.29	10.81	
IV(d)	12.53	10.90	
IV(e)	15.48	13.35	
IV(f)	10.92	10.73	
IV(g)	17.67	15.52	
IV(h)	18.77	16.71	
IV(i)	16.53	14.62	
IV(j)	18.71	17.53	
IV(k)	19.80	18.68	
Fluconazole	26.36	27.35	

### III. RESULTS AND DISCUSSION

The new derivatives thiadiazole were prepared following the reaction sequences depicted in Scheme 1. Initial compounds I was prepared from available quinoline-4- carboxylic acid and thiosemicarbazide, which was then converted to compound II

using pyridine and  $CS_2$ , then to compound III by using substituted phenol isothiocyanate and finally to compound IV(ak) by using chloroform and concentrated  $H_2SO_4$  The synthesized compounds were screened for their antimicrobial activity and they were found to possess good antibacterial and antifungal activity.

### IV. CONCLUSION

Bis -(5-quinolin -4- yl- [1, 3, 4,] thiadiazol -2- yl) - amine has proved to be a potential chemotherapeutic and pharmacotherapeutic agents. The microwave technique has continued to add further improvements on the performance of reactions to provide products more efficiently in higher yields, better quality in less reaction time and is ecofriendly in nature.

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#### AUTHORS

**First Author** – I.R.Siddiqui, Dept. Of Chem. University of Allahabad, Allahabad (India.)

**Second Author** – Juhi Nazaan, Dept. Of Chem. University of Allahabad, Allahabad (India.)

### Correspondence Author - Juhi Nazaan,

juhi\_naz@rediffmail.com, juhi.nazaan@gmail.com, +91-9335575072.

# Architecture for Employee Tracking System Using Smartphone

# Nagashayana R

Abstract- Using GPS devices for tracking employee, vehicles are becoming outdated now, when most of the people are using

Smartphone's, there are many applications which helps in tracking vehicles, children's, women and etc.

We can also use Smartphone to track employee, but tracking employee is very different from others as the employee generally works 10 hours a day, so turning on GPS for such a long time and sending data continuously to the server, the battery running for such a long time in today's situation is not easy. This paper provides a solution for tracking employee for a long time without draining his battery and without losing data. The employer can check which path his employee is using to travel, at any point of time the employer can see where his employee is currently; at what time exactly he visited defined locations and etc.

*Index Terms*- Battery efficient tracking system, Employee tracking using a Smartphone, Employee tracking using GPS and Network, good architecture for GPS based apps.

# Introduction

ne in every five people in the world has Smartphone, Smartphone with its attractive features, price starting from just 3k onwards has become part of every one's life. Able to install custom apps from the market, GPS, Location through the network, use all social media sites and e-commerce sites through their apps are most popular features.

There are many companies where they have a need to track their employees periodically throughout the day reasons being to avoid employee cheating the employer by not visiting the places he has been asked to or to track employee performance by real-time data or showing miscellaneous expenditure without actually spending or using it example, travelling charges.

There are some solutions, where some are using handheld GPS devices and some already have apps for tracking through Smartphone but they are not efficient as most of the apps are not well designed, so it will not survive for more than 6 hours a day as it has to work complete day with GPS on and update being taken every 10 minutes or less.

This paper provides a solution to the above mentioned problem - the best architecture for developing battery efficient employee tracking systems in fact, any app which uses GPS and sends data frequently can use this architecture.

This paper is organized as follows Section I is an Introduction to work. Section II will be related work. Section III we will explain complete system, its design and how it works. Section IV is the conclusion and future work.

# Related work

Although there is no exact work on employee tracking there are different tracking application we found.

- A. Al-Mazloum, E. Omer, M. F. A. Abdullah work on GPS and SMS based tracking provides solution for tracking children by parents using Smartphone's, they propose an architecture which includes two Smartphone's one being client(child) another being server (parent), whenever parents wants to track children, parents will send request through SMS and on client side the active listener listens to that specially formatted message responds back with location details and then on parent side the location details will be presented on map.
- B. In Almomani, Alkhalil, Ahmad and Jodeh work they track vehicles using GPS, GSM modem, GPRS and it is clientserver model, when a user requests a location from web or mobile, a SMS will be sent to the GSM modem, the client then responds using GPRS which will be received by GPRS server and send to GSM modem which in turn sends to server.
- C. Chandra, Jain, Qadeer used a simple web server based approach along with SMS for Java based mobiles equipped with GPS receptor. A client can send his location details either directly through SMS or send to the server using the internet. The main aim of this work is to enable user to share his location with friends or some other people.

As it can be established from a related work review, there are many solutions which can be used to find or track employee. Some of the above mentioned architecture requires GSM modems or SMS functionalities of a mobile to share location and it is complex in architecture, also SMS functionality cannot be used when we need frequent location update to be sent to the server so GPRS is a good solution. But there is no solution where we can continuously track employee without his interaction and getting location from multiple sources, as waiting only for GPS coordinates drains our battery. So this proposed application solves these problems

Application development

Requirements

This work is designed for employers to track their employee, but it can be used by anyone who wants to track other person with prior permission as this application needs to be installed on the person whom we are going to track.

This application is developed using the Android SDK and eclipse and server side is developed using PHP and tracking is plotted on Google maps using JavaScript.

For this application to work properly the location services should be turned such that the app can get location through GPS or from the network.

**Application Architecture** 



This system consists of two components: Client and Server.

The client will be the android application or android phone, it is designed in such a way that it has very few elements and very less user interaction and the interval at which location updates are received can be either hard-coded or selected, but ideal timing will be every 10 minutes.

In this system server will receive data sent from the client side and it will save it in a database and display to the end-user who will be the employer or the person who wants to track on map.

The above mentioned problems are being solved with two main components: GPS and Network; these two features are present in almost all smart phones now.

For first time once user installs the app he should start the app and after that every 10 minutes or any predefined time the application will start automatically and fetch the location and send to server.

Instead of having a loop inside the program we use feature of android called alarm manager which will take time interval as the input considering interval time as x, so the app starts repeating every x time period automatically. This ensures that the app is started only when it is needed at regular interval automatically.

Whenever the application starts , the app starts listening to GPS and network location, as already known, location can be obtained through network very fast (maximum being 2 seconds average), but with the GPS maximum average being 25 seconds so this is the area that is focused for reducing battery.

25 seconds of GPS consume approx: 1mAh.

Whereas 2 seconds of network consumes approx 0.1mAh.

Then why don't we go only with network, answer is accuracy GPS gives us average 10 meters of accuracy and depends upon the location of mobile if under clear sky, we will get location, fast and with very good accuracy, in close location you may not get location at all for hours, where network depends upon location of source, if we are getting location from mobile network or mobile tower then every 4km one tower is placed and getting location from WIFI depends on how far you are from it, using both is a good idea as it can save battery a lot.

Imagine the situation where GPS starts and the employee is in the office or closed location until he comes out GPS will run continuously, then every 10 minutes average 25 seconds will cost us

Then for 1 hour, 10 minutes \* 6 = 60 minutes

25 \* 6 = 150 seconds = 2.5 minutes = 6mAh per hour approx, so great your 3000mAh battery will give you backup for 500 hours. But is this the only thing you or your employee does with his phone? Messaging, calling, browsing, even our app sends data to server will cost us battery right.

The most important thing to remember whenever we are waking our application it's not just the application that wakes up, but we are waking up the CPU of our mobile which was in sleep mode so this will also trigger other applications to update or do their own processing, so every 10 minutes we are waking up the CPU and other apps that will again drain our battery.

This is the main reason we are getting average 1 day battery backup with our batteries. So how can we optimize our application now?

As we are using two providers, GPS and Network will start listening to both, not for infinite time but for finite time.

We are going to fix deadline of 10 seconds, which is less than average, but according to our research when under open sky, location from GPS will be obtained within the deadline period easily and network of course maximum average time being 2 seconds. So every 10 minutes the app will be started and only spend 10 seconds for getting location and if location is obtained before this 10 seconds, then the app stops listening for locations and do further processing. This is the most important part where we are saving the battery to the core.

If location is obtained from both GPS and Network, then, according to the accuracy the app considers one location and ignores another location, this ensures that the app is accurate.

Another problem to be addressed is, are we going to consider all location updates, if it is accurate. An employee can be standing somewhere for some time more than 10 minutes so taking multiple location update from same place creates a problem when we plot all location data on map and even sending unwanted data is waste of bandwidth and battery of that employee. So the solution will be to filter the data which will be useful.

This provides proposes distance filtering of data, whenever we get new location update, it will be considered only if it is x meters or km apart from the previous distance. So new location update will be considered only if the employee has travelled minimum distance from his previous location, else it will be ignored as duplication, this saves battery because an employee will not travel continuously throughout the day..

Next, once the app gets a location, it needs to be sent to the server, but opening and closing a network connection every 10 minutes is again not a good idea from battery point of view. Below is the solution provided for this problem.

Depending upon user requirement, if user wants to track and see data in real time, then the app needs to send the data immediately once it gets the location else if the user is okay with some delay, then the app can store all the received locations in local database and send all at a time after some predefined hours or end of the day or also use another android feature called bulk data transfer. When bulk data transfer is used, instead of opening network connection and sending data every 10 minutes the app pushes to queue and whenever a user wakes up the system or any other app wakes up the system all data in the queue will be sent to the server. This ensures that the battery is not drained every ten minutes by opening network connection and starting other apps to do a network transaction indirectly. So battery is saved very much right there.

Also in this app a database system called SQLite is used to make sure that the data is stored in the same order as it is received to avoid loss of data when there is no network connection.

At last once data is stored in DB or pushed to network queue or sent data directly then the application stops immediately and this ensures that the app is stopped when it has finished the work.

As specified from very beginning of the paper that 10 minutes is ideal interval time to get location, but the ideal time should usually vary according to mode of travel of the employee. So if he is riding bike or car, 10 minutes will be late because when we plot data on map we may not see the route properly.

This paper provides solution called dynamic timing, app is going to change time interval for getting location dynamically by determining his speed of travel. We are going to find speed using our basic math formula.

Speed = (distance / current interval time)

Using this the app dynamically predicts the mode of travel and changes its current interval time accordingly, because average human walking speed is 5km/hour or 3.1miles/hour average, a average bike speed is 30 - 50 km/hour inside city and 60-80km/hour outside the city and average car speed outside city is 80km - 120km or more so using this simple assumptions the app will predict speed and change the interval time, so increased interval time means app will start with more interval so if app itself starts late then it obviously saves battery.

So making sure our application runs for least time by using minimum resources in a very efficient way and ends as soon as it has finished is the motive behind this system and best practice to be followed by all app developers.

# Conclusion

We would like to conclude saying that there is much more room to improve, one thing is AGPS we would like to dig deeper into this feature as this is becoming very common now and the understand best way of using wake locks as we use wake locks in this system but we still need to learn and try many things on that part. Another very part to examine is how android system reacts and kills our app as the user interaction is very less in memory critical conditions and how to improve that for less user interaction app like this.

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Author - Nagashayana R, sunilmaster393@gmail.com

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# Linkage model between sustainable consumption and waste management system

# NiLuh Widyaningsih<sup>\*</sup>

\* Environmental Science, University of Indonesia

Abstract- Indonesia as the 4<sup>th</sup> most populous country in the world, has potential economic growth and also environmental degradation problems. DKI Jakarta Province (capital city) has the most dense area about 30% of the people. East Jakarta has the highest number of unmanaged waste (2,430 m3/day). It is because of the people do not apply the sustainable consumption and they do not obey the law (UU No. 18/2008 on Waste Management). To see the relation between the household income and their consumption (for food and non-food), I used the Spearman's Rho Correlation and to build a linkage model between the household consumption and the waste management system, I used the System Dynamics Analysis. This paper used qualitative approach and used quantitative data also. This paper emphasized on the consumer behavior. The important finding to apply the sustainable consumption are the green motivation and the green lifestyle.

*Index Terms*- Sustainable Consumption, Household Waste, Spearman's Rho Correlation, System Dynamics

### I. INTRODUCTION

Since Industrial Revolution, the development on the knowledge and technology made tremendous improvement on any human life aspects (manufacturing, transportation, healthcare, and others). The increase number of the population increases the need of human beings, such as food, clothes, and shelter. On the other hands, there is limitation on the natural resources to supply the factor of production. This phenomena caused well-being gaps and public problems. For example, poverty (economic side), criminality (social side), and pollution/waste (environmental side).

Indonesia has almost 250 million of people and they centered on the capital city (14,469 people/km<sup>2</sup>). Jakarta divided into five district areas, such as: North Jakarta, South Jakarta, West Jakarta, East Jakarta, and Central Jakarta. East Jakarta. East Jakarta (Table 1.) has the highest number of unmanaged waste (2,430 m3/day). East Jakarta has ten sub-district areas and Kecamatan Duren Sawit has the highest number of household 94,862 KK (a.k.a. Kepala Keluarga).

The number of household implies the purchasing power of one family, where it includes father/mother, and kid (s). The household expenditure can be approached from their spending because there is no data for consumption for each household. The household consumption expenditure data (Table 2.) from Statistical Office in 2011 and 2012, people in Jakarta consumed more on non-food products (66.24% and 63.01%) than food products (33.76% and 36.99%). It means that the increase of the household income, it will shift the consumption pattern from

food products into non-food products. this phenomena follows the Engel's Law (with the assumption that the household consumption preferences are at the same level).

The change on the household consumption pattern will change the waste volume and the waste characteristics or composition. The waste management system in Jakarta did not integrate yet and it cause many environmental issues, e.g. flooding and health issues. The most risky areas are in the North Jakarta and East Jakarta. The people has low participation level on the environmental awareness.

Table 1. Waste Volume in DKI Jakarta (2011)

No.	District Area	Volume (m3/day)	Managed (m3/day)	Unmanaged (m3/day)
1.	Central Jakarta	5,479	5,479	0
2.	North Jakarta	4,519	4,517	2
3.	West Jakarta	6,490	5,526	964
4.	South Jakarta	5,696	5,642	54
5.	East Jakarta	6,331	3,901	2,430
	Total	28,515	25,065	3,450

Source: Sanitation Department.

Province/	Consumpt	ion on Food	Consumption o Non-Food	
Inational	2011	2012	2011	2012
Jakarta	33.76	36.99	66.24	63.01
Indonesia	49.45	51.62	50.55	48.38
a a			0.00	

Source: Susenas 2011 and 2012, Statistical Office.

There is linkage between the economic activity and waste management. So, to reduce the unmanaged waste, we focus on the economic side, especially on the consumer behavior on consumption decision making-process.

### II. RESEARCH ELABORATIONS

I used the qualitative approach and also used the quantitative data to support the System Dynamics model. The questionnaires are for one hundred households (Slovin) that spread on the seven villages at Kecamatan Duren Sawit, East Jakarta. The questionnaires used the Likert scale (1-5). I used depth interview to eight households at the fours villages that already applied the 3R principle (reduce, reuse, and recycle). The seven villages at Kecamatan Duren Sawit are Kelurahan Pondok Bambu, Kelurahan Duren Sawit, Kelurahan Pondok Kelapa, Kelurahan Pondok Kopi, Kelurahan Malaka Jaya, Kelurahan Malaka Sari,

and Kelurahan Klender. Samples are being chosen random proportionally.

The housing area divided into two types for the purpose of this research, such as the unorganized and organized housing area. The different between these types are:

- 1. The characteristics of the unorganized housing area are: the size of the houses are mostly small; less/no trash bin available in front of their house; close distance between houses; and their household income is low.
- 2. the characteristic of the organized housing area are: the size of the houses are mostly medium and big; they have trash bin; there is space between houses (garden and/or garage); and their household income are medium and high levels.

The housing area types make a bit difference on the way the sanitation officer carry the household waste. For the unorganized housing area, the sanitation officer cannot use the motorcycle bin but they use the wheeled bin. For the organized housing area, the sanitation officer use the wheeled bin. They do not have separated bin to carry the household waste from the house. the distance between the houses gives impact to the social interaction among them. For the unorganized housing area, people communicate more frequent than people on the organized housing area. So, the social interaction becomes informal advertisement media on the smallest level (household).

The variables on the statistical analysis are: household consumption; motivation (the need value and the usage value); lifestyle (other the people influence and advertisement); and 3R principle (reduce, reuse, and recycle). The consumption motivation sub variables are derived from the human needs triangle by Abraham Maslow (Picture 1.)

### Picture 1. Hierarchical Theory of Human Needs



Source: Nitisusastro, 2013.

The consumer behavior come from the internal and external factors, such as:

- 1. Internal factors: perception, personality, experience, motivation, and behavior.
- 2. External:
  - a. Packaging: product, price, distribution, and promotion.
  - b. Social-culture: demography, family, social class, and group reference.

These all factors combined and mingled in the questionnaires. The household consumption is for food and non-food product (not including the service). The linkage between economic activities and environment, we can see on the picture below. This paper did not discuss about the producer side because we focus on the consumer side only. I believed that human being can be a homo-economicus and homo-ecologicus. It means that a consumer does not only maximize their utility but they also can preserve the environment condition.





Source: Thampapillai, 1991.

Sustainable consumption is not only consider the price of the product and the quantity but it also consider the value of the environment on their consumption decision making-process. So, the development will be sustainable if consumer apply the sustainable consumption. The impacts will not only for the environmental condition but also for the social standard of living.

Picture 3. Sustainable Development Triangle



Source: FAO Corporate Document Repository, 2004

On the Picture 3. above, the economic development must consider the environmental value and the social condition to be more sustainable in the future. Having sustainable environmental condition, we have to manage the household waste that starts from reducing the waste from the source (household consumption). So, reducing the household waste will reduce the greenhouse effect gas emission and eliminate the source of the disease (flies, rats, and other insects). Based on the Organization for Economic Cooperation and Development (OECD), the definition of waste refers to materials that are not prime products (that is, products produced for the market) for which the generator has no further use in terms of his/her own purposes of production, transformation or consumption, and of which he/she wants to dispose. On this paper, the consumption divided into food and non-food. For food products usually the waste is natural or organic, where it is easy to decompose naturally. For non-food products, the waste comes from the man-made packaging materials (i.e. paper, plastic, glass, metal, and other), which are not easy to decompose naturally. So, this kind of household waste need more process to manage it.

In Indonesia, the waste management system includes collect the waste (usually after the cooking time in the morning); put the trash in the trash plastic (usually they get the plastic bags from the markets/stores); hang it in front of their gate or put it into the trash bin; and the sanitation officer will take the trash once every two days. The sanitation officer will carry the waste to the temporary landfills (Tempat Penampungan Sementara=TPS) before the dump truck take it to the permanent landfills (Tempat Pengolahan Akhir Sampah=TPA). The problems is, they do not sort the waste into inorganic and organic waste. Based on the secondary data from the Sanitation Department Kecamatan Duren Sawit, there are twenty eight TPS. After I observed, there are more than twenty eight. It is because people at Kecamatan Duren Sawit use illegal property to throw their waste (a.k.a. shadow TPS).

The waste management system paradigm shifted from the end of pipe system paradigm into the goodhouse keeping paradigm. End of pipe system paradigm means that the percentage of the application of the 3R principle (reduce, reuse, recycle, and disposal), the biggest is on the disposal level at the end. Now, the goodhouse keeping paradigm, the biggest percentage emphasizes on the first level (reduce the waste). Reduce the waste starts from the small level or family.

### III. RESULTS AND FINDING

The household goods categorized into two groups:

- 1. Food products are rice, yam/cassava/maize, fish, meat, eggs/dairy, vegetables, fruits, sugar/coffee/tea, cooking oil/spices, beverages, tobacco/betel, and other food stuff/beverages.
- 2. Non-food products are clothes/shoes/hats, party needs/ceremonies (not including facilities for home/transportation/telecommunications,

tax/insurance/savings, education services, security services/household workers, and health service/physician).

### Table 3. Spearman's Rho Correlation between Income and Consumption

			Pendapatan	Konsumsi Makanan	Konsumsi Non Makanan
Spearman's rho	Pendapatan	Correlation Coefficient	1.000	.175	.399
		Sig. (2-tailed)		.083	.000
		Ν	99	99	99
	Konsumsi Makanan	Correlation Coefficient	.175	1.000	.248
		Sig. (2-tailed)	.083		.013
		Ν	99	99	99
	Konsumsi Non Makanan	Correlation Coefficient	.399**	.248	1.000
		Sig. (2-tailed)	.000	.013	
		Ν	99	99	99

Source: Data processed using SPSS, 2014.

The statistical analysis showed that there is correlation between income and household consumption with p value is 0.000 < 0.005. People in Jakarta has bigger percentage of nonfood consumption than for food products. Based on the statistical analysis, the non-food consumption has significant correlation with the motivation (especially for the need value). For the lifestyle, non-food consumption has significant correlation with the influence by other people (with p-value is 0.040 < 0.005). On the interviewed, I found that people who live in the unorganized housing areas, they communicate to their neighbor every morning while they go to the markets. For example, they are being introduced with a new packaging food products (a.k.a. sachet). They buy it and they introduce it to the other family members. So, there is intense relationship between consumer of the households.

The knowledge about environment awareness for people at Kecamatan Duren Sawit is different between people who live at the unorganized and organized housing area. People at the organized housing area mostly are well-educated and have permanent income job, for example a lecturer, a lawyer, and other (housewife). They are already well-known about unmanaged waste problems and how to separate their waste before their throw it but the obstacle that they find is there is no law enforcement.

I interviewed also the closet markets/stores with the housing area. Based on the questionnaires, the average distance between the housing area and the market is less than one kilometer and they can go there by walk or ride a bicycle. The respondents said that they get used to buy something (food and/or food) every week. When I asked about their willingness to bring a shopping bag, they are a bit reluctant because the unpractical reason. The store cashiers (such as Alfamart or Indomaret), they said that they sell the products as a given products, where they do not know about the green product or biodegradable products.

Other interesting findings are: (a) people who live in the unorganized housing area has actualization value that I called here as prestige (gengsi in bahasa Indonesia). Prestige means here is people will feel better if they carry more of plastic bags; and (b) the location of the TPSs do not have standard regulation, such as the TPS location some of them are very close distance with the big size permanent houses. For the gengsi variable, there is significant correlation between income and the non-food consumption based on the actualization value (p value is 0.003 < 0.05).

For the application of the 3R principle, there is significant correlation between non-food consumption and 2R principle (the reduce and recycle activities). It means that there is potential intervention on the application of the 3R principle. These subvariables can become intervention on the System Dynamic analysis.

Picture 4. show the TPS locations and the housing area at Kecamatan Duren Sawit. There are permanent TPS with a building and the non-permanent TPS (which is only on the open space area). On the left side of the map, there are some areas that cannot get the one kilometer radius TPS's service. It creates shadow TPS. The rest of the other areas, there are so many overlapping one kilometer radius TPS's service.



Picture 4. Kecamatan Duren Sawit

Source: Spatial Planning Office, 2010.

The waste composition data is not available on the sub-district or Kecamatan level (only for the province level). Table 4. below show the waste characteristic at DKI Jakarta Province 2010. The organic waste is still the highest percentage (55.37%) compare with the inorganic waste.

Table 4. Waste Characteristic at DKI Jakarta Province 2010

Туре	Percentage (%)
Organic	55.37
Inorganic	44.63
Paper	20.57
Plastic	13.25
B3	1.52
Other	9.29

Source: Sanitation Department DKI Jakarta Province.

The System Dynamics analysis is a system to build model the linkage between the sustainable consumption and the waste management system. The household waste increases the unmanaged waste. To reduce the unmanaged waste, people call the sanitation officer to pick it up. So in reality, reducing the unmanaged waste by doing this system is not sustainable in the future because it does not come from inside the consumer. This story becomes CLD structure on the System Dynamics analysis (Picture 5.).

The unmanaged waste degrade the environmental condition and people start to realize that they must change into green motivation on their consumption behavior. It will shift into the green lifestyle. The green lifestyle will change the household consumption and it will reduce the waste percentage. For example: if people buy a bottle of water every day, it will add the inorganic waste. If people apply the sustainable consumption (reduce the use of a bottle plastic) and they use their own bottle to drink, it will reduce the inorganic waste. It is not only more effective on using the resources but also more efficient on the consumption expenditure.

Other variables that influence the household consumption are the population number and the income level. Based on the validation test (Absolute Means Error or AME < 30%) for the System Dynamics analysis, the increase number of population will increase the waste volume. So, because the unmanaged waste model is valid, we can run the simulation until 2020. The Spearman Rho's Correlation showed that the household income has significant correlation with the consumption.

The intervention that we can do on the System Dynamic analysis are the green motivation level from the needs value and the usage value; and the lifestyle value from the influence of other and advertisement level. All those interventions are from the inside of the System Dynamics analysis (functional intervention). The structural intervention that we can do is the waste percentage that comes from the sorting the waste. This sub-variables is relatively sensitive to reduce the unmanaged waste. The sensitivity test is being conducted on each subvariable, such as:

1. Motivation: the need value and usage value.

- 2. Lifestyle: the influence of other and advertisement media.
- 3. Consumption: food and non-food products.

Picture 5. Causal Loop Diagram (CLD) and Business as Usual (BAU) for the Waste Management System



Some basic information that I used to run the model are:

- 1. The waste management (once every two days).
- 2. One dump truck capacity is about 6.8-10m<sup>3</sup>.
- 3. There are twenty eight TPS locations.

4. Waste volume for one person is about 0.75kg/day (considered the Standard National Indonesia and the interviewed with the Sanitation Department).

The assumptions are: no adding facility (such as the dump truck) and the waste pickers (a.k.a pemulung in Bahasa Indonesia) do not change their work.

Below is some parts of the Stock Flow Diagram (SFD) for the model:

# Picture 6. Stock Flow Diagram (SFD) of the Waste Management



Picture 7. SFD with the Intervention Model



Picture 6., the waste per person (=sampah\_per\_orang); the waste volume (=pembuangan sampah); the waste volume (=jumlah sampah tersisa); the carrying waste (=pengangkutan\_sampah); the population growth (=laju pertumbuhan penduduk); the population number (=jumlah\_penduduk); the growth rate (=angka\_pertmbuhan\_penduduk); the frequency (frekuensi\_pengangkutan); dump truck number (=truk\_sampah); TPSs number (jumlah\_TPS); and truck capacity (kapasitas\_truk\_sampah).

Picture 7., food consumption (=konsumsi food); non-food consumption (=konsumsi\_non\_food); income (=pendapatan); minimum wage (=kenaikan UMR); inflation (=inflasi);

motivation (=motvasi); lifestyle (=gaya\_hidup); need value (=nilai\_kebutuhan); usage value (=nilai\_kegunaan); other influence (=pengaruh\_orang\_lain); and advertisement (=pengaruh\_iklian).

Picture 8. showed the intervention on the graphically scenario: (a) the first line id the BAU; (b) the second line is the optimistic scenario; and (c) the third line is the pessimistic scenario. The scenarios are based on the waste processed on the household levels, such as:

- 1. Organic waste: composting.
- 2. Inorganic waste:
  - a. Waste can be on sale or reused.
  - b. Waste can on recycled.
  - c. Not processed at all or disposal.



### IV. CONCLUSIONS

The sustainable consumption has correlation with the waste management system and it will be more sustainable in the long run to reduce the unmanaged waste. The green motivation and the green lifestyle are the most crucial parts on the sustainable consumption, especially on the application of the 3R principles.

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### AUTHOR

**Author** – NiLuh Widyaningsih, Ph.D. candidate, University of Indonesia and nhwidya@yahoo.com.

**Correspondence Author** – NiLuh Widyaningsih, nhwidya@yahoo.com, (+62) 813-1403-2020

# Effect of *Moringa Oleifera* Leaf Extracts Supplementation in Preventing Maternal DNA Damage

Anang Otoluwa<sup>1</sup>, Abdul Salam<sup>2</sup>, Yasmin Syauki<sup>3</sup>, Muh Nurhasan<sup>2</sup>, Yustiyanty Monoarfa<sup>4</sup>, Suryani As'ad<sup>3</sup>, Veni Hadju<sup>2</sup>, A. Razak Thaha<sup>2</sup>\*

> <sup>1</sup>Faculty of Medicine, Hasanuddin University, Makassar, South Sulawesi, and Luwuk Nursing School, Indonesia. <sup>2</sup>Department of Public Health Nutrition, Hasanuddin University, Makassar, South Sulawesi, 90245, Indonesia. <sup>3</sup> Department of Clinical Nutrition, Faculty of Medicine, Hasanuddin University, Makassar, 90245, Indonesia. <sup>4</sup>Department of Public Health Nutrition, Tompotika University, Luwuk, Central Sulawesi, 94713, Indonesia.

Abstract- The extracts of Moringa oleifera leaf have been proven to have potent anti oxidant activity, prevent oxidative damage and afford significant protection against oxidative damage. This study aims to assess the effect of Moringa oleifera leaf extracts supplementation in preventing maternal oxidative DNA damage. This was a double bind, randomized control trial study, which conducted in Gowa District, South Sulawesi Province, Indonesia, from January to December 2012. Seventy six of first trimester pregnant women enrolled in this study. They were randomized equally to the intervention and control group. Intervention group received Moringa oleifera leaf extracts with iron folic acid capsules, while the control group received only iron folic acid capsules for three months. Before and after intervention, blood samples were extracted for measuring 8hydroxy-2' -deoxyguanosine (8-OHdG) using enzyme-linked immune sorbent assay (ELISA). The effect of intervention was analyzed by Independent T test and paired T test. In the supplemented group, mean concentration of 8-OHdG was 3616 pg/ml and significantly reduced during the intervention by 36% (p=0.000). Levels of 8-OHdG were higher in the control group 3690 pg/ml, and reduced by 30.4% (p=0.019). The mean difference was not significant between two groups (p= 0.278). The result indicate there was no significant difference in the level of 8-OHdG between intervention and control group but the percentage of velocity in the intervention group larger than control group. Further research is needed to be implemented on non pregnant women, so the control group could receive pure placebo.

### Index Terms- Moringa oleifera, maternal DNA damage

### I. INTRODUCTION

Diet in pregnancy and the supply of nutrition to the development of the embryo or fetus is one of the important environmental factors that affect fetal growth, cell proliferation, and DNA replication in the critical period of life. Nutrition is very important to maintain the integrity of the genome because of its role as an enzyme cofactor or as part of a protein that plays a role in DNA synthesis and repair, prevention of DNA damage due to oxidative stress reactions, and maintain DNA methylation<sup>1</sup>.

DNA damage, especially that caused by oxidative stress, has been shown to be associated with abnormal pregnancy

outcome including pre-eclampsia (PE) and intrauterine growth restriction (IUGR)<sup>2,3</sup>. The results showed that DNA damage was significantly associated with pregnancy develop into PE and IUGR<sup>4</sup>.

DNA damage can be caused by micronutrients deficiency. Micronutrients have an important role in protecting DNA damage by providing a co-factor required for the proper functioning of enzymes that play a role in DNA repair. Fenech  $(2005)^5$  has identified that a low intake of calcium, folate, nicotinamide acid, vitamin E, retinol, beta-carotene and significantly associated with genomic instability. Zinc has also been shown to play an important role in the repair of DNA damage<sup>6</sup>.

DNA damage in pregnant women, as measured by the concentration 8-OHdG has been shown to be associated with PE and IUGR. The mechanism is still not clear but it is thought because of ischemia or hypoxia of the placenta. Injury due to ischemia may contribute to the oxidative stress and cause the release of oxidative stress to the maternal and placental circulation is likely to result in DNA damage and could be the basis of impaired fetal growth and development<sup>7</sup>.

Anti-oxidants such as vitamins A, and E can prevent 8-OHdG production due to anti-oxidant activity in inhibiting free radicals<sup>8</sup>. Thomas P  $(2009)^9$  in a review also reported that supplementation with antioxidant vitamins and B vitamins can reduce the frequency of micronuclei (a marker of DNA damage). An intervention study found that the frequency micronuclei significantly associated with serum levels of vitamin B12<sup>10</sup>. Smolkova  $(2004)^{11}$  reported that supplementation with antioxidants had a significant effect in reducing the amount of 39% micronuclei.

Oxidative DNA damage can be measured with 8-OHdG. 8-OHdG is one of the most easily formed oxidative DNA lesions. 8-OHdG is a modified nucleoside base, which is very often studied and detected as DNA damage products excreted in the urine when DNA damage occurs<sup>12</sup>. Examination of DNA damage using ELISA is a rapid and sensitive immunoassay for the detection compete with the amount of 8-OHdG in urine samples, serum, or saliva<sup>13</sup>.

*Moringa oleifera* leaves have long been used to overcome the problem of malnutrition among children, pregnant women, and breastfeeding<sup>14</sup>. In addition, antioxidant activity of

*Moringa* leaf have been investigated. Sreelatha and Padma  $(2009)^{15}$  reported that 1 g of extract of *Moringa* leaf contain non enzyme anti-oxidants such as ascorbic acid 6.6 mg, tocopherol 6.53 mg, and carotenoids 92.38 mg. Research on antioxidant enzymes in extracts of *Moringa* leaf also showed a high rate activity of superoxide dismutase (SOD), and catalase (CAT). Similarly to the phenolic (45.81 mg/g) and flavonoids (27mg/gr). Since polyphenols act as an anti-oxidant that is a high number indicates that extracts of *Moringa* leaf contain high antioxidant activity. This study further reported antioxidant activity in preventing DNA damage. By measuring the activity of  $\lambda$  DNA (72.45 ug / ml) of *Moringa* leaf extract can significantly reduce DNA damage induced by H2O2 oxidant.

With micronutrients substances and high anti-oxidant compounds, the extracts of *Moringa* leaves can be used as an alternative supplement for pregnant women to prevent DNA damage. Prevention of DNA damage can decrease the incidence of pregnancy complications such as PE and IUGR and which lead to the normal birth weight baby<sup>16</sup>. The purpose of this study was to assess the effect of extracts of *Moringa Oleifera* to the prevention of DNA damage in pregnant women.

### II. MATERIAL AND METHOD

Study design was double blind, randomized, control trial. First trimester pregnant women who tested positive by dipstick pregnancy (urine test) that meet the inclusion and exclusion criteria were recruited consecutively. Totally, 76 pregnant women who enrolled, randomized to group who received *Moringa* leaf extract capsules with iron 60 mg and folic acid 400µg (intervention) and iron 60 mg with folic acid 400 µg capsules (control). Capsules were given for three months. Before and after intervention blood samples were extracted for measuring 8-hydroxy-2' -deoxyguanosine (8-OHdG).

Moringa leaves were drawn from the Moringa tree that growing in Makassar and Majene district. Moringa leaf washed by dipping it into water ways and douse with water several times. After being washed, dried Moringa leaf-aired aerate for 2 hours, and then dried in a heating clothesline using incandescent lamps with a temperature of 38°C for 2 x 24 hours. The dried leaves were kneaded by hand until a small shielded. Moringa leaves that already half smooth then taken to the laboratory. Moringa leaves were taken and there are 9 g plus 1 g bitter macerated with methanol to within 1 x 24 hours, this treatment was repeated 3 times, then filtered to separate and extract the pulp. The extract were evaporated at a temperature of  $600^{\circ}$ C for 2 x 24 hours. The result was dried frozen (freeze dryer) for 1 x 24 hours. The pulp was dried at a temperature of 400°C for 1x24 hours. The results of 200 mg of extract was mixed with 800 g of the residue, and then inserted into an extract Moringa capsules weighing 1 g.

Examination of 8OHdG performed in accordance with protocol 8-hydroxy 2 deoxyguanosine ELISA Kit Abcam production of  $(101245)^{17}$ . Plate, buffer solutions, standards, antibody, and reagent issued to room temperature before done. Plasma samples of homogenized with Fortex. Plate prepared, then added reagent such as buffer, standard, sample, and antibody number 50 ml each corresponding to wells that have been specified in the protocol. Plates were then incubated for 18

hours at a temperature of  $20^{0}$  C. Wells then emptied and rinsed five times with wash buffer. Then added 200 ml Ellman's reagent to each well and 5 ml of tracer to the total activity well. Plate and then covered with plastic films and shaken with an orbital shaker for 90 minutes. After the plate was read by the machine wiped and read with Elisa reader at a wave length of 420 nm.

Data were analyzed using statistical package for social science (SPSS). The mean of 8-OHdG levels before and after intervention were analyzed using paired T test, and the mean between the two groups using independent T test.

### III. RESULTS AND DISCUSSION

8-OHdG levels in the intervention and the control groups can be seen in Table 1. below.

Enc	End, as well as the Inter-Group Differences				
Group	Level of 8- OHdG Beginning (pg/ml)	Level of 8- OHdG End (pg/ml)	P-Value		
Intervention	5684	3616	0.000		
Control	5307	3690	0.019		
P-Value	0.596	0.278			

 Table 1. Differences 8-OHdG Levels at the Beginning and the End, as well as the Inter-Group Differences

The decrease in 8OHdG levels was significant when compared to the time before and after the intervention. Nevertheless, when compared between the intervention and control groups, no significant differences appear. Although the analysis of the two groups did not give a significant difference, but if we observe a decrease in the percentage rate of 8 OHdG levels, the intervention group gave greater rate as we can see at Table 2. This result confirmed studies on green tea and red wine that had beneficial effect to reduce 8-oxodG concentrations<sup>18,19</sup>.

Group	Mean of	Mean of	Velocity
	8-OHdG	8-OHdG	(%)
	Before (pg/ml)	After (pg/ml)	
Intervention			
	5684	3616	36,3 %
Control			
	5307	3690	30,4 %

DNA damage in this study was determined by ELISA method that uses 8-OHdG as a biomarker. Deoxyguanosine (dG) is one of the constituent DNA and when oxidized will turn into 8 hydroxy-guanosine (8-OHdG). In addition to undergo oxidation, hydroxylation of guanosine can also be experienced as a normal metabolic response or due to other environmental factors. Increased levels of 8-OHdG associated with aging and pathological disorders, including depression, cancer, diabetes, hypertension, and oxidative stress<sup>20</sup>. Supplementation with vitamins and minerals with antioxidants has been shown to prevent damage to DNA<sup>9</sup>.

In this study, administration of *Moringa* leaf extract that has been proven to contain vitamins and minerals as well as antioxidant enzymes are expected to prevent DNA damage<sup>21</sup>. Dietary antioxidants are expected to inhibit the formation of oxidative DNA damage. When ROS are formed in vitro or by oxidative stress in vivo, several types of oxidative DNA lesions are formed, including small base lesions and exocyclic adducts<sup>20</sup>. The results showed that 8-OHdG levels decreased significantly before and after the intervention, both in the intervention group (p = 0.000) and in the control group (p = 0.019). Significant changes in both groups may be caused by these two groups therefore get a supplement containing folate and iron, two micronutrients that play a role in DNA synthesis and oxidative DNA damage repair<sup>22,23</sup>.

Independent T test on the difference between the intervention and control groups was not significant (p = 0278). However, when viewed from the rate of decrease (velocity) intervention group had a rate of decline in the percentage in the intervention group (36.3%) greater than the control group (30.4%). This is possible because in the intervention group, Moringa leaf extract contains anti-oxidants that much faster can prevent oxidative stress plays a role in DNA damage due to oxidation. In this study, a control group given a placebo cannot be pure, because in pregnant women in Indonesia, iron and folic acid supplementation has become a national program. This can affect the results of the difference decreased levels of 8-OHdG in both groups. It is paralel with Moller's statement in a review, that consumption of multiple vitamins can not provides better protection against oxidative DNA damage than does singlevitamin supplementation<sup>24</sup>.

In conclusion, Moringa Oleifera leaf extracts have no significant effect to reduce DNA damage compared to the iron folic acid. Further research is needed to proof their effect on the people with the normal condition or non pregnant, so the control group could be given pure placebo.

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#### AUTHORS

**First Author** – Anang Otoluwa, Faculty of Medicine, Hasanuddin University, Makassar, South Sulawesi, and Luwuk Nursing School, Indonesia. **Second Author** – Abdul Salam, Department of Public Health Nutrition, Hasanuddin University, Makassar, South Sulawesi, 90245, Indonesia.

**Third Author** – Yasmin Syauki, Department of Clinical Nutrition, Faculty of Medicine, Hasanuddin University, Makassar, 90245, Indonesia.

**Fourth Author** – Muh Nurhasan, Department of Public Health Nutrition, Hasanuddin University, Makassar, South Sulawesi, 90245, Indonesia.

**Fifth Author** – Yustiyanty Monoarfa, Department of Public Health Nutrition, Tompotika University, Luwuk, Central Sulawesi, 94713, Indonesia

**Sixth Author** – Suryani As'ad, Department of Clinical Nutrition, Faculty of Medicine, Hasanuddin University, Makassar, 90245, Indonesia.

**Seventh Author** – Veni Hadju, Department of Public Health Nutrition, Hasanuddin University, Makassar, South Sulawesi, 90245, Indonesia.

**Eighth Author** – A. Razak Thaha, Department of Public Health Nutrition, Hasanuddin University, Makassar, South Sulawesi, 90245, Indonesia.

**Correspondence Author** – Anang Otoluwa, Email: <u>akperlwk@yahoo.com</u>, <u>aotoluwa@gmail.com</u>, Handphone: 085656045000.

# The Impact of Competition on Performance of Firms in the Mobile Telecommunication Sector in Kenya

### **Tansley Wandera Kaunyangi**

School of Business, Jomo Kenyatta University of Agriculture and Technology

**Abstract-** Competition is a factor that affects the business environment in any industry. This study sought to investigate the impact of competition on the performance of the mobile telecommunication industry in Kenya. This research aimed at looking at how competition has impacted on performance of the four firms in the sector i.e. Orange Kenya, Airtel, Yu and Safaricom (K) ltd. The study used a descriptive research design that answered questions how competition affects the independent variables of the study i.e. new market entrants, competitive rivalry and buyer power. Simple stratified sampling was used to select the sample of the respondents to avoid bias and ensure that samples drawn were representative of the population of mobile service subscribers of the four firms. Data collection was done using questionnaires and analyzed using Ms Excel. The results were presented using bar graphs and pie charts.

The study found out that competition has an impact on the performance of firms and this accounted for 79.8% while 20.2% of the respondents indicated that competition did not have an impact on performance of firms. From the research it was further established that majority of the respondents indicated that new market entrants, competitive rivalry and buyer power affects performance of the firms in this industry accounting for 61.2% while 38.8% of the respondents indicated that new market entrants, competitive rivalry and buyer power did not affect the performance of the firms in the telecommunication industry in Kenya. The study recommended improvement of performance in the telecommunication industry based upon better understanding of the competitive factors in the industry which this study was based on.

*Index Terms*- Competition, Porters five forces model, competitive rivalry, new market entrants

### I. INTRODUCTION

Joekes and Evans, (2008) define competition as the process of trying to win something that is; a higher success level in a

business enterprise or industry which someone else is also trying to win or achieve. A competitor on the other hand refers to an individual or group that an enterprise is trying to succeed against. Competition can also be defined as the <u>rivalry</u> or individual effort of two or more parties acting independently (Beato & Laffont, 2002).

In a competitive business environment, prices tend to remain relatively low because the power of bargaining is usually in the hands of the buyers (Joekes & Evans, 2008). Economic competition usually takes place in markets where the sellers compete to attract offers from prospective buyers. In the process of buyer seller interactions, a lot of information is signaled through product/ service prices therefore most sellers will cut prices to attract buyers (Carlton & Dana, 2004).

Competition is inevitable in almost every business environment but according to Joekes& Evans, (2008) competition is good for business. Every business enterprise in operation with a profit oriented goal will have to face competition with exception to monopolistic business enterprises (Joekes& Evans, 2008). The mobile telecommunication industry in Kenya is an oligopolistic market because it is characterized by multiple buyers, few sellers and the price is not influenced by the cost of production but by the reaction of other firms' to each of the individual market player's actions especially on price and output matters (Ayoola&Azeez, 2013). The authors further explain that this results to the emerging issue of how individual firms will stay afloat in market based on strategies these firms will have to employ to remain relevant and profitable based on the existent competitive environments.

### II. RESEARCH ELABORATIONS



Dependent variable

### Figure 3.1 Conceptual framework

### 3.1 The threat of new market entrants

Threat of new entrants according to Porters five forces refers to the threat that new competitors pose to the existing competitors in any industry. Where an industry is profitable, it can be expected that it will attract more competitors who are also looking to have a slice of the profits (Michael, 2008). If it is easy for these new entrants to enter the market, for example if entry barriers are low or nonexistent, this will pose a threat to firms already operating and competing in that industry (Murphy 2002). More competition leads to increased production levels. Without matching a concurrent increase in consumer demand, profit levels for every market player are bound to go down and therefore, threat of new entrants, according to Porter's 5 forces, is one of the forces that shape the competitive structure of an industry.

The threat of new entrants as the model created by porter depicts, also influences the ability of firms existing in the industry to achieve profitability and better their performance levels (Michael, 2008). A high threat of entry means new competitors are highly likely to be attracted to the profits of the industry as they can enter the industry with relative ease (Carlton & Dana, 2004). With new competitors making entry into the industry, they could decrease the market share and thus profitability of the existing competitors. New entrants could also mean changes to existing product quality and/or price levels.

High levels of threat of new entrants could make an industry more competitive and thus decrease profit potential for existing market players (Michael, 2008). Low threat of entry on the other hand makes an industry less competitive and at the same time increases profit potential for the existing firms (Michael, 2008). New entrants are deterred by barriers to entry (factors in a competitive industry that make it difficult for new market entrant to begin operating in that market).The degree of threat of new entrants is determined by several factors, with many of these factors falling into the category of entry barriers.

A high economy of scale is an entry barrier that could lower the threat of entry (Hernon& Whitman, 2001). Well-known brand names such as established industry names e.g. Safaricom and Airtel are as well barriers to entry that can lower the threat of new entrants. High upfront capital investments required to jump start an enterprise can as well lower the threat of new entrants. High consumer switching costs are also barriers to entry(Michael, 2008). The opposite is true for any of these factors where the barriers to entry are low and the threat of new entrants is high. For instance, if there are no required economies of scale, standardized products, low initial capital investment requirements and low consumer switching costs indicates that entry barriers are low and the threat of entry is high.

High threat of entry of new competitors occurs when: profitability does not require economies of scale; products are undifferentiated; brand names are not well-known; initial capital investment is low; consumer switching costs are low; accessing distribution channels is easy; location is not an issue; proprietary technology is not an issue, proprietary materials is not an issue; government policy is not an issue and expected retaliation of existing firms is not an issue (Michael, 2008).

Threat of new entry on the other hand is low if; profitability requires economies of scale; products are differentiated; brand names are well-known; initial capital investment is high; consumer switching costs are high; accessing distribution channels is difficult; location is an issue; proprietary technology is an issue; proprietary materials is an issue; government policy is an issue and the expected retaliation of existing firms is an issue (Michael, 2008). Thus the research focused on the threat of new market entrants in the Kenyan telecommunications industry being low as the factors outlined above largely reflected the reality of the industry.

The researcher chose the threat of new entrants as one of the independent variables for reasons explained above on the threats established industry players such as Safaricom and Airtel face as well based on the fact that a low threat of new market entrants makes an industry become more attractive and increases profit potential for firms already operating in that industry. A high threat of new market entrants makes an industry become less attractive and decreases profit potential for the firms already operating in that industry become less attractive and decreases profit potential for the firms already operating in that industry (Hernon Whitman, 2001).

3.2 Buyer power

The presence, composition and number of powerful buyers in a market reduce the profit potential for the industry as a whole (Michael, 2008). Buyers increase competition and impact on performance of firms within an industry by bargaining for improved quality/quantity of services, forcing down prices as well as playing competitors against each other with end result being diminished industry profitability (Michael, 2008).

With the Kenyan mobile telecommunications industry, the power of the industry's important buyer groups depends upon the characteristics related to the market situation as well as the relative importance of purchases from customers of a single operator as compared to the overall business. To assess the power of the buying group in the Kenyan mobile telecommunications industry, the research used the following conditions: that the buyer group was concentrated, or purchased large volumes relative to the seller's sales; that products purchased from the four firms are standard or undifferentiatedalternative suppliers are easy to find and competitors are played against each other; that few switching costs existed (such as little penalty for moving to another service provider); that the industry's product is not important to the quality of the buyer's products and that the buyer has full information (their knowledge of demand and market prices provides them with leverage)

Buyer power, also defined as the ability of customers to put a firm<u>http://en.wikipedia.org/wiki/Firm</u> under pressure, also affects the customer's sensitivity to price changes (Michael, 2008). Firms in the Kenyan mobile telecommunication industry had taken measures during the research to reduce buyer power by for example implementing loyalty and reward programs. The buyer power is high if the buyer has many alternatives (Grand, 2007).

Buyer power can enable consumers exert pressure on businesses to get them to provide better quality products, better customer services and lowered product prices (Hernon & Whitman, 2001). As with the case with this research the researcher sought to investigate the Impact of buyer power by analyzing the Kenya's mobile subscriber bargaining power and its impact on quality and price. When analyzing the bargaining power of buyers, the industry analysis was conducted from the seller's. According to Porter's 5 forces industry analysis model, buyer power remains among the forces that shape the competitive structure and performance of any industry (Michael, 2008).

A strong buyer can make an industry more competitive and decrease profit potential for the seller (Carlton & Dana, 2004). However a buyer, who is not as strong makes an industry less competitive and increases profit potential for the seller because the prices and quality will be determined by the seller (Michael, 2008). The concept of buyer power Porter created has had a lasting Impact in market theory. Several factors determine Porter's Five Forces buyer bargaining power. One of the factors is the number of buyers as compared to sellers. When the buyers are more than the sellers, this shifts the power to the buyers. Another factor is switching costs, that is, if it is relatively easy for a buyer to switch from one seller to another then the power is also with the buyers. If buyers can easily backward integrate - or begin to produce the seller's product themselves - the bargain power of customers is high. If the consumer is price sensitive and well-educated regarding the product, buyer power is high. If the

customer purchases large volumes of standardized products from the seller, buyer bargaining power is high. If substitute products are available on the market, buyer power is high and the opposite is true (Michael, 2008).

During analysis of an industry, all of the above mentioned factors regarding Porter's 5 Forces on buyer power did not apply. But others if not majority, certainly did apply to the study. Of the factors that did apply, some indicated a high buyer bargaining power and others a low buyer bargaining power, with the results not always being straightforward. Therefore for this research, it was necessary to consider the particular circumstances of each of the given firms in the industry as a whole when using data to evaluate the competitive structure and performance of the four firms.

According to Porter's 5 forces, with regards to buyer power industry analysis, when there is lower bargaining power it makes the industry to be more attractive and the potential of earning profits is high for the seller (Grand, 2007). Since its introduction, Porter's Five Forces has been used widely in industry analysis and this informed its inclusion in this study. The five forces measure the competitiveness of the market deriving its attractiveness (Michael, 2008). The researcher therefore used conclusions based from the analysis to determine the Impact of competition on the performance of individual firms in the telecommunications industry.

### **3.3** Competitive rivalry

This forms part of the Porter's Five Forces that the researcher used as an independent variable to the research. As a starting point in analyzing the Kenyan telecommunications industry, the research looked at the nature of the competitive rivalry existing between the established firms in the industry. Where entry to an industry is easy, competitive rivalry is likely to be high while if it is not easy for customers to go for substitute products in the market (Hernon & Whitman, 2001), for example a subscriber could choose Airtel services over Safaricom, then rivalry will be low. Competitive rivalry depends on several factors such as differentiation between the products in the market, brand loyalty by the buyers and price comparisons by the media (Grand, 2007). Competitive rivalry will also be high where it's costly to leave the industry hence they fight to just stay in (exit barriers); where the market growth rates are low (growth of a particular company is possible only at the expense of a competitor); where high "strategic stakes" are tied up in capital equipment, research or marketing and where capacity can only be increased by large amounts. In such a scenario, companies will apply the necessary strategies so as to retain their share of the market (Michael, 2008). A highly competitive business environment results in competitiveness in prices, profitability and performance of firms in the industry.

### III. FINDINGS

### 4.1 Impact of threat of new market entrants

Rating the impact of threat of new market entrants on performance of firms in the mobile telecommunications industry in Kenya on a five point Likert scale where **5=strongly agree 4=agree 3=don't know 2= Disagree1= Strongly disagree.** 

The range was 'strongly agree' (5) to 'Strongly disagree' (1).

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The scores of 'disagree/strongly disagree' had an equivalent mean score of 0 to 2.5 on the continuous Likert scale ;(  $0 \le L/N \le 2.4$ ).

The scores of 'don't know' had an equivalent mean score of equivalent to a mean score of 2.5 to 3.4 on the continuous Likert scale:  $(2.5 \le M.E \le 3.4)$ .

The score of very strongly agree/agree had an equivalent mean score of 3.5 to 5.0 on a continuous Likert scale;  $(3.5 \le F \le 5.0)$ .

A standard deviation of >1.5 implies a significant difference on the impact of the variable among respondents.

Statements	Mean	Std. Dev.
New market entrants have led to decreased market shares	3.51	0.364
New market entrants have led to decreased revenues	3.33	0.675
New market entrants have led to decreased profitability of firms.	3.51	0.731
New market entrants have led to decreased price levels of services	3.78	0.275

### Table 4.1: threat of new market entrants

The study sought to establish the views of respondents on whether a firm required economies of scale in order to attain profitability in the Kenyan Telecommunications sector. The results were as shown below.





According to the study findings, the majority of the respondents indicated that they had the view that a firm required economies of scale in order to attain profitability in the Kenyan Telecommunications sector, accounting for 61.8% while 38.2% indicated they did not hold the view that a firm required economies of scale in order to attain profitability. The results therefore show that new entrants into the market of mobile telecommunication impacts on the performance of the firms.

# **4.2 Impact of buyer power on performance of firms in the mobile telecommunications industry in Kenya.**

The study took a rating the Impact of buyer power on performance of firms in the mobile telecommunications industry

in Kenya on a five point Likert scale where **5=strongly agree 4=agree 3=don't know 2= Disagree 1= strongly disagree.** 

The range was 'high' (4) to 'unchanged' (1).

The scores of unchanged/low had an equivalent mean score of 0 to 2.5 on the continuous Likert scale ;(  $0 \le U/M \le 2.4$ ).

The scores of moderate had an equivalent mean score of of 2.5 to 3.4 on the continuous Likert scale:  $2.5 \le G \le 3.4$ ).

The score of high had an equivalent mean score of 3.5 to 5.0 on a continuous Likert scale;  $3.5 \le E \le 5.0$ ).

A standard deviation of >1.5 implied a significant difference on the impact of the variable among respondents.

Table 4.2 Purchase	volumes	& switching	costs for	mobile	subscribers

Impact of competition on affordability on each of the four firms based upon:	Mean	Std. Dev.
a. Purchase volumes:		
Airtel Kenya	3.42	0.371

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Orange Kenya	1.85	0.634
Safaricom	3.62	0.526
Yu mobile	2.16	0.389
b. Switching costs:		
Airtel Kenya	2.53	0.571
Orange Kenya	2.18	0.232
Safaricom	3.51	0.393
Yu mobile	2.32	0.364

The study sought to find out the Purchase volumes & switching costs for mobile subscribers of either of the four telecommunications firms in the industry in relation to consumer/subscriber buying power. The respondents rated buyer power in terms of purchase volumes as follows: Airtel Kenya (mean of 3.42) indicating that the purchase volumes were moderate; Orange Kenya (mean of 1.85) indicating that the purchase volumes were unchanged/low; Safaricom Kenya (mean of 3.62) indicating that the purchase volumes were high and Yu mobile (mean of 2.16) indicating that the purchase volumes were unchanged/low.

The extent to which respondents rated buyer power in terms of switching cost were as follows; Airtel Kenya (mean of 2.53) indicating that the quality was moderate; Orange Kenya (mean of 2.18) indicating that the quality was unchanged/low; Safaricom Kenya (mean of 3.51) indicating that the quality was excellent and Yu mobile also had a (mean of 2.32) indicating that the quality was unchanged/low.

Impact of subscribers' buyer power in the mobile telecommunications industry in Kenya on substitute products, backward integration and industry attractiveness. Rating the Impact of subscriber's buyer power in the mobile telecommunications industry in Kenya on substitute products, backward integration and industry attractiveness on a five point Likert scale where 5=strongly agree 4=agree 3=don't know 2= Disagree 1= Strongly disagree.

The range was 'strongly agree' (4) to 'Strongly disagree' (1).

The scores of 'disagree/strongly disagree' had an equivalent mean score of 0 to 2.5 on the continuous Likert scale ;(  $0 \le L/N \le 2.4$ ).

The scores of 'don't know' had an equivalent mean score of equivalent to a mean score of 2.5 to 3.4 on the continuous Likert scale:  $(2.5 \le M.E < 3.4)$ .

The score of very strongly agree/agree had an equivalent mean score of 3.5 to 5.0 on a continuous Likert scale;  $(3.5 \le F \le 5.0)$ .

A standard deviation of >1.5 implies a significant difference on the impact of the variable among respondents.

### Table 4.3 Impact of subscribers' buyer power on substitute products, backward integration and industry attractiveness.

Impact of subscriber's buyer power on substitute products, backward integration	Mean	Std. Dev.
and industry attractiveness		
There are no substitute products for the telecommunications industry as a whole	3.63	.638
Buyer power has resulted in better product price and quality	3.74	.523
Can buyers begin to produce sellers products themselves (buyer backward	2.16	.248
integration)		
The buying power of mobile subscribers in the Kenyan telecommunications	3.51	.287
industry has made the industry attractive to new service providers/ market players.		

The study sought to find out the impact of subscriber's buyer power in the mobile telecommunications industry in Kenya on substitute products, backward integration and industry attractiveness. The respondents were of the opinion that there are no substitute products for the telecommunications industry as a whole (mean of 3.63) indicating that they strongly agreed there were no existing substitute telecommunication products to the industry's that the purchase volumes were moderate. On the question of whether buyer power had resulted in better product price and quality, respondents indicated that indeed buyer power had resulted in better price and quality of products (mean of 3.74). On the question of whether buyers could begin producing sellers products themselves (buyer backward integration, respondent indicated they strongly disagreed (mean of 2.16). Respondent also indicated to a mean of 3.51 that buying power of mobile subscribers in the Kenyan telecommunications industry has made the industry attractive to new service providers/ market players

### 4.3 Impact of competitive rivalry on performance of firms

On the third independent variable, the study sought to find out the impact of competitive rivalry on performance of firms in the mobile telecommunications industry in Kenya based on various measures as shown below. The results were determined by use of mean and standard deviation as shown.

The range was 'strongly agree' (4) to 'Strongly disagree' (1). The scores of 'disagree/strongly disagree' had an equivalent mean score of 0 to 2.5 on the continuous Likert scale ;(  $0 \le L/N \le 2.4$ ).

The scores of 'don't know' had an equivalent mean score of equivalent to a mean score of 2.5 to 3.4 on the continuous Likert scale:  $(2.5 \le M.E < 3.4)$ .

The score of very strongly agree/agree had an equivalent mean score of 3.5 to 5.0 on a continuous Likert scale;  $(3.5 \le F \le 5.0)$ .

A standard deviation of >1.5 implies a significant difference on the Impact of the variable among respondents.

### Table 4.4 Impact of competitive rivalry on performance of firms

Impact of competitive rivalry on performance of firms in the mobile telecommunications industry in Kenya	Mean	Std. Dev.
Competitors are few thus performance of firms is relatively predictable and stable	3.63	0.638
Competitors are of unequal size, some are large firms, others are small, and thus performance of these firms differs.	3.74	0.523
Competitors possess unequal market share and this directly relates to their different levels in performance.	3.65	0.248
Performance of firms grows in tandem with the industry growth which remains fast.	3.51	0.287
Products for the different firms in the industry are differentiated and thus performance for individual firms is easily measured.	3.54	0.243
Brand loyalty is significant for the different brands for firms in the industry and this reflects directly in performance of brands for the four firms	4.21	0.342

The results obtained from table 4.8 showed that respondents strongly agreed that competitors were few thus performance of firms is relatively predictable and stable with a mean of 3.63. Respondents also strongly agreed that competitors are of unequal size, some are large firms, others are small, and thus performance of these firms differ by a mean of 3.74.On the question of whether competitors possessed unequal market share and which directly relates to their different levels in performance, respondents strongly agreed, with a mean of 3.65.

Respondents also strongly agreed that performance of firms grows in tandem with the industry growth which remains fast, rated with a mean of 3.51. On whether products for the different firms in the industry are differentiated and thus performance for individual firms was easily measured, respondents strongly agreed with a mean of 3.54. Lastly, on the question of whether Brand loyalty is significant for the different brands for firms in the industry and this reflects directly in performance of brands for the four firms, respondents strongly agreed with a mean rating of 4.21.

### **IV. CONCLUSIONS**

The impact of competition on the Kenyan mobile telecommunication market is that it has greatly enhanced performance. The study further concluded that there is a direct relationship between competition and the performance of these four firms. Competition in this industry impacts directly on the performance of the firms because of the few number of the firms in the industry therefore the improvement in performance aspects is not based on cost of production rather it is as a reaction from the actions of the competitors. The study therefore concludes that the level of competition in the telecommunication industry impacts on the performance of the four firms in this industry which were the basis of the study. The study has shown that competition has a great impact on the performance of the firms in the telecommunication industry. The study has shown that there are barriers to entry into this industry but they are low therefore there is room for new firms to enter into this industry. The study therefore recommends that more firms should consider entering this industry despite the level of competition.

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#### AUTHORS

**First Author** – Tansley Wandera Kaunyangi, MBA (Strategic Management) student, Jomo Kenyatta University of Agriculture and Technology, wtansley@gmail.com

# Teacher Effectiveness-a parameter of Quality in Higher Education in the polarized scenario of 'UGC Governed' and 'non-UGC Governed' Teachers in Aided Arts and Science Colleges of Chennai City

C.R.Ravi<sup>\*</sup>, Dr.M.V.Arulalan<sup>\*\*</sup>

\* Associate Professor, Head, Dept. of Commerce, Former Unit Secretary of Association of University Teachers(AUT), A.M Jain College, Chennai- 600 114

\*\* Associate Professor, Head, Dept. of Commerce, Chairman, Zone II of Association of University Teachers(AUT), Guru Nanak College, Chennai-600 042.

### I. INTRODUCTION

A ided College system coming under the grant-in-aid Code dates to the pre-independence era. Block grant of 50% was granted to aided colleges before Independence and from 1972-73, the grant-in-aid pattern was as follows:

- a. From 1.4.1977, the revised pattern of grant-in-aid came into force in order to ensure prompt and full payment of salaries to staff in aided colleges, namely, 100% of salary grant and non-salary grant<sup>-1</sup>
- b. Managements of aided colleges were directed by the Government to open a Bank A/c entitled 'Approved Staff Salary Account' for making payment to the approved staff w.e.f. 1.4.1977, followed by Advance Salary Grant system which was introduced from 1978-79.<sup>2</sup>
- c. After the Review Committee suggested certain measures, 'Direct Payment' system was introduced from 1.4.1980 by which salaries directly gottransferred from the Treasury to the bank account of individual staff.<sup>3</sup>

The concept of Evening College came into existence during 1970s owing to the demand from employed people thronging at the portals of higher education. This created the 'grant less sector teachers'. The market orientation of the unaided shift has created a special status to it as against the aided in the context of the utility-viability, marketability-employability criteria, being zealously advocated by the market theorists of globalization.<sup>4</sup>This situation assumed greater proportions after the New Educational Policy of 1986, followed by a virtual moratorium imposed by the State Government in 1988-89 on Aided Courses and mushrooming growth of Self-financing Colleges, culminating in the creation of dichotomy of teachers in aided colleges, i.e., Teachers 'governed by UGC scales of pay and 'not governed by UGC scales of pay'. While majority of UGC governed teachers are members of one teacher Association or other, only a negligible part of those not-governed by UGC scales are members of Association, with varying pay scales, service conditions, professional development measures, participation in management and other factors impacting the effectiveness of a teacher, thus the present study. It should be underscored that teacher organisations which had a crucial role in fostering the Direct Payment Scheme were unable to prevent the

drift and privatisation move resulting in the unaided stream in aided colleges and creation of self-financing colleges and education being converted as a commodity from being a cherished noble exercise on account of the global phenomenons.

### II. NEED FOR THE PRESENT STUDY

"The term teacher effectiveness is used broadly, to mean the collection of characteristics, competencies, and behaviors of teachers at all educational levels that enable students to reach desired outcomes".<sup>5</sup> Awofala claimed that teacher effectiveness is synonymous to individual teachers' performance and "teacher effectiveness is encompassed in knowledge, attitudes, and performance".<sup>6</sup> Teacher effectiveness is important because the "effectiveness of every teacher is the life of every educational institution".<sup>7</sup> In particular, teacher characteristics are one of the factors that influence teachers' overall effectiveness. "Teacher characteristics are relatively stable traits that are related to and influence the way teachers practice their profession". Specifically, "effective teachers are those who achieve the goals they have set for themselves or which they have set for them by others". Additionally, "the work of effective teachers reverberates far outside of school walls. Their students develop a love of learning and a belief in themselves that they carry with them throughout their lives". It must be recognized also that "the quality of a teacher canmake the difference of a full year's growth in learning for a student in a single year".<sup>8</sup>

Teacher Evaluation by the students is also known as 'Students' Feedback' over teachers and their teaching. It has become an integral part of National Assessment and Accreditation (NAAC) process and grant of Autonomous Status to colleges. Insitutions follow different evaluation criteria of their own. As there has been no full-fledged study research or study on evaluation criteria, there is a need for research about evaluation criteria for 'Teachers' Effectiveness' and identification offactorsfor enhancing the same and also the extent of organized teachers' satisfaction level with their associations and its dimensions.

### III. OBJECTIVES OF THE STUDY

1. To know the profile of the Aided college teachers

2.To examine the association of income groups with age, position, nature of position and experience groups of the teachers.

3. To measure their opinions about Teachers' Service Conditions (TSC) and Teacher Effectiveness (TE).

4. To find the latent dominant dimensions in the TE variables.

5. To identify the profile and TSC significantly influencing Total TE.

6. To identity the dominant differentiations in TSC betweenteachers governed by UGC Scales and not governed by UGC Scales in aided colleges.

7. To identify the dominant underlying dimensions of Members Satisfaction With their Association (MSWA) Variables.

Research Methodology: The study is based on primary data collected from a random sample of 150 teachers, 75 teachers -'Governed by UGC Scales of pay' and 75 teachers-'not governed by UGC Scales of pay' working in the aided colleges in the city of Chennai using a structured questionnaire. Gender, age(years), educational qualification, first generation higher educated, religion, community, spouse employment and family monthly income are the Personal Profiles.Position, appointment earlier to or later than 01.04.2003, status of the collegeautonomous or otherwise, NAAC Accredidation or otherwise, experience, association membership, knowledge of Governance of service conditions and monthly income are the Professional Profiles of the teachers covered by the study. Their opinion was obtained on each of the Teachers'ServiceConditions(TSC) viz., In-service Monetary Benefit Realisation(ISMBR), Inservice Non-Benefit Realisation(ISNMBR), Post-Retirement monetary Realisation(PRMBR), Professional Monetary Benefit Development Benefit Realisation(PDBR), Defined Teaching Responsibility Fulfilment(DTRF), Professional Development Responsibilities(PDRF),Corporate Life Responsibilities Fulfilment(CLRF), Internal Management Rights(IMR), External Management Rights(EMR), Primary Remedy(PR) and Secondary Remedy(SR). The perception of the Members Satisfaction With Associations [MSWA] was measured in terms of 12 variables as listed out in Table No.12.

The Ten Teaching Effectiveness(TE) variables areRegularity in the conduct of Assignment/Seminar, Regularity in the conduct of tests, Motivating/Counselling sessions, Promptness in handling classes, Ensuring fair and just Internal Assessment, Ensuring adequate understanding by students, Being impartial to students/parents, Updated subject knowledge & Expertise, Effective Communication and Timely Syllabus Completion.

TSC, TE and MSWA variables have been measured using 5 point LikertscaleofStrongly Agree, Agree, No Opinion, Disagree and Strongly Disagree with the weights of 5,4,3,2 and 1 respectively.

Percentage Analysis, Descriptive Statistics, Chi-square Test, FactorAnalysis, Discriminant Analysis and Multiple Regression have been used for analysis.

The major findings of the study are as follows:

I. Personal Profile of the Aided College Teachers:

Majority of the respondents are male, younger,M.Phil., holders, non-minority and have self-employed or employed spouses. Sizable section of them are Ph.Ds., BCs first generation gradudates with monthly family income of more than Rs.1,00,000. (Table 1)

### **II.** Organisational Profile of Aided College teachers:

While majority of the respondents are Assistant Professors, appointed after 1.4.2008 without Standard Pensionary Benefits, working in autonomous and accredited colleges, unaware of Government Rules or being governed by Tamil Nadu Private Colleges(Regulation) Act 1976 or Service Agreements and sizeable sections of them earn monthly family income of more than a lakh of rupees. (Table 2)

### III. Significance Of Association Between Income Groups And Profile Groups

The income of the respondents is significantly associated with their position, nature of position, age and experience. While Assistant Professors, aided management staff, youngsters and lesser experienced are significantly associated with lesser pay, associate professors, elders, more experienced and UGC scale teachers are significantly associated with better pay(Tables 3 and 4).

### IV. Factorisation of Teaching Effectiveness Variables of Aided College Teachers

Factor Analysis has been applied to identify the latent dominant deminsions of the 10 teaching effectiveness variables of the aided college teachers.

The results show TE Variables of Aided College Teachers with their **communality values** ranging from **0.361 to 0.889** and also **MSA values** ranging from **0.781 to 0.901**, have goodness of fit for factorization. **KMO-MSA** value of **0.857** and **chi-square value of 898.891** with df of **45** and **P-value of 0.000** reveal that factor analysis can be applied for 10 Teaching Effectiveness variables of the Aided College teachers. Two dominant independent Teaching Effectiveness factors explaining **64.633%** of total variance have been extracted out of 10Teaching Effectivenes Variables. Of them, the most dominant factor is Assessment Front Factor (AFF) with 7 variablesexplaining 33.621% variance, followed by **Teaching** FrontFactor(**TFF**) with 3 variables explaining 33.012% variance, in the order of their dominance. (Table 5)

### V. Descriptive Statistics of Teaching Effectiveness

With lesser standard deviation value of 4.102, the mean value of 45.967 is robust measure of Total TE. There is a slight negativeskewness in Total TE. (Table 6)

# VI. Multiple Regression Analysis of Profiles and TSC factors on Total TE

The Multiple Correlation coefficient (R) is 0.513. The F-Value of 12.929 at P-Value of 0.000 shows that OLS Model has the goodness of fit forthe multiple regression run. The External Management Rights (EMR), Experience, Educational Qualification and Generation highert educated status are the 4 Independent Factors which significantly influence the Total Teaching Effectivenessin the order of their influence and they explain 26.33% of the variance in Total TE. While EMR has positive influence on Total TE, whereas more experienced, second generation higher educated and science teachers are significantly associated with higher Total TE. (Table 7)

### VII.Discriminant Analysis between TSC Factors between UGC Scale and Management Scale Teachers

The Discriminant Analysis has been done to find out whether there are significant differentiations in TSC factors between UGC scale teachers and Management Scale teachers in the aided colleges. There are significant differentiations in the TSC factors except DRRF,CLRF,IMR,PR and SR. The TSC of the UGC scale teachers are significantly better than the management scale teachers in factors of ISNMBR, ISMBR, PDBR, PRMBR,EMR and PDRF in the order of differentiation. However in the TSC factors of IMR, SR,PR,DTRF and CLRF, not significant differences have been observed even though factor levels are on the higher side among both categories of teachers.(Tables 8 – 11)

### VIII .DOMINANT DIMENSIONS OF MEMBERS SATISFACTION WITH ASSOCIATION [MSWA] VARIABLES

The factor analysis has been run to understand the underlying dominant latent dimensions in the 12 MSWA variables. Extraction methods of Principal Component Analysis and Rotation Method of Varimax with Kaiser Normalization have been applied and the results are shown in Tables 12 and 13which reveal that with lesser S.D values, the mean values of MSWA variables are the robust measures of their Central values. The communalities are ranging from **0.557** to **0.872** and the MSAs (Measure of Statistical Adequacy) ranging from **0.862** to **0.944** for MSWA Variables, show that those variables are fit for factorization. Moreover, KMO- MSA test value of **0.894** and Bartlett's Test of sphericity with chi-square value of **1609.376** at d.f. of **66** and P Value of **0.000** indicate that the factor analysis can be applied to 12 MSWA variables.

**Two** independent MSWA factors have been extracted out of 12 MSWA variables and they together explain **67.438%** of variance.

The most dominant factor 1 explains **33.863%** of variance in MSWA variables and it contains **Six**MSWA variables of Association Strategies, Members' Participation in Association, Association Objectives and Policies, Effective Leadership, AIFUCTO role and JAC role in the order of importance of their relative correlation with it and therefore, it has been labelled as **Association Centric (AC) factor.** 

The second most dominant factor 2 explains **33.574%** variance in MSWA variables and it comprises of **six** MSWA variables viz., M.Phil/Ph.D incentives, Career Advancement Promotion, rectification of pay anomalies, Post superannuation re-employment, UGC scales of pay earned and Grievance Redressal in the order of their importance of relative correlation with it and therefore, it has been named as **Benefit Centric (BC)** factor.

Thus, two independent factors have been extracted out of 12 MSWA variables of which the AC factor is the most dominant one, followed by the BC factor.

The conclusions that emerge are:

i. The satisfaction of the members with each and every 12 aspects of their Associations is on the higher side[with the minimum mean value of 62.4%(31.11/5 \* 100) which is highly consistent and therefore more reliable.

ii. Those 12 members-satisfaction aspects with their Associations have been statistically grouped in 2 Factors, namely, Association Centric(AC) Satisfaction(33.863% variance explained) and Benefit Centric(BC) Satisfaction(33.574% variance explained), of which the AC is more dominant than BC.

iii. In the AC Satisfaction Factor, Association Strategies are the most satisfying to the members, followed by their Participation in Association Activities, Objectives and Policies of their Association, Effectiveness of the Association Leadership, Role of AIFUCTO and Role of JAC in that order. In terms of BC satisfaction, the members derive the most satisfaction with M.Phil/Ph.D., Incentives, followed by CAS, Rectification of Anomalies, Re-employment on superannuation, UGC scales of pay Realized and Redressal of Grievances in that order.

### IV. SUGGESTIONS

The Awareness of the Aided college teachers about their service conditions as governed by Government Rules, TNPC(R)Act and Service Conditions must be enhanced.

- 1. All TSC factors except EMR should be improved in order that TE is enhanced in the interest of the students, even though they are at better levels.
- 2. The polarisation of UGC and non-UGC scales of pay has left the non-UGC teachers dissatisfied with their management-fixed scales. Hence, steps are to be initiated to revise their scales of pay to a considerable level commensurate with their qualification and experience.
- 3. In terms of ISNABR, PRMBR, PDBR, DTRF and EMR factors, effective steps be taken by the 'powers that be', in order that the Aided Management Staff are endowed with higher morale which would augur well for improving TE.
- 4. Though the Association Centric(AC) Satisfaction is already on the higher side,the Teacher Associations shall further endeavor to conduct Seminars and Conferences to consolidate further the Association Centric Satisfaction of members towards their Associations for the furtherance of teachers' overall welfare in future also.

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### AUTHORS

**First Author** – C.R.Ravi, Associate Professor, Head, Dept. of Commerce, Former Unit Secretary of Association of University Teachers(AUT), A.M Jain College, Chennai- 600 114, e-mail: raviamjain@gmail.com

**Second Author** – Dr.M.V.Arulalan, Associate Professor, Head, Dept. of Commerce, Chairman, Zone II of Association of University Teachers(AUT), Guru Nanak College, Chennai- 600 042., e-mail: gncarulalan@yahoo.com.

# ANNEXURE

# Table 1 PERSONAL PROFILE OF AIDED COLLEGIATE TEACHERS

PROFILE	G	Total			
GENDER	Male = 89 [59.3%	]	Female = 61 [40.	7%]	150 [100%]
AGE[YRS]	[<35] = 53[35.3%]	[35-50 ]= 70[46.79	%]	[>50] = 27 [18%]	150 [100%]
EDUCATIONAL QUALIFICATION	M.Com = 61 [40.7%]	M.A = 34 [ 22.7%]		M.Sc = 55 [36.7%]	150 [100%]
M.Phil	Yes = 106[70.7%]		No = 44 [29.3] 150		150 [100%]
P.hD	Yes = 68 [45.3%]		No = 82 [54.7%]	150[100%]	
FIRST GENERATION LEARNER	YES = 60 [40%]		NO = 90 [60%]	150 [100%]	
RELIGION	Minority = 54 [ 36	%]	Non-minority= 9	150 [100%]	
COMMUNITY	SC/ST = 21[14%]	MBC = 30 [20%]	BC = 74 [49.3%]	OC = 25 [16.7%]	150 [100%]
SPOUSE EMPLOYMENT	Self employed = 15 [ 10%]	Employed = 63 [ 42%]	Employed = 63 [ 42%]		150 [100%]
FAMILY MONTHLY INCOME(Rs)	Upto 20,000 = 28[18.7%]	[20,000-50,000] = 39 [26%]	[50,000-100000] =38 (25.3%]	[>100000] = 45 [30%]	150 [100%]

# Table 2 PROFESSIONAL PROFILE OF AIDED COLLEGIATE TEACHERS

PROFILE	GROUPS WITH FREQUENCY	
	Assistant professor	Associate professor
POSITION	= 113 [75.3%]	= 37 [24.7%]
	Earlier to 1.4.2003	After 1.4.2003
APPOINTMENT	= 62 [ 41.3%]	= 88 [58.7%]
	Autonomous	Non- autonomous
STREAM OF COLLEGE	= 82 [54.7%]	= 68 [45.3%]

	Non-accreditatio	on				Accreditation			
NAAC ACCREDITATION	= 12 [8%]					= 138 [92%]			
	Govt. Rules TNPC® Act			Service agreements			5		
	Yes = 75		No = 100 Yes =50		No = 129		Yes =21		
GOVERNANCE OF SERVICE	No = 75 [50.%]	[509	%]	[66.7%]		[33.3%]	[86%]		[14%]
	UPTO 20,000		[20,000-50,000] [5		[50	[50,000-100000]		[>100000]	
INCOME PER MONTH(Rs)	= 54 [36%]		= 29[19.3%]		=39 [26%]		= 28 [18.7%]		
Experience	≤ 12 years =106(70.7%)			≥ 12 years =44(29.3%)					

### Table 3 CROSS TABLE BETWEEN INCOME GROUPS AND PROFILE GROUP OF AIDED COLLEGIATE TEACHERS

Income per month	Position		Nature Of Position		Age (year	rs)	Experience(years)		
(Rs in Ks)	Assistant	Associate	Aided	Aided	<35	(35-50)	>50	Upto 12	> 12
	Professor	Professor	(UGC)	management					
UPTO 20	52	2	0	54	38	15	1	48	6
[20-50]	25	4	15	14	8	20	1	24	5
[50-100]	31	8	37	2	5	25	9	26	13
[>100]	5	23	23	5	2	10	16	8	20

# Table 4 SIGNIFICANCE OF ASSOCIATION BETWEEN INCOME GROUPS & PROFILE GROUP OF AIDED COLLEGETEACHERS

S.No	INCOME PER MONTH	Cramer's value	X <sup>2</sup> – Value	df	P-value	Inference
1.	Position	0.657	64.756	3	0.000	Significant
2.	Nature of position	0.804	97.016	3	0.000	Significant
3.	Age	0.507	77.251	6	0.000	Significant
4.	Experience Groups	0.483	34.932	3	0.000	Significant

### Table 5 FACTAORISATION OF TEACHING EFFECTIVENESS VARIABLES OF AIDED COLLEGE TEACHERS

Factors	Variance	Variables	Factor	Communalities	MSA	Mean	S.D
	Explained		Loading				

		Regularity of Assignment/Seminars	0.825	0.721	0.901	4.530	0.552			
		Regularity of Tests	0.814	0.700	0.863	4.560	0.537			
Assessment Front		Motivating/Counseling students	0.655	0.646	0.906	4.600	0.531			
	33.621%	Regularity of promptness	0.624	0.634	0.926	4.590	0.569			
		Ensuring fair and just Internal Assessment	0.575	0.361	0.919	4.500	0.758			
		Ensuring Adequate understanding by students	0.567	0.551	0.812	4.680	0.496			
		Being impartial to students/parents	0.505	0.381	0.781	4.470	0.730			
Teaching	31.012%	Updated subject knowledge & Expertise	0.916	0.889	0.803	4.680	0.496			
Front		Effective Communication	0.895	0.858	0.809	4.680	0.509			
		Timely syllabus completion	0.732	0.722	0.880	4.670	0.485			
KMO- MSA = 0.857, Total Variance Explained = 64.633%										
Bartlett's Test	Bartlett's Test of Sphericity Chi-Square value of <b>898.981</b> with d. f of <b>45</b> and P- Value of <b>0.000</b>									

# Table 6 DESCRIPTIVE STATISTICS OF TEACHING EFFECTIVENESS TOTAL

Description	Score	Description	Score	
Mean	45.967	Std. Error of Kurtosis	0.394	
Median	46.000	Minimum	36.000	
Mode	50.000	Maximum	50.000	
Std. Deviation	4.102	Q1	43.000	
Skewness	-0.526	Q3	50.000	
Std. Error of Skewness	0.198	Out of maximum score	50.000	
Kurtosis	-1.038			

# Table 7 INFLUENCING VARIABLES SIGNIFICANTLY INFLUENCING THE TOTAL TEACHING EFFECTIVENESS OF AIDEDCOLLEGE TEACHERS

Influencing Variables	Unstandardised	Standardised	Т	Sig
	Coefficients	Coefficients		

	B	Std. Error	Beta				
Constant	35.435	1.975		17.942	0.000		
EMR	1.949	0.398	0.353	4.895	0.000		
Experience – Present position	-0.138	0.038	-0.258	-3.597	0.000		
Educational Qualification	0.767	0.337	0.165	2.280	0.024		
First Generation Learner	1.344	0.599	0.161	2.243	0.026		
$R = 0.513R^2 = 0.263$ Adjusted $R^2 = 0.243$ F value = 12.929 with P value of 0.000							

# Table 8 RESULTS OF DISCRIMINANT ANALYSIS

Discrimina nt	Eigen	Variance	Canonical	Wilks	Chi	df	P value	Influence
Function	value	explained	Correlation	Lambda	Square			
1	0.395	100%	0.532	0.717	47.444	11	0.000	significant

# Table 9STRUCTURE MATRIX OF DISCRIMINANT FACTORS IN DISCRIMINANT FUNCTIONS

Factors	1	Factors	1
ISNMBR	0.786	IMR	0.238
ISMBR	0.749	SR	0.209
PDBR	0.622	PR	0.092
PRMBR	0.573	DTRF	-0.064
EMR	0.443	CLRF	-0.054
PDRF	0.267		

# Table 10CLASSIFICATION RESULTS IN FORMATION OF AIDED COLLEGE TEACHERS

Number	Predicted Group Membership		Total
	1	2	
Aided (UGC Scales)	58	17	75
Aided (Management Staff)	23	52	75
Total	81	69	150

### **#72.3 of original grouped cases are correctly classified.**

	AIDED(UGC Scales)		AIDED(Management Staff)		Wilks' Lambda	F	df1	df2	P-Value	S/NS
Factors	Mean	SD	Mean	SD	1					
ISMBR	4.0112	0.508	3.350	0.861	0.819	32.810	1	148	0.000	S
PRMBR	3.925	0.611	3.320	1.026	0.885	19.228	1	148	0.000	S
PDBR	4.213	0.555	3.604	0.961	0.867	22.621	1	148	0.000	S
ISNMBR	4.193	0.421	3.521	0.871	0.804	36.126	1	148	0.000	S
DTRF	3.896	0.562	3.941	0.564	0.998	0.238	1	148	0.626	NS
PDRF	4.212	0.565	4.020	0.588	0.973	4.160	1	148	0.043	S
CLRF	3.888	0.648	3.931	0.615	0.999	0.171	1	148	0.680	NS
IMR	4.143	0.562	3.950	0.731	0.978	3.298	1	148	0.071	NS
EMR	4.404	0.620	4.006	0.805	0.928	11.491	1	148	0.001	S
PR	3.501	0.683	3.418	0.759	0.997	0.500	1	148	0.481	NS
SR	3.587	0.741	3.373	0.886	0.983	2.558	1	148	0.112	NS

### Table 11 FACTOR WISE TEST OF EQUALITY OF MEAN VALUES

NOTE: S- Significant NS: Not Significant

# Table 12 MEAN, S.D, COMMUNALITIES AND MSA OF MSWA VARIABLES

MSWA VARIABLES	MEAN	S.D	COMMU- NALITIES	MSA
Association objectives and policies	3.640	0.976	0.724	0.896
Association strategies	3.510	0.955	0.822	0.883
Members' Participation in Association	3.630	0.929	0.723	0.902
Effective Leadership	3.470	0.991	0.662	0.944
UGC scales of pay earned	3.640	1.007	0.538	0.924
Rectification of pay anomalies	3.110	0.976	0.642	0.884
M.Phil/Ph.D Incentives	3.270	1.015	0.787	0.862
Career Advancement Promotion	3.190	0.901	0.752	0.884

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Post Superannuation Re-employment	3.250	0.871	0.557	0.930			
Grievance Redressal	3.110	0.860	0.563	0.889			
JAC Role	3.350	0.875	0.670	0.868			
AIFUCTO Role	3.410	0.907	0.653	0.886			
KMO - MSA = 0.894							
Partlett's Test of Schemistry Chi Square Value = 1600 276 at dfc with Duches of 0.000							
Barnett S rest of sphericity Chi Square value – 1009.570 at 1100 with P value of 0.000							

# Table 13 MSWA FACTORS

FACTOR	MSWA VARIABLES	FACTOR	EIGEN	EXPLAINED
		LOADING	VALUE	VARIANCE
	Association strategies	0.869		
	Members' Participation in Association	0.836	_	
Factor 1	Association objectives and policies	0.811	4.064	33.863%
AC	Effective Leadership	0.792		
	AIFUCTO Role	0.618		
	JAC Role	0.601	_	
	M.Phil/Ph.D Incentives	0.876		
Factor 2	Career Advancement Promotion	0.859		
BC	Rectification of pay anomalies	0.772	4.029	33.574%
	Post Superannuation Re-employment	0.658		
	UGC scales of pay earned	0.618	_	
	Grievance Redressal	0.584	-	
TOTAL VAR	67.438%			
# Influence of education and family history of alcoholism on alcohol consumption among male alcoholics

Shivananda N Kalludi\*, Ravindra Maradi\*\*, Vasavi R Gorantla\*\*\*, Murali Dhar\*\*\*\*

\* Department of Physiology, Associate Professor, Akash Institute of Medical Sciences and Research Centre, Bangalore, India.

\* Department of Biochemistry, Associate Professor, American University of Antigua, College of Medicine, Antigua, West Indies.

\*\*\*Department of Anatomy, Assistant Professor, American University of Antigua, College of Medicine, Antigua, West Indies.

\*\*\*\*Department of Population Policies and Programmes, Associate Professor, International Institute for Population Sciences, Mumbai, India.

#### Abstract-INTRODUCTION

Alcohol is the most common chemical substance intentionally used by individuals to alter mood and relieve chronic pain. Early detection of male drinkers with health problems due to alcohol consumption would reduce morbidity of disease. Objectives of the present study are 1) To examine the influence of education on alcohol consumption, 2) To examine the influence of family history of alcoholism on alcohol consumption among male alcoholics.

#### MATERIALS AND METHODS

The subjects were 124 men aged  $\geq$  20years. Face-to-face interviews were used to identify male alcoholics who attended health camp held at Udupi, Karnataka state, India. The Alcohol Use Disorders Identification Test (AUDIT) questionnaire was used as the alcohol-screening instrument.

#### RESULTS

Significant increase (P < 0.001) in subjects with high AUDIT score was observed in group I (illiterates) when compared to group III (graduates). Similarly significant increase (P < 0.001) in subjects with high AUDIT score was observed in group II when compared to group III. No association between family history and alcohol consumption was observed in the three groups.

#### CONCLUSION

Frequency and quantity of alcohol consumption is less in subjects who are educated. Hence education brings awareness about harmful effects of alcohol consumption and therefore forms an important component in health status of male alcoholics.

*Index Terms*- alcohol use disorder, education, family history, alcohol abuse, binge drinking

**INTRODUCTION** Heavy episodic drinking poses a danger of serious health and other consequences for alcohol abusers and for others in the immediate environment [1]. Alcohol use disorders are defined as alcohol abuse or dependence according to psychiatric diagnostic criteria [2]. Problem drinking in people raises mental and physical issues. Alcohol consumption causes gastritis, gastro-esophageal reflux disorder and peptic ulcer. In addition heavy drinking exacerbates diseases of the digestive system such as gastritis, cirrhosis, liver cancer, oral cancer, esophageal cancer and pancreatitis. It also increases the morbidity rates of cardiovascular diseases such as atrial fibrillation, hypertension and stroke. It elevates the morbidity rates of depression, anxiety disorders and suicidal ideation [3,4]. Chronic alcohol abuse is associated with Wernicke-Korsa-koff

syndrome. Study by Go et al., found that men who frequent alcohol venues have high rates of sexually transmitted diseases including HIV infection [5]. Chenitz et al., have reported that the prevalence rate of alcohol abuse will increase in direct proportion to the increase of elders because current middle aged generation is much more accustomed to alcohol consumption [6]. But study by Lamy et al., observed that both older adults and youngsters use alcohol to feel different [7]. Adults want to relax, to feel good, to "break the ice" in increasingly difficult social situations, to forget problems, losses or loneliness and to eradicate or minimize chronic pain [8,9]. The above mentioned studies indicate that individuals irrespective of age consume alcohol to overcome daily stresses and chronic diseases which cause pain. Alcohol consumption is often related to 'celebration', 'high living' and some individuals often boast of their large capacity to drink.

Wechsler et al., found that episodic drinking and frequent binge drinking in younger adults is associated with driving after alcohol consumption, engaging in unplanned, unsafe sexual activity, poor academic performance and damage public property [10]. Another study by Sanjuan et al., observed that younger males were more likely to use alcohol, tobacco and other drug use [11]. The same study observed rate of substance use in younger males is similar to or higher than emergency department patients.

A study at university hospital in the Netherlands found that only 33% of elderly alcohol abuse patients were identified by clinicians [11]. This indicates major percentage of alcohol abuse patients are not discovered by clinicians. The situation observed among elderly patients might exist in younger individuals also. Therefore it is necessary to identify patients with alcoholism in primary care settings so that they can receive guidance and proper treatment [12]. Touvier M et al., have concluded that medical advice for people with personal or family history of alcohol related diseases including cancer should be strengthened [13]. Hence it is important to know the causes for alcohol consumption. Nurturing family values, better socioeconomic status, provision of education and financial support to children by parents may prevent an individual to consume alcohol. Ryou et al., observed that education can enhance the demand for preventive health check-ups and improves communication with health practitioner [14].

Therefore this study was undertaken to find out the influence of education and family history on alcohol consumption among male alcoholics in Udupi district, India.

#### MATERIALS AND METHODS

Male alcoholics (N=124) were recruited during health camps

conducted in Udupi district, Karnataka, South India. Male alcoholics were divided into three groups based on their educational background. Illiterate alcoholics were merged into group I (N=35), alcoholics who had passed 7<sup>th</sup> standard and onwards to completion of II year Pre-University College were merged into group II (N=41). Alcoholics who had obtained their bachelor degree were grouped under group III (N=48). The study was approved by the Institutional Ethics Committee.

The Alcohol Use Disorders Identification Test (AUDIT) questionnaire was used to screen, assess the severity of alcohol consumption and alcohol dependence. Statements present in the questionnaire were explained to participants in their native language.

#### RESULTS

Raw data was entered into Microsoft Excel and are represented as mean and standard deviation. The statistical significance level was calculated by the Mann-Whitney U test using SPSS (Version 16.0).

The mean age  $\pm$  SD of the alcoholics was 34.6  $\pm$  6.9 years. Of the 124 subjects, family history of alcoholism was found in 54 alcoholics and 53 alcoholics had a smoking habit. Thirty two alcoholics were on antidepressants and 24 were on various medications due to chronic illnesses.

In the present study AUDIT questionnaire was used. If an individual obtains a total score of 8 or more indicates hazardous alcohol use and possible alcohol dependence. Similarly, a total score of 9 or more reflects greater severity of alcohol problems.

Out of 35 alcoholics in group I, 30 had an AUDIT score  $\geq$ 15 and 5 alcoholics scored less than 15. In group II (N=41) 31 alcoholics had an AUDIT score  $\geq$  8 and 10 scored  $\leq$  2. In group III (N=48), 42 alcoholics scored <2 and 6 alcoholics had an AUDIT score  $\geq$  8. Highest number of alcoholics with an AUDIT score of  $\geq$  15 were present in group I.

Mann-Whitney U test was performed and significant increase (P < 0.001) in AUDIT scores among alcoholics was observed in group I when compared to group III. To compare AUDIT scores between group II and group III, Mann-Whitney U test was used. We observed a significant difference in AUDIT scores (P < 0.001, Figure 1).

To see the influence of family history of alcoholism on alcohol consumption in all three groups, Chi-square test was performed and no association between family history and alcohol consumption was observed. To identify association between education status and smoking habit of men in all three groups, Chi-square test was used and we found no association.

#### DISCUSSION

Alcohol consumption affects vital organs in the body including central nervous system. Highest number of alcoholics with an AUDIT score of  $\geq 15$  were present in group I, therefore vigorous interventions are necessary for this particular group of alcoholics when compared to other groups.

Screening problem-drinking patients at an earlier stage encourages prevention. Intervention by confrontation is a technique that has been used successfully with younger alcoholdependent patients and may be used with selected elderly patients. In this technique patient's relative or parents gather to convince the alcohol abuser that his or her use of alcohol has been harmful to that individual and relationships in near future. Components of therapy include detoxification, education, group therapy and Alcoholics Anonymous [6]. Berning et al., observed that incorporation of professional health advice increased the probability that alcohol drinkers reduced their alcohol consumption [15].

Ryou et al., have suggested that the AUDIT score is superior to Michigan Alcoholism Screening Test and cut down, annoyed, guilty, eye opener questionnaire [14]. Hence AUDIT score was used as a screening tool in this study.

Results in the present study suggested educated subjects showed (group III) decrease in frequency and quantity of alcohol consumption when compared to group I and group II. Increased number of male alcoholics with an AUDIT score of  $\geq 15$  in group I might be due to unawareness and half-knowledge about complication of alcohol consumption, easy availability of alcohol and lower socioeconomic status.

Significant increase in number of male drinkers with AUDIT  $\geq 8$  in group II when compared to group III is probably due to lower education status which in turn leads to low socioeconomic status. However, results reported by Marmot et al., and Hulshof et al., suggests no relation between low socioeconomic group and excessive drinking among men [16,17]. This is due to cutoff point for heavy alcohol consumption is different for the above mentioned studies, which could have influenced the findings. Van Oers et al., observed that very excessive drinking patterns in men showed significant differences between different educational levels [18]. Similar observations were found in the present study. But Hulshof et al., have observed that lower socioeconomic status is accompanied by a higher prevalence of indicators of an unhealthy life style.

In the present study, there was no association between family history of alcoholism and alcohol consumption, this probably indicates cultural factor has a role. Chitty KM et al., observed alcohol and tobacco consumption are the risk factors for decreased anti-oxidant capacity in bipolar disorder patients [19]. Decreased anti-oxidant results in reduced anterior cingulate cortex-glutathione concentration among bipolar disorder patients. However in the present study none of the individuals were suffering from bipolar disorder.

In conclusion, the present study investigated the influence of education status on alcohol consumption. We observed that education forms an important component in health status of elderly male drinkers. However there was no association between family history of alcoholism and alcohol consumption among male drinkers.

#### CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.



Fig-1: Mean AUDIT scores in three groups. AUDIT scores are represented as mean  $\pm$  standard deviation. \* P < 0.001 compared with group I and # P < 0.001 compared with group II.

Numerical data for figure 1. Mean AUDIT score in group I is  $13.4\pm4.1$ , group II is  $6.6\pm1.8$  and group III is  $2.6\pm1.3$ .



Fig-2: Presence and absence of family history among alcoholics when three groups were merged.

Numerical data for figure 2. Presence of family history of alcoholism in all three groups when merged is 54 and absence of family history of alcoholism in all three groups when merged is 70.

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#### AUTHORS

First Author – Shivananda N Kalludi, MBBS MD, Akash Institute of Medical Sciences and Research Centre, India. E-mail- hellodrshivanand@gmail.com. Second Author – Ravindra Maradi, MBBS MD, College of Medicine, Antigua. E-mail – drravimaradi@rediffmail.com

Third Author – Vasavi R Gorantla, MBBS MD, College of Medicine, Antigua. Fourth Author – Murali Dhar, MSc PhD, International Institute for Population Sciences, India. E-mail – murali\_dhar\_1966@yahoo.com

Correspondence Author – Shivananda N Kalludi,

email- hellodrshivanand@gmail.com.

Address- Associate Professor, Department of Physiology, Akash Institute of Medical Sciences and Research Centre, Devanahalli, Bangalore Rural- 562110, India.

Contact number- 9180-27681555.

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### Effect of Traditional Fire on N-Mineralization in the Oak Forest Stand of Manipur, North East India.

Tongbram Chand Singh<sup>\*</sup>, E.J. Singh<sup>\*\*</sup>

<sup>\*</sup> Department of Botany, Waikhom Mani Girls' College, Thoubal, Manipur <sup>\*\*</sup> Department of Botany (P.G.), D.M. College of Science, Imphal, Manipur.

Abstract- The effect of traditional fire on available soil nitrogen and rate of N-mineralization in the oak forest soil of Lambui hill, Ukhrul district, Manipur, North East India have been studied. The rate of ammonification, nitrification and mineralization varied from 0.08 to 5.99  $\mu$ g g<sup>-1</sup>month<sup>-1</sup>, 0.40 to 2.52 $\mu$ g g<sup>-1</sup>month<sup>-1</sup> and 0.46 to 9.09 $\mu$ g g<sup>-1</sup>month<sup>-1</sup> of soil in the traditional burnt site, 0.31 to  $3.93\mu g g^{-1}$  month<sup>-1</sup>, 0.14 to  $2.52\mu g g^{-1}$  month<sup>-1</sup> and 0.48 to  $5.67\mu g g^{-1}$ month<sup>-1</sup> of soil in the unburnt site and 0.19 to 4.00 $\mu g g^{-1}$ <sup>1</sup>month<sup>-1</sup>, -0.09 to 2.17 $\mu$ g g<sup>-1</sup>month<sup>-1</sup> and 0.33 to 5.61 $\mu$ g g<sup>-1</sup>month<sup>-1</sup> of soil in the control site respectively for different months throughout the year. The rate of ammonification, nitrification and mineralization were found to be higher in the traditional burnt site followed by unburnt and control forest site which may be due to the increase of decomposable organic matter and increase of soil temperature during the operation of traditional fire treatment. Significant positive correlation was observed in ammonification and mineralization rate with soil moisture, soil temperature and organic carbon. The variation on the rate of N mineralization was explain R=0.98,  $R^2$ =0.96, F=96.20 (P<0.05) by the linear regression model of soil temperature.

*Index Terms*- Traditional Fire, oak forest stand, Temperature, Ammonification, N-mineralization

#### I. INTRODUCTION

ineralization of organic soil N is fundamentally linked Which forest productivity, and attention has shifting from static measures of N availability to dynamic measures of N release (Keeney, 1980). Rates of mineralization are influenced by various environmental factors (Morecroft et al., 1992). It often differs with forest type, elevation, and topographic position (Garten and Van Migroet, 1994; Power, 1900). Knowledge of soil N dynamics is critical to understand how forest management practice may affect long-term soil productivity substrate quality, quantity, environmental conditions and soil micro-organisms control soil dynamics (Stanford and Smith, 1972; Goncalves and Carlyle, 1994). Harvesting and site preparation activities may change soil structure, environmental conditions, substrate availability, and ultimately nitrogen dynamics in various forest ecosystems. In Manipur the subtropical and temperate oak forest stands has been fastly replaced by scrub forest due to various pressures such as felling of timber, fuel wood and slash and burning for shifting cultivation. Fire becomes a very important ecological tool why it shaping vegetation structure of these forest ecosystems. Fire can be a great value in the management of

forest ecosystem and uncontrolled condition it can destroy independent of its composition, age, density and diversity (Bessie and Johnson, 1995).

There is a growing need for better understanding the effect of fire on nutrient availability particularly N-biochemical processes in forest soils. The soil nutrient dynamics are highly sensitive to environment change and therefore, can provide important information about early ecosystem response to management activities (Diaz-Rovina et al., 1996; Trasar-Cepeda et al., 1998). The increase in nitrification and mineralization after fire of the various ecosystems of the world has been reported by several workers (Adams and Atwill, 1986; Singh et al., 1991 and Yadava and Devi, 2005). The objective of the present study was to analyze monthly and seasonal variation in the rate of ammonification, nitrification and mineralization and their relationship with different treatment i.e. burnt, unburnt and control sites. We also emphasized to predict the best explanatory variable among the interested covariates by using linear regression analysis in unburnt and burnt sites.

#### II. MATERIALS AND METHODS

The Lambui hills of Ukhrul district Manipur, north east India was the study site which falls at  $25^{0}01$ ' N Latitude and  $94^{0}02$ ' E Longitude at the distance of 65 km from Imphal city at an altitude of 1470 m from mean sea level. It was located at the transition between sub-tropical and temperate region and were dominated by five oak tree species such as *Lithocarpus dealbata*, *Lithocarpus fenestrata*, *Quercus griffithii*, *Quercus serrata* and *Castanopsis tribuloides*. The climate of the area is monsoonic with warm moist summer and cool dry winter. The mean maximum temperature varies from 16.49<sup>o</sup> C (January) to 33.30<sup>o</sup> C (August) and mean minimum temperature from  $3.52^{\circ}$  C (January) to  $20.16^{\circ}$  C (August) with average annual rainfall of 1258.9 mm.

#### III. SOIL ANALYSIS

The soil samples were collected at monthly intervals from the three forest sites for measurement of Inorganic-N, rate of ammonification, nitrification and N-mineralization. The soil organic carbon was also estimated by Warkly-Black Partial oxidation method. The soil temperature was measured by clinical thermometer and soil moisture by the soil moisture meter. The nitrogen mineralization *in situ* was conducted at monthly intervals by using buried bag techniques (Eno, 1960). The soil samples were collected randomly from 0-10cm in the study sites

by using steel cover (6.5 cm diameter). Each soil sample was divided into two parts and the first part of the soil samples were sealed in sterilized polyethylene bags after removing coarse stones, roots and large recognizable organic debris and later on incubated at the same depth. After one month, the buried bags were retrieved and analyzed for final ammonium and nitrate concentration. The second part of the soil sample was brought to the laboratory for the measurement of initial Inorganic-N (NH<sub>3</sub>-N and NO<sub>3</sub>-N). Each sample was sieved (2 mm) to remove stone, coarse, roots and other recognizable plant debris. The initial ammonium and nitrate concentration was determined within 24 hours following standard procedure (Anderson and Ingram, 1993). Soil were extracted for N-analysis by shacking 10g of soil in 50ml of 2M KCl for 30 min and filtered with Whitman 42 filter paper, Buchner funnel and a vacuum manifold. The extracts were analyzed for colorimetric determination of (NH<sub>4</sub>-N and NO<sub>3</sub>-N) in Spectrophotometer. The changes in ammonium and nitrate concentration were obtained by subtracting the initial concentration from the corresponding final concentration and the resultant values are referred to as ammonification and nitrification rates. The net N-mineralization rate was calculated by the changes in extractable ammonium-N and nitrate-N over one month.

#### IV. DATA ANALYSIS

Data were analyzed using split-site experimental design with monthly representing sites. The mean values of monthly, seasonal nitrate, ammonia, Inorganic-N, ammonification, nitrification and N-mineralization in soil depth (0-10cm) were analyzed with ANOVA. The mean values for initial ammonia and nitrate of 0-10cm depth are compared with ANOVA. The correlation analysis of soil moisture, temperature and organic carbon with ammonification, nitrification and N-mineralization were studied for three sites. The complexity of N-mineralization rate in the present study is influenced by different covariates such as soil moisture, temperature, organic carbon, site quality etc. which gives the different nature and dynamics of Nmineralization. A colinearity diagnostic was develop to understand the problem of multicolinearity among the independent variable for a suitable model development. A linear regression model was developed to understand the variability of the rate of N mineralization after examining the scatter plot. The plot was appear to be suitable for regression because the rate of mineralization is increased with the increase of soil temperature. A binary dummy variable (0 and 1) is adopted to quantify the site quality. The statistical treatment of the study is performed through SPSS V.11.

#### V. RESULT AND DISCUSSION

#### Initial NH<sub>3</sub>-N, NO<sub>3</sub>-N and Inorganic-N

The initial concentration of  $NH_3$ -N,  $NO_3$ -N and Inorganic-N in the unburnt, burnt and control site exhibited highest in winter months (January, February) and lowest in (July). Monthly trends was significant (P<0.05) except May (Fig. 1, 2 and 3). Seasonally the higher concentration was observed in winter season followed by summer and rainy season in all the three

study sites (Tab.1). The annual NH<sub>3</sub>-N, NO<sub>3</sub>-N and Inorganic-N were higher in the burnt site than unburnt and control site. The annual NO<sub>3</sub>-N was found higher in the control site and lowest in the unburnt site (Tab. 1). The F-Values (ANOVA) of annual initial NH<sub>3</sub>-N, NO<sub>3</sub>-N and Inorganic-N of three seasons showed significant P<0.001 (unburnt and burnt; burnt and control) and P<0.05 for NO<sub>3</sub>-N, P<0.01 for NH<sub>3</sub>-Nand Inorganic-N (unburnt and control) (Tab. 2).

#### Ammonification

The monthly variation in the rate of ammonification in the unburnt, burnt and control site were found highest in the month of (July) and lowest in winter months (December, January). The rate of ammonification was found high in the rainy season (except control site) followed by summer and winter season in all the sites. The annual rate of ammonification was higher in burnt sites followed by unburnt and control site (Tab. 3). The F-value (ANOVA) of annual ammonification rate showed significant P<0.01 (unburnt and burnt) and P<0.01(control and unburnt) (Tab. 4). Annual ammonification rate of three forest site showed signification correlation with soil moisture r=0.933 (P<0.01), soil temperature r=0.982 (P<0.01), soil organic carbon r=0.916 (P<0.01) (Tab. 5).

#### Nitrification

The rate of nitrification was found highest in rainy months (June, July) and found lowest in winter months (November, December) in all the sites. The monthly trends were found fluctuation (Fig. 5). In all the three study sites the higher rate of nitrification was observed in the rainy season followed by summer and winter season. The annual nitrification rate was higher in the burnt site followed by unburnt and control sites (Tab. 2). The F-value (ANOVA) of annual nitrification rate showed significant P<0.01(control and burnt) (Tab. 4).

#### **N-Mineralization**

The monthly rate of N- mineralization was found fluctuation with lower in (December, January) and higher in (June, July) of unburnt and burnt; (April and May) for control site (Fig. 6). In the unburnt and control sites the highest rate was exhibited in the summer months followed by rainy and winter months. In the burnt site the higher rate of N-mineralization was found in rainy season and lowest in the winter season. Its annual rates were also found maximum in the burnt than followed by unburnt and control sites (Tab. 2). The F-Value (ANOVA) of annual N-mineralization showed significant P<0.01(unburnt and burnt) and P<0.001 (unburnt and control) (Tab. 4). The N-mineralization rate showed significant correlation with soil moisture r=0.951 (P<0.01), soil temperature r=0.980 (P<0.01) and organic carbon r=0.951 (P<0.01) (Table 5).

Linear regression colinearity diagnostics in shows that second dimension i.e. soil temperature have Eigenvalue (0 >0.38) and Condition Index (3.46<15) indicates there is no problem of multicolinearity (Tab.6). The remaining three covariates viz. organic C, moisture and site quality exhibited Condition Index (>30) was excluded with large problem of multicolinearity. The linear regression analysis model explain R=98% (R<sup>2</sup>=0.96) variation in the rate of N-mineralization with F=96.20, (P<0.05). **Mineralization rate = 0.38 x Temp.** ( $^{6}$ C) – 4.19

It is significant at t=9.8 (P< $\overline{0.05}$ ). If the temperature is at 22<sup>0</sup>C the predicted rate of N-mineralization would be 4.19  $\Box$  g g<sup>-1</sup> month<sup>-1</sup>). The P-P plotted residuals of the model follow the 45<sup>0</sup>

line (Fig. 7). The plot indicates that the normality assumption is not violated. The linear regression model analysis for the SE shows lower error (SE = 0.16) (Tab. 7).

The concentration of initial NH<sub>3</sub>-N, NO<sub>3</sub>-N and Inorganic-N was found higher in the winter season followed by the summer season and lower in the rainy season in the unburnt, burnt and control sites. The wide variations in the values of Inorganic-N could be due to variation of mineralization rates, uptake by plants and microbes and losses through soil erosion, leaching, runoff and denitrification. The lower NH<sub>3</sub>-N, NO<sub>3</sub>-N and Inorganic-N in the rainy season may be due to greater demand for these nutrients by plants which grow vigorously during this time. The losses of Inorganic-N through leaching and denitrification during the rainy season can also be another factor. The higher value of Inorganic-N in the winter season may also be associated with the low demand by plants during the dormant period. In the tropical and subtropical forest of north east India also reported similar trend (Maithani et al., 1998; Yadava and Devi, 2005).

The annual Inorganic-N content of control, unburnt and burnt forest sites was significantly higher in burnt sites. This may be due to organic matter input by fire and the lower nitrogen uptake by plants. In all the three study sites the value of NH<sub>3</sub>-N was found to be higher than NO<sub>3</sub>-N, this may be due to the acidic nature of soil. In the acidic nature of soil only a few autotrophic nitrifying microorganisms can grow well in the acidic soil. The rate of nitrification in the oak forest of Missouri Ozarks is regulated indirectly by NH<sub>3</sub>-N, availability (Donalson and Henderson, 1990).

The significant variation in the rate of ammonification, nitrification and N-mineralization were recorded in the three study site. In the three study sites the rate of ammonification, nitrification and N-mineralization were higher in the rainy season, this may be due to higher activities of the soil microorganisms. The activities of microorganisms were enhanced leading to higher decomposition of organic matters with the onset of rains. It was evident by the correlation and covariance analysis which showed significant relation with soil moisture, soil temperature and organic carbon. A similar correlation was also reported in the Western Juniper forest, Boreal Aspen forest (Subarctic Alaska Forest Bates et al., 2002, Carmosini et al., 2003 and Grunzwig et al., 2003). The higher rate of ammonification, nitrification and N-mineralization during the rainy season was reported in the mixed oak forest (Knoeep and Swank, 1998). However, the lower rate of ammonification, nitrification and N-mineralization were found during the winter season in all the three study sites which may be due to the cold and dry period as the soil moisture were very low in this season thereby harming microbial activity. Same trend have been reported by (Gonclaves and Carlyle, 1994; Leiros et al., 1999; Singh et al., 1991; Morecroft et al., 1992; Clein and Schimel, 1995; Maithani et al., 1998). A similar result has also been reported in the subtropical Dipterocarpus Forest of Manipur North East India (Yadava and Devi, 2005).

The annual N-mineralization in all the three sites was significantly higher in the burnt forest site followed by unburnt and control site. The higher rate of N- mineralization in the burnt site may be due to the larger input of decomposable substrate (Singh et al., 1991). Some workers have also reported increase of nitrification and N-mineralization after fire (Knoepp and Swank, 1995; Deluca et al., 2005).

The rate of ammonification, nitrification and Nmineralization in the present oak forest stand may have relationship with decomposition rate. As the decomposition rate can be analyzed by the substrate quality and also prevailing environmental condition like soil moisture, soil temperature, organic carbon etc. In the present study the primary information of substrate quality is not available. However there is significant correlation between ammonification, N-mineralization with soil moisture, soil temperature and organic carbon in both the study sites (Singh et al., 1991; Morecroft et al., 1992; Clein and Schimel, 1995; Maithani et al., 1998; Leiros et al., 1999).

The higher N-mineralization rates in the summer and rainy months when the moisture and temperature were highest in unburnt and burnt site. It is obvious that in the soil with greater N-mineralization potential, may detect seasonal patterns when seasonal appropriate moisture and temperature conditions are exhibited (Zhou et al., 2009). Among the four interested covariates only soil temperature explain the variation in the rate of N-mineralization R=98% ( $R^2$ =0.96) with the observed and model prediction in the present study. The interested covariates viz. soil moisture, organic carbon, site quality does not explain due to high correlation among them. Studies in the temperate regions of the world it is found that the rates are greatest when soil temperature were high, in summer (Virzo De Santo et al., 1982; Nadelhoffer et al., 1989; Son and Lee, 1997; Knoeep and Swank, 1998). The increased of microbial efficiency with the increase of soil temperature from to decompose organic matter  $(15^{\circ}C \text{ to } 25^{\sqcup}C)$  (Steinweg et al., 2008 and Karhu et al., 2010). The lower rate of N-mineralization in winter season may be due to limiting moisture and temperature in the winter. In the tropical forest soils temperature were not limiting whereas soil moisture fluctuations between wet and dry seasons largely regulate Nmineralization rates (Wong and Nortcliff, 1995). The present study site is transition between temperate and the subtropical forest ecosystem therefore, it is true that temperature is one of the best limiting factors to explain the rate of N-mineralization in study sites.

Table 1. Second variation in concentration of	FNIL N NO N and Incorrection N man	$\mathbf{n} \in \mathbf{SE}$ (up $\mathbf{q}^{-1}$ ) in control unburnt and burnt give
Table-1:Seasonal variation in concentration o	I INH 3-IN, INU 3-IN AND INOF game-in mean	<b>II+SE (µ2 2). III CONTROL, UNDURING AND DURING SILE</b>

Season	Control site			Unburnt site			Burnt site	Burnt site		
	NH <sub>3</sub> -N	NO <sub>3</sub> -N	Inorganic N	NH <sub>3</sub> -N	NO <sub>3</sub> -N	Inorganic N	NH <sub>3</sub> -N	NO <sub>3</sub> -N	Inorganic N	
Summer	5.71±0.04	3.60±0.03	9.31±0.07	4.93±0.10	$2.90 \pm 0.05$	7.12±0.15	6.30±0.14	3.52±0.10	9.31±0.25	
Rainy	$2.65 \pm 0.04$	$2.64 \pm 0.04$	6.12±0.06	$2.20\pm0.08$	$1.70\pm0.04$	4.95±0.15	4.77±0.27	3.33±0.18	7.58±0.31	
Winter	9.10±0.03	$7.40 \pm 0.03$	12.16±0.07	$8.42 \pm 0.08$	3.26±0.08	11.68±0.16	$11.80\pm0.30$	$4.60 \pm 0.09$	16.41±0.39	
Annual	$5.82 \pm 0.02$	$4.55 \pm 0.02$	6.89±0.03	$5.18 \pm 0.08$	$2.62 \pm 0.06$	7.92±0.14	7.62±0.24	3.82±0.12	11.10±0.32	

N=3, (µg g<sup>-1</sup>).

#### Table-2: The F- Values (ANOVA) of NH<sub>4</sub>-N, NO<sub>3</sub>-N and Inorganic-N of three seasons.

Compara	NH <sub>4</sub> -N	NH <sub>4</sub> -N			NO <sub>3</sub> -N				Inorganic N	Inorganic N		
-tive sites	Summer	Rainy	Winter	Annual	Summer	Rainy	Winter	Annual	Summer	Rainy	Winter	Annual
Unburnt Burnt	183.21***	258.30***	345.73***	278.50***	101.93**	246.84***	934.84***	251.32***	166.29***	187.62***	377.06***	250.08***
Control Unburnt	85.74**	9.29*	28.52**	37.46**	14.77*	47.71**	3.56	13.33*	51.25**	19.46*	13.15*	25.97**
Control Burnt	329.73***	338.98***	146.87***	260.08***	5.10	338.98***	76.18**	142.96***	169.02***	342.95***	220.57***	65.14***

N= 3, ( $\mu g g^{-1} month^{-1}$ ); '\*'; '\*\*'; F- value with it is significantly different (P<0.05), (P<0.01) and (P<0.001) respectively.

Table-3: Seasonal variations in concentration	n of ammonification, nitrification and	N-mineralization mean+ SE (g g <sup>-1</sup>	<sup>1</sup> month <sup>-</sup>	<sup>1</sup> ). in control, unburnt and burnt site
				),

Season	Control site			Unburnt site			Burnt site		
	Ammonification Nitrification Mineralization		Ammonificati	Nitrification	Mineralizati	Ammonificatio	Nitrification	Mineralization	
				on		on	n		
Summer	3.36±0.01	$1.12\pm0.00$	4.03±0.02	2.35±0.03	$1.19\pm0.20$	4.03±0.02	3.95±0.29	$1.02 \pm 0.08$	4.98±0.37
Rainy	1.90±0.02	$1.49 \pm 0.01$	3.22±0.04	3.24±0.09	$1.66 \pm 0.17$	3.22±0.04	5.50±0.34	$2.14 \pm 0.01$	7.99±0.01
Winter	0.73±0.01	$0.25 \pm 0.02$	$0.84 \pm 0.18$	$0.84 \pm 0.01$	$0.22 \pm 0.00$	$0.84 \pm 0.17$	$0.52 \pm 0.48$	0.31±0.01	0.71±0.59
Annual	$1.02\pm0.01$	$0.95 \pm 0.00$	$2.69 \pm 0.04$	$2.12\pm0.44$	$1.02 \pm 0.12$	$2.70\pm0.04$	3.29±0.41	$1.16\pm0.03$	4.56±0.32

N=3, (µg g<sup>-1</sup> month<sup>-1</sup>).

### Table-4: The F-Values (ANOVA) of Ammonification, Nitrification and N-mineralization of three seasons.

Comparative	Ammonification			Nitrification				N-mineralization				
sites	Summer	Rainy	Winter	Annual	Summer	Rainy	Winter	Annual	Summer	Rainy	Winter	Annual
Unburnt Burnt	93.70**	123.92***	1.28	24.47**	1.66	23.68**	433.20***	3.60	38.47**	415.69***	0.55	36.97**
Control Unburnt	18.84*	5.34	240.10***	30.99**	0.39	3.05	10.99	1.00	24.94**	366.68***	1.66	80.07**

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ISSN 2250-3153												
Control Burnt	24.66**	7.66*	0.62**	0.82	3.58	135.12***	249.64***	873.61***	0.09	1903.37***	0.40	17.01
		haha (ahahaha T			1 11 00		0.01) 1.00	0.001				

N=3, (µg g<sup>-1</sup> month<sup>-1</sup>); '\*'; '\*\*'; F-value with it is significantly different (P<0.005), (P<0.01) and (P<0.001) respectively.

	AA	AN	AM	ASN	AST	AOC
Annual Ammonification	1					
Annual Nitrification	.673	1				
Annual Mineralization	.986**	.777	1			
Annual Soil Moisture	.933**	.671	.951**	1		
Annual Soil Temperature	.982**	.662	.980**	.980**	1	
Annual Soil Organic	.916*	.740	.951**	.989**	.965**	1
Carbon						

 Table 5: Pearson's correlation analysis between ammonification, nitrification, mineralization, soil moisture, soil temperature and soil organic carbon in the three study sites.

'\*'; '\*\*' Correlation is significant at the 0.05, 0.01 level (2-tailed); N= 6.

Table 6: Colinearity diagnostics for the four interested covariates in a five dimensional model study.

Model	Dimension	Eigen value	Condition Index
1	1	4.615	1.000
	2	.385	3.464
	3	2.863E-04	126.955
	4	1.087E-04	206.056
	5	2.825E-06	1278.137

a. Dependent Variable: Annual Mineralization

Table 7: A linear regression model to the prediction of rate of N mineralization by using soil temperature.

Dependent variable	Independent variable
Annual N mineralization	Annual mean Temperature ( <sup>0</sup> C)
	R=0.98
	$R^2 = 0.96$
	Std. Error=0.16
	Regression row=Sum Sq. 2.341, df 1, Mean Sq. 2.34
	Residual row= Sum Sq. 0.09, df 4, Mean Sq. 0.24
	F=96.20*.
	Constant coefficient= - 4.19
	Temperature coefficient=0.381
	t=9.8*

\* Significant level at P<0.05



Figure 1: Monthly trends of initial concentration of  $NH_3$ -N ( $\Box g g^{-1}$ ) in the burnt, unburnt and control forest sites.



Figure 2: Monthly trends of the initial concentration of NO<sub>3</sub>-N ( $\mu$ g g<sup>-1</sup>) in the control, unburnt and burn forest sites.



Figure 3: Monthly trends of inorganic-N concentration  $\mu g g^{-1}$ ) in the unburnt, burnt and control forest sites throughout the year.



Figure 4: Monthly rate of ammonification  $\Box \Box \Box g g^{-1}$  month<sup>-1</sup>) in the unburnt, burnt and control forest sites throughout the year.



Figure 5: Monthly rate of nitrification  $\Box \Box \Box \Box g g^{-1}$  month<sup>-1</sup>) in the three oak forests sites throughout the year.



Figure 6: Monthly rate of N-mineralization  $\mu g g^{-1}$  month<sup>-1</sup>) in the three oak forest sites throughout the year.



### Figure 7: Relationship between N-mineralization rates predicted from field soil temperature data and in situ N-mineralization measurements (0-10 cm).

#### I. CONCLUSION

It is confirmed that climate changes had significant effect on the rate of N-mineralization in the subtropical temperate oak forest of Manipur. From the comparative study of the three sites, it is obvious burnt site have more N dynamics than unburnt and control site. A slit increase of soil temperature in the burnt site by the traditional fire treatment took major critical role on the rate of N-mineralization. Among the interested covariates, soil temperature of unburnt and burnt site can also predict the rate of N-mineralization. The realization of the ecological limiting factor could lead to the better management concept.

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#### AUTHORS

First Author – Tongbram Chand Singh, M.Sc. Ph,D. Waikhom Mani Girls' College, Thoubal and email address:chandtongbram@yahoo.com Second Author – Elangbam Jadu Singh, M.Sc.Ph.D., D.M. College of Science and email address:jaduelangbam\_@yahoo.co.in

**Correspondence Author** – Tongbram Chand Singh, M.Sc. Ph,D. Waikhom Mani Girls' College, Thoubal and email address:chandtongbram@yahoo.com . contact no. 08729812958

# Direct and Indirect Effects of Product Innovation and Product Quality on Brand Image: Empirical Evidence from Automotive Industry

#### Jalal Hanaysha, Haim Hilman, Noor Hasmini Abdul-Ghani

School of Business Management, Universiti Utara Malaysia, Malaysia

Abstract- This study examines the effect of product innovation and product quality on brand image with brand trust as mediator. Past studies paid less attention to empirically determine the relationship between the said variables on brand image and using brand trust as mediator between such independent and dependent variables. Therefore, this study aims to fill up this gap and contribute to the body of knowledge by examining the relationship between them. Data is collected using questionnaire from 287 passenger car users at shopping malls in Northern region of Malaysia. Specifically, systematic sampling procedure was followed during data collection. The data is analyzed using structural equation modeling (AMOS). The findings indicate that product innovation and product quality have significant relationship with brand image. The findings also reveal that product innovation and product quality have significant relationship with brand trust. Additionally, brand trust mediates the relationships between product innovation and brand image. It is also found that brand trust mediates the relationship between product quality and brand image. Based on these findings, several conclusions were made with some recommendations for future researches to strengthen our understandings toward the process of developing brand image.

*Index Terms*- Brand image, brand trust, product innovation, product quality.

#### I. INTRODUCTION

Due to the high competition in business markets, it has become very important for organizations to focus on branding mechanisms of their products. Particularly, building brand equity is regarded as the key determinant of the strength of a brand and its surveillance is considered to be the primary step in successful brand management (Aaker, 1991). Brand image is one of the key assets of brand equity which forms the overall evaluation of customers toward a brand (Keller, 1993). No doubt, building favourable brand image is one of the main objectives for several organizations. This is because organizations with favourable brand image can obtain higher market share, charge premium price, and further increase their profit margins. In business scenario, brand image forms the basis for making better strategic marketing decisions about targeting certain market segments and product positioning (Lee, James, and Kim, 2014).

Based on the review of past literature, it shows that several factors contribute to the development of brand image. However, this study focuses on product innovation, product quality, and brand trust as key determinants of brand image. This is because empirical research on the relationship between the said variables is limited. Moreover, it is rare to find a study that came across examining the relationship between product innovation and product quality on brand image with brand trust as a mediator between them in one research framework. Therefore, this study aims to fill up this research gap and provides an empirical evidence on the effect of product innovation and product quality on brand image. It also aims to test the relationship between product innovation and product quality with brand trust, because previous studies have somewhat ignored the relationship between them. Based on the above statement, this research gathers significance because of the unprecedented combination of the variables opted in this empirical research.

In order to accomplish the objectives of this study, the automotive industry in Malaysia is selected. This is because the industry contributes significantly to the economy of the country. As for Malaysia's strategic plans for the next years, this industry is expected to contribute to higher percentage of GDP and create greater demand for new vehicles (Ahmad, 2014; Malaysian Automotive Association [MAA], 2014). The government of Malaysia is also working hard to create positive brand image of local industries in international markets, besides making the country as base for global automotive manufacturing. Therefore, this research is designed to help this industry to achieve its targets through its findings and recommendations. The preceding section reviews the literature on the variables selected in this study and explain how they relate with each other.

#### II. LITERATURE REVIEW

#### **Brand Image**

Brand image is one of the key elements of brand equity which forms the basis of brand success (Keller, 1993). It refers to the set of associations related to a brand developed in customer's mind. A relative advantage of brand image is represented in the entrance barrier to any market, as customers mainly prefer brands with a strong image during their purchasing decisions (Nikhashemi, Paim, Sidin, and Osman, 2013). Keller (2001) conceptualized brand image in terms of brand associations, brand performance, brand imagery, consumer judgments, and consumer feelings shaped in the minds of customers. On the other hand, Aaker (1991, 1996) thought about brand image as unique set of associations that brand strategist aspires to build or sustain. Ross, James, and Vargas (2006) further described brand image as the thoughts that come to consumers' minds immediately when a brand is mentioned.

According to Saydan (2013), brand image is essential for marketing experts and customers. Particularly, he indicated that marketing experts use brand image in differentiating, positioning, and extending the brand, besides establishing favourable attitudes and feelings towards the brand and providing the benefits of purchasing and selecting that brand. Practically, consumers utilize brand image to process, organize, and recall the data in their memories about it to form purchasing decision (Aaker, 1991). Therefore, in order to clearly convey the company's goal and to position its brand, proper brand images are essential (Lee et al., 2014). Moreover, the creation of well-defined and welladdressed brand image will as a result empower practitioners to improve brand equity, which is the ultimate goal of any organization.

Therefore, creating a positive brand image is considered as the initial and most essential step in positioning a brand in the targeted marketplace (Andrews and Kim, 2007; Park, Jaworski, and MacInnis, 1986). Evidently, brand image is a significant concept that should not be overlooked by organizations at any phase of the brand's life cycle. Roth (1995) indicated that a brand image strategy must be designed to correctly position a product for the targeted market segment. This is because a positive brand image provides several benefits such as higher revenues and improved customer loyalty. In addition, a positive brand image can enhance marketing communication effectiveness (Keller, 1993). Andrews and Kim (2007) indicated that it is important to establish a positive brand image at earlier stages in order facilitate handling future problems and issues that may happen without significantly hindering organization's overall growth.

#### **Product Innovation**

Product innovation is one of the key factors in the success of several brands. It was described by Vazquez-Brust and Sarkis (2012) as new product design launched by a brand for profitable purposes that aim to promote the quality and features of products which basically stem from the creative designs during production process. Product innovation covers several aspects such as new product development, improvement in design of established products, or utilization of new resources or components in the creation of established products (Policy Studies Institute [PSI], 2010). In general, product innovation comes from a brand's ability to bring something new to the marketplace which enhances the degree and quality of products.

For several organizations, successful product innovation is an engine of growth (Pauwels, Silva-Risso, Srinivasan, and Hanssens, 2004). This is because products with unique and differentiated features provide additional value to customers, and thus, influence their purchasing decision. In large organizations which successfully managed to build trustworthy brand names worldwide, innovation is becoming their common practice to create positive perception among customers. One of the possible means to ensure innovations comes from a firm's ability to come up with quality products and attractive product designs such as the case of automotives. Moreover, product innovation occurs when a firm creates something unique that makes competitors hard to copy or imitate such as technological features attached with a product to enhance its value. Product development and innovation are essential to firm's success (Yalcinkaya, Calantone, and Griffith, 2007). especially in high-tech industries (Kim, and Huarng, 2011; Madhok, and Osegowitsch, 2000). Product development and innovation allows companies to gain competitive advantage, attract new customers, retain existing customers, and strengthen the relationships with their distribution channels (Keller, 2003). Besides, Pauwels et al., (2004) found out that innovation through new product introductions enhancees long-term financial performance and brand value. Deloitte (2006) demonstrated that the long-term success of global brands in emerging markets depends on innovative product offerings. He concluded that to be successful in international markets, firms need to completely improve their products to fulfill the expectations of customers and meet market conditions.

According to Andrews and Kim (2007), a brand can influence customer's purchasing decision through introducing new innovative products with unique features in comparison with other brands. They demonstrated that innovations such as the introduction of new features and enhancements are some of the most common methods for differentiating products and protecting brand image. Undoubtedly, innovation can improve the quality of products, enhance brand image, reinforce customer loyalty, and attract possible customers (Ottenbacher, and Gnoth, 2005). Moreover, certain scholars believe that product innovation represents a key consideration factor in affecting consumers when making a purchase (Boyd, and Charlotte, 1999; Shiau, 2014).

As for the relationship between product innovation and brand image, Tidd et al. (1997) believed that innovation and brand image are related terms used by organizations in their pursuit of survival and growth, which permit them to create new values for their assets. Moreover, Shiau (2014) Indicated that product innovation had significant positive impact on brand image. He further added that good product innovation allows customers to perceive the superiority of product functions, which in turn enables them to develop a sense of satisfaction. The company on the other hand will have a sound brand image in the heart of its customers. Simialrly, Dimyati (2011) found out that product innovation has significant relationship with brand trust. Based on the above discussion, the following hypotheses are presented:

H1: Product innovation has significant relationship with brand image.

H2: Product innovation has significant relationship with brand trust.

#### **Product Quality**

Product quality is an important positioning factor where customers' intentions to purchase and repurchase a product reflect the quality level of the performance of that product. Danaee and Andalib (2013) defined product quality as consumer's evaluation toward the overall value of a product according to the desired objectives. Similarly, Keller (2003) referred product quality to the customer's perception of the overall quality or advantage of a certain product in comparison with other products from same category under different brands. Product quality was described in past literature as the customer's evaluation the product's reliability, functionality, and customization (Walter, Muller, Helfert, and Ritter, 2003). Product quality includes the attributes and features of a product that bears on its ability to satisfy and meet customers' expectations (Yee, and Sidek, 2008).

Aaker (1991) argued that perceived quality can show the salient differentiation of a product and becomes a selective brand in consumers' mind. A brand's perceived product quality results from the overall evaluation made by consumers' about aspects and elements relevant to the quality of its products [2001]. According to Nikhashemi, Paim, Sidin, and Osman (2013), the key elements which cover product quality include: performance, features, conformance, reliability, durability, and serviceability. Product quality directly affects purchasing decisions, especially when a customer is provoked or capacitated to generate a detailed evaluation of the purchase. Another relative advantage of product quality is the possibility to maintain a premium price, increase brand's profitability and equity (Aaker, 1998).

Existing literature shows that perceived product quality of a brand is related positively to the extent to which the brand is distributed through stores with a good image (Yoo, Donthu, and Lee, 2000). Besides, Walter el al. (2000) demonstrated that the most effective way for a brand to develop trust among its customer is to provide them with positive experiences through the elements of honesty, benevolence, and competence. Particularly, if customers have already experienced that a brand is providing them with high quality products, they will be willing to trust that brand (Ganesan, 1994, Walter et al, 2003). Based on the discussion made above, the following hypothesis is presented:

H3: Product quality has significant relationship with brand image.

H4: Product quality has significant relationship with brand trust.

#### **Brand Trust**

Brand trust is one of the key concepts in brand relationship quality and it has received significant attention in past literature. It was defined by Chauduri and Holbrook (2001, p.82) as "The willingness of the average consumer to rely on the ability of the brand to perform its function Stated." Morgan and Hunt (1994) declared that trust is a key variable in developing an enduring desire to keep a a long term brand relationship e.g. this relationship might be developed due to the trusting relationship that the customer has about that brand. Certain scholars (Shariff, Setyawati, and Kristina, 2012; Sheth, and Parvatiyar, 1995)suggested that brand trust is based on the idea of a customer's brand relationship which is seen as an alternate for human contact between brands and their customers. They added that in current business scenario, trust becomes the most critical factor in the relationship between a brand and its customers. This is because trust requires long-term process for forming the relationship between both parties (Pavlou, 2003).

Brand trust arises from customer experience with regard to different behavioural elements such as confidence, honesty and reliability (Morgan, and Hunt, 1994). Similarly, Doney and Cannon (1997) argued that trust consists of two aspects: perceived credibility and benevolence. Particularly, consumers' belief in the reliability and honesty of a brand increase their trust, and these beliefs may arise from familiarity with or understanding of the brand according to previous experiences i.e., the relationship with the brand (Bianchi, Drennan, and Proud, 2012). Specifically, trust reduces the uncertainty in an environment in which consumers feel especially vulnerable, because they know they can rely on the trusted brand (Gefen, Karahanna, and Straub, 2003).

Brand trust acts as an important mediating factor between customer behavior before and after purchasing a product (Liu, Guo, and Lee, 2011). It can lead to long-term loyalty and strengthens the relationship between a brand and its customers (Singh, and Sirdeshmukh, 2000). Particularly, when a customer trusts an brand, he or she has the confidence in its product quality. In the commitment-trust theory, Morgan and Hunt (1994) indicated that relationship quality concepts such as trust and commitment mediate the relationship between variable. They further recommended to examine their mediating effect in future studies. However, in this research we are interested in the direct effects of trust, as components of relationship quality on brand image besides its mediating effect on the relationship between product innovation and product quality on brand image. Therefore, the following hypotheses are presented:

H5: Brand trust has significant relationship with brand image.

H6: Brand trust mediates the relationship between product innovation and brand image.

H7: Brand trust mediates the relationship between product quality and brand image.

#### III. METHODOLOGY

This research follows quantitative approach whereby the data is collected through self-administered questionnaire from respondents. Specifically, the population of this study is comprised of passenger car users in Northern region of Malaysia. According to the official department of road and transport in Malaysia, the total number of passenger cars on road in Northern Malaysia as for the year of 2014 exceeds one million. Therefore, based on the suggestions of Krejcei and Morgan table (1976) for sample size determination, a sample of 384 is best suited for this number of population. Thus, 384 questionnaires were distributed personally to passenger car users at several shopping malls in Northern Malaysia. This study employs systematic sampling technique while collecting the data, whereby every 10th leaving customer is approached at the entrance to participate in filling the questionnaire.

There are four constructs in this study; brand image, product innovation, product quality, and brand trust. The measurement items of the constructs are adapted from previous studies. Particularly, the dependent variable which is brand image is measured using five items adapted from Nigam and Kaushik (2011) to fit the context of this study. As for product innovation, the measurement scale including seven items is adapted from Stock (2011). The items were reported at an acceptable reliability with Cronbach's alpha of more than 0.7. Similarly, product quality is measured using 5 items adapted from Kennedy, Ferrellb, and LeClair (2001). Finally, brand trust is measured using five items adapted from Mohammad (2012) with some modification to fit the context of this study. The items were validated in past studied and had acceptable value of Cronbach's alpha. All items are measured on seven-point Likert scale ranging from 1= strongly agree to 7= strongly disagree. This scale has been accepted in past studies to be highly valid in measuring variables [Henard and Dacin, 2010; Ok, Choi, and Hyun, 2011; Zehir, Sahin, Kitapçi, and Özsahin, 2011).

The collected data is analyzed on structural equation modeling using AMOS 18. At first, the reliability of constructs is calculated using Cronbach's alpha. Besides, the measurement model was drawn to run confirmatory factor analysis (CFA) and calculate the factor loadings of items. Validity tests were further generated through discriminant validity and convergent validity. Then structural model based on the final results of CFA was drawn in order to test the hypothesized relationships between constructs. Based on the regression table, the hypothesis results were obtained.

#### IV. ANALYSIS OF RESULTS

Out of 384 questionnaires distributed, only 287 were returned back representing 72.6% of the response rate. The demographic profile indicated that out of 287, 136 (47.4%) were male and 151 (52.6%) were female. With regard to age, 12% of the respondents were less than 25 years old, while the majority representing 48.8% were between 25 and 35 years. Those whose age between 35 and 45 accounted for 16% of total response, where 22.6 belong to the age category of 45 years and above. Most of the respondents (75.3%) are Muslims; while 14.6% are Buddhists, 4.5% Hindu, 4.9% Christians, and 0.7% belong to other religions. On the education level, 43.2% obtain high school certificate, 21.6% have diploma, 25.4% have bachelor degree, 8% have postgraduate degree, and 1.7% have other certificate.

Additionally, the reliability is conducted to determine the internal consistency among constructs. The results indicated that the Cronbach's alpha of constructs exceeded the cut off value of 0.70 as recommended by Hair et al. (2010). Particularly, the Cronbach's alpha of brand image is equal to 0.842, whereas product innovation and product quality had a Cronbach's alpha of 0.905 and 0.926, respectively. Likewise, the Cronbach's alpha of brand trust is equal 0.920 which is acceptable. To support the reliability result for constructs, composite reliability was used and it shows that all constructs have exceeded the recommended cut-off value of 0.70. Therefore, it can be concluded that reliability of constructs is achieved.

The measurement model exhibited a reasonable fit through several goodness-of-fit indices whereby Chi-square ( $\chi^{2}$ ) is significant at 303.585. Other fit indices were also used to ensure goodness-of-fit for the model (df = 113, GFI = 0.885, AGFI = 0.845, CFI = 0.941, TLI = 0.929, and RMSEA = 0.077). However, in order to check the convergent validity, factor loadings and average variance extracted (AVE) among the items of all construct were calculated. The results revealed that the factor loadings range between 0.67 and 0.95, which provides an evidence of construct and convergent validity. Similarly, AVE has acceptable values of more than 0.50 and this indicates that discriminant validity is also supported. The results also showed that the average variance extracted for each construct is higher than the squared correlations of the other constructs in the model. The structural model and research hypotheses were evaluated after validating the measurement model. The structural model exhibited a good fit for the data whereby the chi-square ( $\gamma 2$ ) is significant at 196.059. Other fit indices were also used to support the chi-square (df = 164, GFI = 0.919, AGFI = 0.884, CFI = 0.960, TLI = 0.951, and RMSEA = 0.068). Based on the regression results of structural model, the hypotheses were tested. The results indicated that product innovation has significant relationship with brand image ( $\beta$ = 0.258, CR= 2.872, p= <0.05), thus H1 is supported. The relationship between product innovation and brand trust is also significant ( $\beta$ = 0.189, CR= 2.454, p= <0.05), thus H2 is also supported. Furthermore, the results indicated that product quality has significant relationship with brand image ( $\beta$ = 0.291, CR= 2.991, p= <0.05), therefore, H3 is also accepted. Likewise, the relationship between product quality and brand trust is significant ( $\beta$ = 0.646, CR= 9.447, p= <0.05), which means that H4 is supported.

Besides, brand trust has significant relationship with brand image ( $\beta$ = 0.268, CR= 3.253, p= <0.05), thus, H5 is confirmed. Meanwhile, product innovation and product quality explained 56% of total variance in brand trust. Besides, product innovation, product quality, and brand trust explained 32% of overall variance in brand image.

In order to test the mediation effect of brand trust between the independent variables and the dependent variable, Bootstrapping procedure was followed by testing the indirect effect according to the recommendations of Preacher and Hayes (2008). Bootstrapping is a powerful statistical method for testing indirect effects and computes better accuracy for confidence intervals (CI) of indirect effects in comparison with other statistical methods, such as the causal steps strategy (Baron, and Kenny, 1986) and Sobel test. In this study, both direct and indirect estimates of the generated model were calculated to test the mediating effect of brand trust between product innovation and product quality with brand image (Preacher and Hayes, 2008) with 1000 bootstrap samples. As presented in Table 1, bias-corrected confidence intervals were reported at the level of 95%.

The procedure for testing mediation as presented in Table 1 showed the significant direct effect of product innovation on brand image (0.007, 95% CI) and a significant indirect effect (0.022), Hence, the partial mediation is confirmed. Similarly, the results presented in the below table showed the insignificant direct effect of product quality on brand image (0.394, 95% CI) and a significant indirect effect (0.002), Therefore, full mediation was confirmed. This means that brand trust mediates the relationship between the independent variables; product innovation and product quality and the dependent variable; brand image, therefore, H6 and H7 are supported.

	Bootst	rapping					
	Estimate	Std. Error	Lower Bound	Upper Bound	Two- Tale sig	Direct Effect	Indirect Effect
Product innovation	0.191	0.026	0.008	0.113	0.020	0.007	0.022
Product quality	0.048	0.081	0.061	0.369	0.002	0.394	0.002

Table 1: Indirect effects of product innovation and product quality on brand image

#### V. DISCUSSION AND CONCLUSION

This study examined the effect of product innovation and product quality on brand image in addition to testing the mediating effect of brand trust between them. The results indicated that product innovation has significant relationship with brand image. This result was support by certain previous studies (Nemati, 2009; Shiau, 2014) which reported a significant relationship between product innovation and brand image. This means that product innovation plays an important role in enabling firms to develop strong brand image. Moreover, this study provides an evidence of the significant relationship between product innovation and brand trust. The result was supported by Dimyati (2011) who demonstrated that innovation creates a sense of trust among customers toward the manufacturing brand in delivering its products and services as expected. Thus, organizations cannot overlook the important role of product innovation in strengthening their brands.

In this research, significant relationship between product quality and brand image in automotive industry is also supported. This result is in line with some previous studies (Serrao, and Botelho, 2008; Tan, Liew, William, Michelle, and Tan, 2012). which reported a significant relationship between product quality and brand image. For example, Toyota is an automotive brand which successfully managed to create positive brand image among customers worldwide through high quality productions. Kaplan (2009) emphasized the significance of innovation in building strong brands and on the judgment of an innovative brand. This implies that in the automotive industry, there is a close relationship between product quality and brand image. Besides, this study found out that product quality has significant positive relationship with brand trust. This result was confirmed by certain scholars (Hameed, 2013; Jakpar, Na, Johari, and Myint, 2012) indicating that a brand which introduces high product quality would as a result gain higher levels of trust from customers in comparison with that of lower quality.

This study provides further evidence of the significant relationship between brand trust and brand image. This means that a brand which is perceived to be trustworthy in delivering what is promised to its customer would as a result lead to favourable brand image. The results of this study also contribute to the body of knowledge by providing an empirical evidence the mediating effect of brand trust between product innovation and brand image. Brand trust in this study also mediates the relationship between product quality and brand image. Based on these findings, it shows that brand trust plays a key mediating role between variables and it has significant effect on enhancing overall brand image.

This study has some limitations which would indeed open opportunities for future research. For example, this study has focused only on one product category which automotives, therefore, future studies can test the variables in different industry contexts. Moreover, this study focused only on car users in Northern region of Malaysia, thus, future research can look into the possibility of conducting similar work in other regions with larger sample size. Besides, this study is cross-sectional in nature, longitudinal data may yield different result. As for this study, quantitative research was employed to generate the findings, therefore, future research can utilize qualitative methodologies to gain better insights on the factors that matter to brand image. Finally, future studies can examine the effect of other factors such as after sale service and marketing communication on brand image.

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#### **Appendix: Measurement Scale of Constructs**

#### **Brand Image**

- 1. This car brand has created a distinct image in my mind.
- 2. This car brand has given me whatever it promised to me.
- 3. This car brand provided me a better life style.
- 4. This car brand I'm using is associated with the manufacturer's image.
- 5. The staff of this car brand is able to build strong brand relationship with me.

#### **Brand Trust**

- 1. The car brand I'm using is trustworthy.
- 2. The car I'm using is reliable.
- 3. The car I'm using is being delivered on time.
- 4. The car I'm using is safe.
- 5. The car I'm using is beyond my expectations.

#### **Product Innovation**

- 1. This car brand is highly innovative compared to other car brands in the market.
- 2. This car brand is frequently updated with new models.
- 3. This car brand provides new alternatives for the customers.
- 4. This car brand is frequently supplemented with new features and specifications for the customers.
- 5. This car brand differs from competing models in the market.
- 6. This car brand frequently comprises new features which are meaningful to the customers.
- 7. This car is considered to be innovative in terms of product design.

#### **Product Quality**

- 1. The workmanship of the car brand appears to be of quality.
- 2. This car has good quality.
- 3. This car is functionable.
- 4. This car is dependable.
- 5. This car is durable.

#### AUTHORS

First Author- Jalal Hanaysha, Universiti Utara Malaysia, College of Business, E-mail: jalal.hanayshi@yahoo.com Second Author- Haim Hilman, Universiti Utara Malaysia, College of Business, E-mail: hilman@uum.edu.my Third Author- Noor Hasmini Abdul-Ghani, Universiti Utara Malaysia, College of Business, E-mail: hasmini@uum.edu.my

**Corresponding Author-** Jalal Hanaysha, Universiti Utara Malaysia, College of Business, E-mail: jalal.hanayshi@yahoo.com

## **Does the Innate Culture make all Failures to Entrepreneurs? An Existing Context Specific Problem**

Dissanayake D.M.N.S.W<sup>1</sup>, Semasinghe D.M.<sup>2</sup>

\* Lecturer (Probationary), Department of Commerce and Financial Management, Faculty of Commerce and Management Studies, University of Kelaniya, Sri Lanka

\*\* Senior Lecturer, Department of Commerce and Financial Management, Faculty of Commerce and Management Studies, University of Kelaniya, Sri Lanka

Abstract- Complementing Ireland et al., (2003) inference of 'regardless of the size of the entrepreneurial venture, strategic entrepreneurial aspects (advantage seeking and opportunity seeking behaviors) are important', we set out to assess whether less entrepreneurial behavior in Sri Lanka has an impact from the innate culture? This working study interviewed 127 entrepreneurs in two districts in Sri Lanka and Geert Hofstede's six dimensional cultures were assessed. We came to know that selected entrepreneurs of two districts hold the characteristics of being collective, high power distant, feminine, low uncertainty avoidance, long term oriented and Indulgent. We concluded that, innate culture hinders entrepreneurship in relation to power distance. Though a large number of entrepreneurial ventures started as solo entrepreneurial ventures in Sri Lanka, the distance of power between the owner and the subordinates may act as a restraining factor in the process of expansion. We generalized our findings and different implications were made and finally some research directions were proposed. Importantly, we propose that, despite the relationship of cultural inheritance and entrepreneurship, strategic entrepreneurial aspects are of paramount importance to secure entrepreneurship in a country. Simply put, it provides a clear basis for sustainable entrepreneurship and it clearly differentiates a mere business venture.

*Index Terms*- Entrepreneurship, Geert Hofstede, National Culture, Sri Lanka.

#### I. INTRODUCTION

It is not irrational to state that we act based on what we believe. Our behaviors, thinking patterns, decisions we take, all are determined by 'something'. Academically stated, despite the various explanations on the societal factors, a large number of literature posit the fact that cultural attributes of a nation are one of the primary determinants of a nation's economic level and entrepreneurial development (House et al., 2004). However, this entrepreneurial development is acquired in different ways. Despite the various scholarly inquiries, entrepreneurial development can be organic or inorganic. Regardless of the modes of entrepreneurial developments, there are restraining forces and driving forces in stimulating entrepreneurship in a country. Once Shane and Venkataraman (2000) defined opportunity recognition as the heart of entrepreneurship. Furthermore, they stated '[e]ntrepreneurship as the scholarly examination of how, by whom, and with what effects opportunities to create future goods and services are discovered, evaluated, and exploited' (p.218). Provided this definition, we are keen to mention that, the people's willingness to take an initiative and seek new entrepreneurial opportunities, is at least or partially depends and is implicitly influenced by innate cultural heritages. Thus there is a prerequisite to address this phenomenon in detail provided House et al., inferences cited above. Given the hidden impact of culture on entrepreneurial behaviors this paper seeks to make a small contribution towards a context specific problem of why entrepreneurial ventures fail in Sri Lanka? And does culture act as the underlying reason for failures?

The remainder of this paper is structured as follows. Since this paper targets the context of Sri Lanka, the second section observes entrepreneurship in Sri Lanka. Blending the literature of sustainable entrepreneurship, the paper proceeds in an exploratory angle to answer the question of whether sustainable entrepreneurial aspects are being practiced in Sri Lanka or not? Provided that, targeting on the core of the discussion of this paper, the section three proceeds to write about relevant literature of National Culture. Finally, in particular, Greet Hofstede's cultural dimensions were evaluated and generalizations are put forth in relation to entrepreneurship in Sri Lanka despite the large number of triggers of entrepreneurship.

#### II. ENTREPRENEURSHIP IN SRI LANKA

If someone asks, 'is entrepreneurship exists in Sri Lanka' based on Shane and Venkataraman's definition, the clear answer is, yes but very less in number. The reason behind this is that, Sri Lankan entrepreneurs are not necessarily motivated to seek opportunities. In Sri Lankan context a mere Small and Medium Size Enterprise (SME) is equalized to an entrepreneurial venture. We agree to the fact that SME can hold entrepreneurial characteristics, but the absence of entrepreneurial opportunities clearly differentiates a mere SME. We introduced the model of levels of opportunity recognition (see; Dissanayake and Semasinghe, 2014) highlighting the fact that there are two levels of opportunity recognition that exist; high level and low level opportunity recognitions. Furthermore, we highlighted that, high level opportunity recognition corresponds to high level of sustainability and vice versa. In the surface level, in a context like Sri Lanka, high level of opportunity seeking behaviors are seldom and low level of opportunities recognition exist. This scenario posits to equate entrepreneurial ventures to SMEs in Sri Lanka. And also, this leads to high rates of venture formations

and high rates of venture failures despite the other factors of venture failure. However, without assessing it empirically, while observing the environment of Sri Lanka, we mention that, the majority of Sri Lankan business owners do not seek entrepreneurial opportunities, and thus they are illiterate in that angle.

In fact, Sri Lanka's SME sector makes up a large part of the country, accounting for 80 percent of the overall business sector. SMEs have proliferated to each sector of Sri Lankan economy. In fact, approximately 20 percent of the industrial activities are contributed by agricultural related business. Furthermore, service SMEs contribute more than 90 percent in business establishments. It is considered that SMEs are the major source of employment generation. It is the generally accepted fact that, around 30 percent of the total employment in Sri Lanka is being contributed by the SME sector. Our recent studies in relation to Sri Lankan entrepreneurs depicted the facts that there is a gender bias in SME ownership. The majority of SME owners are women. Furthermore, our descriptive analysis showed that their financial literacy is significantly low. We believe that, this observation is one of the causes of venture failures. Similarly, Drexler et al., (2014) asserted that micro-entrepreneurs generally lack financial knowledge.

Given facts in relation to the surface level of entrepreneurship in Sri Lanka, this section proceeds to establish what sustainable entrepreneurship requires. First we firmly believe that, sustainable entrepreneurship is predominantly backed by opportunity recognition. It is apparent that almost all the successful entrepreneurs in the world start from a unique entrepreneurial opportunity. It is an entrepreneurial opportunity, which brings a solution to an existing problem in the marketplace. An entrepreneurial opportunity may be captured by an individual (solo/independent entrepreneur) or by a company (corporate entrepreneur). Corporate entrepreneurship can be defined as a phenomenon where entrepreneurship is practiced at firm level. Provided the two extremes, Ireland et al., (2003) postulated that small entrepreneurial firms have a higher tendency to seek for entrepreneurial opportunities, whereas large firms have a higher tendency to seek competitive advantages over its competitive counterparts. Furthermore, they highlighted that, all the entrepreneurial firms, regardless of the size of the venture, should simultaneously practice advantage seeking behaviors and opportunity seeking behaviors. We believe that this premise is applicable regardless of the size, type and the context of entrepreneurship. Despite other factors leading to failure of a venture, we state that if all entrepreneurial firms are geared toward advantage seeking and opportunity seeking behaviors simultaneously, sustainable entrepreneurship can be executed.

We believe that, being entrepreneurial requires initiatives implemented from the foundation of the venture itself. We call it foundation, because the beliefs of the owner manager, vested cultural backgrounds of him/her, passion he/she has towards the entrepreneurial venture are some of the neglected areas of entrepreneurship development. We assert that in order to recognize entrepreneurial opportunities (see, Shane and Venkataraman, 2000) and the people's willingness to execute an entrepreneurial opportunity at least or partially depend and are implicitly influenced by cultural heritages. Therefore, without any empirical inference we state that, the coherent picture of sustainable entrepreneurship requires developments implemented from the foundation level. Stated concisely, opportunity recognition, strategic entrepreneurial aspects, innate cultural factors are some of the prime important factors of sustainable entrepreneurship.

#### III. NATIONAL CULTURE – A THEORETICAL VIEW

#### 3.1. National Culture and Entrepreneurship

The impetus of entrepreneurship in a country mostly lies within the individuals in that society and on degree of internal and external stimuli with regard to the spirit of enterprises. Given this, the key question arises, what actually triggers entrepreneurship? Regardless of the divers aspects of triggers of entrepreneurship, national culture and the relationship it has with the entrepreneurial activities are vital. We put forth this point because, innate culture in a nation invariably has a link with how people think and behave. If so, one can simply determine that, culture shapes entrepreneurship. It may either hinder or stimulate.

It is a fact that the development of entrepreneurship can be largely attributed to culture. Also, some countries' cultures have a greater tendency for entrepreneurship whereas others do not (Ohe, et al., 1991). Since entrepreneurial orientation acts as the sole indicator of entrepreneur's strategy and the vested culture shapes the strategy of entrepreneurs, it is rational to argue that the culture acts as a major cause to shape the entrepreneurial strategy. Besides, given the importance of entrepreneurial orientation Wiklund and Shepherd (2005) write that entrepreneurial orientation is critical for the development of a firm and it offers a beneficial framework for research entrepreneurial activity. Furthermore, entrepreneurship widely accepts the need of individual fulfillment, achievement and career, etc. Also entrepreneurial orientation acts as the strategy of a sole entrepreneur. Thus we state that individual fulfillment and achievement can be largely attributed to effective execution of entrepreneurial strategy, in other words, entrepreneurial orientation. On the other hand culture of a particular country needs to be a supportive and a vital aspect to address.

Many scholarly investigations have addressed the link between entrepreneurship and national culture, and they state that, views and attitudes of key decision makers in firms reflect the assumptions and values in a culture (Mueller and Thomas, 2001). In fact the argument of the reflection of national cultural aspects from the organizational members are especially relates the field of entrepreneurship, as key personnel of the organization acts as the "brain" of the venture and they determine the overall strategic orientation of the venture (Colvin and Selvin, 1991). Also many studies have found that the impact of national culture on strategic behaviors of ventures is significant (Marino et al., 2002).

It is important to recognize the importance of assessing cultural aspects in the phenomenon of entrepreneurship, besides Lee and Peterson (2000) suggested that, the phenomenon of entrepreneurship develops in a manner, where culture gives rise to entrepreneurial potential. Furthermore, they suggested that the unique composite factors of attitudes, values, and behaviors foster or hinder entrepreneurship in a country.

#### **3.2.** Hofstede's Culture

Assessment of the relationship between national culture and entrepreneurship persist for decades (Schumpeter, 1934). Also the phenomenon has been assessed empirically (Morris, et al., 1994). However, it is important to state that the relationship between entrepreneurship and culture is not well established (Hayton et al., 2002). However, some scholars have criticized Hofstede's (1980) work on culture basing on the principle for not being adequately describes the differences in entrepreneurial activity in different countries (Busenitz et al., 2000), but still many accept Hofstede's work in the study of cultural values and entrepreneurship (Hayton et al., 2002).

The phenomenon of entrepreneurship appears to be more compatible with some cultures whereas they do not with others. To identify these differences, Hofstede's (1980) cultural dimensions would be a good starting point. Hofstede, (1980) in his seminal work on culture described a set of features that influence how group of people reacts to its environment and thus differentiates group membership. In his definition of national culture, five independent dimensions were proposed in relation to national culture. Namely; power distance, uncertainty avoidance, individualism - collectivism and masculinity - femininity. (Long term orientation, check). His discovery of national culture and the relational dimensions was a result of an employee attitude survey in the 1970's. The survey was focused through a large scale research and data were collected at IBM. Basically the study's questions were related to values and it represented mental programming of the respondent (Hofstede, 2001, p.48). Furthermore, Hoftede's identifications were each person holds unique parts in relation to mental programming and those parts are shared with each other (Hofstede, 2001). Opposing, Mueller and Thomas (2001) suggested that Hofstede does not specifically state the relationship between culture and entrepreneurial activity, but his cultural dimensions provide a useful means to assess the relationship between cultural aspects and entrepreneurial behavior.

#### **3.3.** Hofstede's Cultural Dimensions

*First dimension;* power distance, "[i]t indicates the extent to which a society accepts the fact that power in institutions and organizations is distributed unequally" (Hofstede, 1980. P. 45). Also he further postulated that the notion of power distance is the perception of organizational and institutional members who have less power within a country expect and accept the fact that, power has not been distributed equally (Hofstede, 2013). Elaborating more about the dimension, organizational structures with less power distance acknowledge individuals' personal ability of making decisions, whereas organizations with high power distance do not accept individuals' ability in making decisions (Hofstede, 2001).

Second dimension; uncertainty avoidance, "indicates the extent to which a society feels threatened by uncertain and ambiguous situations and tries to avoid these situations by providing greater career stability, establishing more suitable rules, not tolerating deviant ideas and behaviors, and believing in absolute truths and the attainment of expertise" (Hofstede, 1980. P. 45). Furthermore, uncertainty avoidance depicts the degree or the extent to which a society deals with inherent ambiguities and complexities of life (Kreiser et al., 2010). It is said that, in countries which have high uncertainty avoidance, standardized

procedures, clear structures and rules are accepted since they bring stability. In contrast, in countries which have low uncertainty avoidance, unfamiliar situation are accepted by the people. Furthermore, in low uncertainty scenarios people are less resistant to change (Hofstede, 2001).

*Third dimension;* individualism versus Collectivism. "The third dimension encompasses individualism and its opposite, Collectivism. Individualism implies a loosely knit social framework in which people are supposed to take care of themselves and of their immediate families only, while collectivism is characterized by a tight social framework in which people distinguish between in-groups and out-groups; they expect their in-group (relatives, clan, organizations) to look after them, and in exchange for that they feel they owe absolute loyalty to it" (Hofstede, 1980. P. 45). Simply put, this dimension defines the independence of members of the society. Kreiser, et al., (2010) define individualism as the relationship between collectivity and individual in a society.

*Fourth dimension;* Masculinity, its opposite pole, femininity. "Measurements in terms of this dimension express the extent to which the dominant values in society are "masculine" –that is, assertiveness, the acquisition of money and things, and not caring for others, the quality of life, or people" (Hofstede, 1980. P. 45). The underlying principle of this dimension is, women generally put emphasis on social factors, on the other hand men pay attention on ego goals, like money and career (Hofstede, 2001). This categorization leads to the typical question. How are people motivated? Hofstede (2001) suggests that in masculine society the prime motivator is achievement and competition, whereas, in feminine society the quality of life and caring for others are considered as the signals of success. Kreiser, et al., (2010) write masculinity as the level of self-confidence and assertiveness in a culture.

Fifth dimension; long term versus short term orientation. "[l]ong Term Orientation stands for a society which fosters virtues oriented towards future rewards, in particular adaptation, perseverance and thrift" (Hofstede G., 2013.P.8) whereas in short term orientation ..."it stands for a society which fosters virtues related to the past and present, in particular respect for tradition, preservation of "face", and fulfilling social obligations" (Hofstede G., 2013.P.8).

Sixth dimension; Indulgence, its opposite pole, restraint. Hofstede (2013) asserted that, indulgence describes the characteristics of members' free gratification in relation to some desires and feelings whereas in restraint cultures, members tend to control gratification and as a result they feel less able to be happy in their lives.

Given all these dimensions of culture, Horst (1996) writes that it is not required and it is not necessarily for all the members in a society to follow all the dimensions proposed above in each aspect of their lives. Also it is important to recognize that none of the individuals will be a slave of the vested culture in a nation. This implies that there will be some individuals who often deviate from the vested cultural norms (Morrison, 2000).

#### IV. METHODOLOGY

#### 4.1. Sample and analysis techniques

As we mentioned above, this paper is enriched with an underlying problem. The problem is 'is the vested culture has an impact on entrepreneurial initiatives provided the low strategic entrepreneurial aspects and low opportunity recognition in a context like Sri Lanka'. To achieve this motive, we employed the Geert Hofstede's Values Survey Module (VSM) (2013) questionnaire (Hofstede, 2013). VSM is a 30 item questionnaire developed for comparing culturally influenced values of two similar respondents from two or more countries, or sometimes regions within countries (Hofstede and Minkov, 2013). A sample of 135 entrepreneurs representing 51 entrepreneurs from Colombo district and 84 from Kegalle district (see figure one). Personally administered questionnaires were utilized to maximize response rate. However, 08 questionnaires were elicited unfilled resulting in 127 questionnaires for the study. Hofstede and Minkov (2013) suggested that, 50 respondents is the ideal size for homogeneous sample. Sampling frame of the study is the entrepreneurial database of, Small Business Development Unit, Ministry of Youth Affairs and Skills Development, Sri Lanka. Furthermore, we utilize Independent Samples Test to evaluate whether the cultural dimensions differed based on the district. The Levene's Test for Equality of Variances is performed to measure Equality of Means of two districts.



Figure 01: Data Collection Districts of the Study Source: Research data

#### 4.2. Measures

Geert Hofstede's Values Survey Module (VSM) (2013) questionnaire (Hofstede, 2013) provides six dimensional measures of national cultural values on the basis of four questions for each dimension resulting in 24 content questions. The rest asks the questions in relation to the demographics of the respondent such as age, educational level, nationality and etc. 4.2.1. Power Distance Index (PDI)

As we elaborated above, "[i]t indicates the extent to which a society accepts the fact that power in institutions and organizations is distributed unequally, (Hofstede, 1980. P. 45). The questionnaire assesses PDI by means of a 5-point likert scale highlighting the questions of, the level of importance of the bosses' involvement in making work related decisions, availability of a direct supervisor who can be respected in the job, How often, in your experience, are subordinates afraid to contradict their boss (or students their teacher?) and, the level of

agreement to the statement of, An organization structure in which certain subordinates having two bosses should be avoided at all cost. The index can be calculated as follows (see, Hofstede and Minkov, 2013).

PDI = 35(m07 - m02) + 25(m20 - m23) + C(pd)

In which, m07 is the mean score for question number 07 and etc. Illustratively, the PDI varies within the range of 0 and 100 depicting high and low power distance values. According to Hofstede & Minkov (2013) C(pd) is the constant value the varies along with the nature of the sample and it does not affect to the comparison of samples. Furthermore, it is chosen to shift the index score to values between 0 and 100. This constant value principle is equally applicable to all the indexes of Hofstede cultural dimensions.

4.2.2. Uncertainty Avoidance Index (UAI)

This "indicates the extent to which a society feels threatened by uncertain and ambiguous situations and tries to avoid these situations by providing greater career stability, establishing more suitable rules, not tolerating deviant ideas and behaviors, and believing in absolute truths and the attainment of expertise" (Hofstede, 1980. P. 45). The questionnaire assesses the UAI by means of a 5-point likert scale highlighting the questions of, all in all, how would you describe your state of health these days?, How often do you feel nervous or tense? The level of agreement to the statement of, one can be a good manager without having a precise answer to every question that a subordinate may raise about his or her work, and, the level of agreement to, A company's or organization's rules should not be broken - not even when the employee thinks breaking the rule would be in the organization's best interest. The index is calculated as follows (see, Hofstede and Minkov, 2013);

UAI = 40(m18 - m15) + 25(m21 - m24) + C(ua)

In which, m15 is the mean score for question number 15 and etc. the UAI values range between 0 and 100 implying strong uncertainty avoidances and low uncertainty avoidances. According to Hofstede and Minkov (2013) C(ua) is the constant value that varies along with the nature of the sample and it does not affect the comparison of samples. Furthermore, it is chosen to shift the index score to values between 0 and 100.

#### 4.2.3. Individualism Index (IDV)

This dimensions provides useful means to assess independence of members in a given society. The VSM employs 04 questions to assess this aspect. The VSM employs questions such as, the level of importance of an ideal job's security of employment, the time available for the respondent to manage work and his/her personal life, the acceptance of current job by the respondents' family members and friends, and the interestingness of a job. The index can be calculated as follows (see, Hofstede and Minkov, 2013);

IDV = 35(m04 - m01) + 35(m09 - m06) + C(ic)

In which, m01 is the mean score of question number 01 and etc. The index normally ranges to 100 points implying high collective and individual cultures. According to Hofstede and Minkov (2013) C(ic) is the constant value that varies along with the nature of the sample and it does not affect the comparison of samples. Furthermore, it is chosen to shift the index score to values between 0 and 100.

4.2.4. Masculinity Index (MAS)

Masculinity. Its opposite pole, femininity. "Measurements in terms of this dimension express the extent to which the dominant values in society are "masculine" –that is, assertiveness, the acquisition of money and things, and not caring for others, the quality of life, or people" (Hofstede, 1980. P. 45). The VSM employs 4 questions gathered via a five-point likert scale highlighting the questions of; the level of agreement to the statement of the availability of pleasant employees in a work setting in a given job, presence of recognition for good performance, living in a desirable area, and the chances of the job to get promoted. Thus the index can be computed as follows (see, Hofstede and Minkov, 2013);

#### MAS = 35(m05 - m03) + 35(m08 - m10) + C(mf)

According to Hofstede & Minkov (2013) the index values have a range about 100 depicting strongly feminine and strongly masculine cultures. According to Hofstede & Minkov, C(mf) is the constant value that varies along with the nature of the sample and it does not affect to the comparison of samples. Furthermore, it is chosen to shift the index score to values between 0 and 100.

#### 4.2.5. Long Term Orientation Index (LTO)

Hofstede G., (2011) write LTO refers to the dimension where, the choice of focus for people's efforts. The VSM utilizes four questions to assess the dimension. The questions raise the aspects of the importance of life in helping friends, thrift. Also it assesses the respondent's pride of being a citizen of his/her country and the level of agreement to the statement of 'persistent efforts are the surest way to results'. The index is computed as, (see, Hofstede and Minkov, 2013);

LTO = 40(m13 - m14) + 25(m19 - m22) + C(ls)

Hofstede & Minkov (2013) write that LTO ranges between 0 and 100 showing the characteristics of long term and short term orientation. Hofstede and Minkov further assert that, C(mf) is the constant value that varies along with the nature of the sample and it does not affect the comparison of samples. Furthermore, it is chosen to shift the index score to values between 0 and 100.

#### 4.2.6. Indulgence versus Restraint (IVR)

Indulgences refer to free gratification in relation to some feelings and desires whereas restraint refers to controlled gratification of some desires and feelings of individuals (Hofstede, 2011). The VSM uses four questions highlighting, the level of importance to the statement of mediation (having few desires) and time available for fun in relation to the individual's personal life. Also, it assesses the magnitude to the questions of 'do other people or circumstances ever prevent you from doing what you really want to?' And 'are you a happy person?' IVR = 35(m12 - m11) + 40(m17 - m16) + C(ir)

The value of IVR usually ranges between 0 and 100 implying the natures of high indulgence and high restraint (Hofstede and Minkov, 2013). Also, C(ir) is the constant value that varies along with the nature of the sample and it does not affect to the comparison of samples. Furthermore, it is chosen to shift the index score to values between 0 and 100.

#### V. DATA ANALYSIS AND DISCUSSION

We agree with the fact that Sri Lankan published data on Hofstede's cultural dimensions are available. However, Hofstede & Minkov (2013) assert that, VSM data are not comparable to published scores and VSM comparisons should be made based on matched sample respondents. Thus our analysis is based on those inferences.

#### 5.1. Descriptive statistics

Following descriptive statistics provide useful means of interpretations in relation to entrepreneurs in Colombo and Kegalle districts. Importantly, woman participation in entrepreneurial aspects is comparatively higher in both districts. Illustratively, 27 and 79 female entrepreneurs have participated from Colombo and Kegalla districts respectively. While 19 and 02 male entrepreneurs have participated from Colombo and Kegalle districts respectively.

		Frequency	Percent	Valid Percent	Cumulative Percent
	Male	19	41.3	41.3	41.3
Valid	Female	27	58.7	58.7	100.0
	Total	46	100.0	100.0	

Table 1: Gender Contribution (Colombo District)

#### Source: Research data

Table 2: Gender Contribution (Kegalle Dis	strict)
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		Frequency	Percent	Valid Percent	Cumulative
					Percent
	Male	2	2.5	2.5	2.5
Valid	Female	79	97.5	97.5	100.0
	Total	81	100.0	100.0	

Source: Research data

This gender contribution in entrepreneurial aspects from the two districts selected poses some important observations. Considering facts in relation to Asia and Pacific regions, since 2002 there is an increase of women participation in the labor force. In

our study also it has been depicted that the women's contribution is dramatically high. We believe that this high women's contribution in entrepreneurship has different implications. Sri Lankan households are mainly male dominated and women are meant for light work. But in contrast, this high female contribution in entrepreneurship in these two districts, in particular, with an emphasis of SME setting, has been a reason for this high female contribution despite being truly entrepreneurial. This observation is derived because, according to our statistics, age ranges of entrepreneurs lie mostly in the range of 35-59.

		Frequency	Percent	Valid Percent	Cumulative
					Percent
	(Under 20)	1	2.2	2.2	2.2
	(20-24)	1	2.2	2.2	4.3
	(25-29)	1	2.2	2.2	6.5
	(30-34)	6	13.0	13.0	19.6
Valid	(35-39)	11	23.9	23.9	43.5
	(40-49)	16	34.8	34.8	78.3
	(50-59)	8	17.4	17.4	95.7
	(60 or over)	2	4.3	4.3	100.0
	Total	46	100.0	100.0	

#### Table 3: Age ranges (Colombo District)

Source: Research data

#### Table 4: Age ranges (Kegalle District)

		Frequency	Percent	Valid Percent	Cumulative
					Percent
	(20-24)	1	1.2	1.2	1.2
Valid	(25-29)	5	6.2	6.2	7.4
	(30-34)	8	9.9	9.9	17.3
	(35-39)	10	12.3	12.3	29.6
	(40-49)	27	33.3	33.3	63.0
	(50-59)	23	28.4	28.4	91.4
	(60 or over)	7	8.6	8.6	100.0
	Total	81	100.0	100.0	

Source: Research data

Provided that the most entrepreneurs are female, and they range within the age range of 35-59, one can state that, these women are mothers and they have more tendencies to engage in self-income generating activities or self-employments. This poses the question that needs empirical investigation, are these female aged entrepreneurs actually and necessarily motivated to be entrepreneurial or to be a mere business owner which satisfies daily income of Sri Lankan households?

Considering respondents' years of formal education, one can note that 13 years is the most rated category. This implies that entrepreneurs in two districts have almost completed their advanced level examinations and less number of individuals have proceeded thereafter.

		Frequency	Percent	Valid Percent	Cumulative
					Percent
	10 years or less	2	4.3	4.3	4.3
	11 years	9	19.6	19.6	23.9
Valid	12 years	2	4.3	4.3	28.3
	13 years	14	30.4	30.4	58.7
	14 years	4	8.7	8.7	67.4
	15 years	2	4.3	4.3	71.7
	16 years	2	4.3	4.3	76.1
	17 years	3	6.5	6.5	82.6
	18 years or over	8	17.4	17.4	100.0
	Total	46	100.0	100.0	

#### Table 5: Years of formal education (Colombo district)

Source: Research data

		Frequency	Percent	Valid Percent	Cumulative
					Percent
	10 years or less	7	8.6	8.6	8.6
	11 years	8	9.9	9.9	18.5
	12 years	9	11.1	11.1	29.6
	13 years	25	30.9	30.9	60.5
Walid	14 years	6	7.4	7.4	67.9
vand	15 years	3	3.7	3.7	71.6
	16 years	3	3.7	3.7	75.3
	17 years	6	7.4	7.4	82.7
	18 years or over	14	17.3	17.3	100.0
	Total	81	100.0	100.0	

#### Table 6: Years of formal education (Kegalle district)

#### Source: Research data

We agree with the fact that education level and success of entrepreneurs have no direct stated relationship, rather we observe that, entrepreneurs who represented the two districts are considerably illiterate in managing finance of their business. We state without empirical investigations, financial illiteracy of entrepreneurs may be a factor in failure rates of entrepreneurs.

Finally, considering the industry composition, notably the Colombo district held less in number for Processing of Rubber, tea, coconuts, tobacco, and other agricultural commodities, whereas in Kegalle it is substantially high. This is due to the urban and non-urban difference in two districts selected.

#### Table 7: Industry composition (Colombo district)

		Frequency	Percent	Valid Percent	Cumulative Percent
	Processing of Rubber, tea, coconuts, tobacco, and other agricultural commodities	2	4.3	4.3	4.3
	Tourism	7	15.2	15.2	19.6
	Clothing	10	21.7	21.7	41.3
Valid	Textiles	3	6.5	6.5	47.8
	Information technology services	1	2.2	2.2	50.0
	Construction	3	6.5	6.5	56.5
	other	20	43.5	43.5	100.0
	Total	46	100.0	100.0	

Source: Research data

#### Table 8: Industry composition (Kegalle District)

		Frequency	Percent	Valid Percent	Cumulative Percent
	Processing of Rubber, tea, coconuts, tobacco, and other agricultural commodities	30	37.0	37.0	37.0
	Banking	2	2.5	2.5	39.5
Valid	Clothing	35	43.2	43.2	82.7
vand	Textiles	8	9.9	9.9	92.6
	Information technology services	1	1.2	1.2	93.8
	other	5	6.2	6.2	100.0
	Total	81	100.0	100.0	

Source: Research data

5.2. Geert Hofstede's Cultual Dimensions for Colombo and Kegalle Districts in Sri Lanka.

According to the figure two of the analysis, one can note that Sri Lanka has been recognized as a country with high levels of power distances. Focally, entrepreneurs who participated in the current study hold the similar characteristic of high power distance. Power Distance Index (PDI) of Colombo and Kegalle hold 80 and 95 PDI. These values imply that entrepreneurial firms in general of two districts considered are not acknowledging participative decision making culture. Simply put this is the dispersion of power in an organization. If an organization tends to be high power distant, it implies that there is an apparent distance among the individuals in decision making. This scenario links to empowerment of an individual as well. Simply empowerment refers to the result an individual may feel when they become part of the decision making process. The participative decision making culture in an organization takes collective decisions. All the managerial and non-managerial positions contribute to the decision making considering the levels and the authority they hold and thus leads to positive outcomes. High power distance further depicts that firms operate in a centralized environment, with strong hierarchies. Also bosses expect their respect in their authority.





As we mentioned above, uncertainty avoidance depicts the degree or the extent to which a society deals with inherent ambiguities and complexities of life (Kreiser et al., 2010). Putting it simple, the dimension refers to the strength of ties people have with others in organizations. The high side of this dimension is referred to as individualism and the other refers to collectivism. The values of the Colombo and Kegalle districts were somewhat moderate in ratings. 35 and 32 values of Individualism (IDV) imply that, the entrepreneurs are cultivating on their skills and they are trying to become masters in their business dealings. According to Geert Hofstede's calculations he has rated IDV dimension as 35. These values depict Sri Lanka as a country that holds characteristics of a collective culture. In a society like Sri Lanka, it is evident that, people always acknowledge commitment to the family, to the work group and etc. overriding rules and regulations, people in a collective society accept loyalty.

Generally, Masculinity (MAS) refers to degree of competition, success and achievement, in a society. Whereas, the low score (usually referred as feminine) depicts the dominant values of quality of life and caring for others. Being feminist, people are restricted to stand in front of a crowd. According to our analysis, entrepreneurs of Colombo and Kegalle districts have characteristics of a feminine society. Being feminine, it holds the characteristic of female dominance. This is observable from our analysis as well. Respective values of 27 and 79 female of Colombo and Kegalle show these societies to be feminine. In a feminine society these women are more admirable and respected.

According to Hofstede's calculations, MAS index for Sri Lanka holds 10. Thus we state that, the sub societies of Colombo and Kegalle hold the same characteristics of the whole island.

The dimension of Uncertainty Avoidance (UAI) index stresses that people in a desired society act with uncertainty about the future prospects of the society. They exist in a dilemma as to whether we are going to control the future or are we going to let what is meant to be happening. This ambiguous situation brings anxiety to a society and different cultures cope with anxiety in different ways. Relatively moderate levels of UAI in Colombo (UAI=45) and Kegalle (UAI=39) depict that, these two societies do not show strong preference in relation to UAI. Simply said, members of the societies are not threatened by anxiety. The possible consequences of such moderate levels of UAIs are entrepreneurs in Colombo and Kegalle tend to run their business informally. Due to the low uncertainty about the future, they tend to establish long term plans in their business with acceptance of risk and change.

Long Term Orientation (LTO) index of a given society expresses the degree to which the relationship one can have with his past, present and his/her future. A society which holds a low value in this dimension prefer to be satisfied with timely honored traditions whereas high scored societies initiate more pragmatic approaches. High LTO culture always encourages thrift and efforts in relation to modern education. The values of 45 for Colombo and 17 for Kegalle, does not show a strong preference to LTO. This intermediate level of LTO depicts that, equality is promoted among the society with a greater emphasis on individualism and creativity.

Indulgence versus Restraint (IVR) index refers to degree of free gratification. If a society is allowing free gratification in relation to some feelings and desires that society is referred to as indulgent, whereas controlled gratification of some desires and feelings are referred to as restraint. According to our analyses IVR values of 54 (Colombo) and 76 (Kegalle) depict high indexes. These values exhibit people of two districts who have a high tendency to fulfill their impulses and desires. Simply put, they are happy. With a greater emphasis on leisure activities, they are more towards optimism. The inferences of IVR in two districts have important implications. Their happy life would possibly increase their entrepreneurial motive.

Referring to the table 12, we state that Levene's Test for Equality of Variances is not violated in all the indexes culture. Or the t test for Equal Variances Assumed is statistically not significant at  $\alpha = .05$ (Because; PDI=p.175>0.05, IDV=p.834>0.05, MAS=p.351>0.05, UAI=p.584>0.05, LTO=p.013>0.05, and IVR=p.104>0.05) and thus we affirm equal variances of all the dimensions. Finally, we claim that, since all the p values are greater than 0.05 and thus there is no any significant differences of cultural dimensions between the two districts of Colombo and Kegalle. Said statistically, though apparent differences exist, those are not statistically proven.

#### Test fort-test for Equality of Means Levene's Equality of Variances df (2-Mean Difference Std. Error95% Confidence Interval of the Sig. Sig. tailed) Difference Difference Upper Lower variances.222 -38.80780 Equal .639 -1.364 125 .175 -15.83065 11.60976 7.14650 assumed PDI Equal variances not -1.389 98.842 .168 -15.83065 11.40013 -38.45143 6.79013 assumed Equal variances 1.254 .210 125 .834 2.27322 10.83687 -19.17429 23.72072 .265 assumed IDV 24.35711 Equal variances not .205 86.830 .838 2.27322 11.11048 -19.81068 assumed variances.427 125 .351 9.95706 10.63329 31.00165 Equal .515 .936 -11.08753 assumed MAS Equal variances not .899 82.784 .371 9.95706 11.07475 -12.07103 31.98514 assumed 10.85480 27.44515 Equal variances.213 .549 125 .584 5.96216 -15.52083 .646 assumed UAI Equal variances not .589 5.96216 10.99240 27.80000 .542 90.143 -15.87569 assumed variances.030 125 27.62748 10.99341 5.87016 49.38480 Equal .862 2.513 .013 assumed LTO Equal variances not 101.888 .011 27.62748 10.68206 6.43939 48.81558 2.586 assumed Equal variances.062 -22.16855 13.52917 4.60736 .803 1.639 125 .104 -48.94446 assumed IVR Equal variances not .094 13.13357 -1.688 102.163 -22.16855 -48.21843 3.88134 assumed

#### **Table 9: Independent Samples Test**

Source:

Research

data

#### VI. CONCLUSION

In this working paper, we set out to identify some important observation in Sri Lanka. That is whether the vested culture in Sri Lanka has an implication to be entrepreneurial. It is important that, being entrepreneurial typically requires opportunity seeking and advantage seeking behaviors (Ireland et al., 2003). They further argued that, regardless of the size of the venture these two dimensions should be practiced simultaneously. Provided this fact, this paper is expected to add a small contribution to a context specific problem. That is whether the considerable rate of entrepreneurial venture failure has an impact from the vested cultural backgrounds. One can argue that, there is no direct impact, but we state that, national cultural background has important implications on entrepreneurial development (see; House et al., 2004).

Therefore, we employed Geert Hofstede's national cultural dimensions in two districts in Sri Lanka. Based on 127 entrepreneurs we derived respective indexes for each dimension of the model. Perhaps most notably, the high value of power distance in both districts implies some of the factors which hinder entrepreneurial aspects. We accept that the majority of Sri Lankan entrepreneurial ventures are driven by few members. But provided the fact that entrepreneurial ventures typically comprehend the value of expansion, the high power distance may act as a restraining factor to stimulate entrepreneurship.

In contrast to that, we identified that Sri Lankan entrepreneurs associate with a collective culture. This may either act as restraining force or a driving force of entrepreneurship. Lumpkin and Dess (1996) in their work highlighted autonomy as a dimension which depicts entrepreneurial orientation. This defines the independence of the entrepreneur in relation to decision making. Thus we affirm that, in a collective culture autonomy is hindered. However, autonomy as a dimension has different implications to venture performance.

In our analysis, we observed that the majority of entrepreneurs who participated to the study are female. Also, we noted that entrepreneurs in these two districts held the characteristics of being feminine. In relation to uncertainty avoidance we noted that Sri Lankan entrepreneurs are not threatened by anxiety allowing them to develop long term objectives of the venture. This inference is very important in relation to sustainable business practices. Long term orientation with a clear strategy provides a clear basis for a venture to compete effectively. Thus we identify long term orientation of Sri Lankan entrepreneurs acting as a driving force to be entrepreneurial. Furthermore, we observed that the high index of Indulgence provide inferences of a happy society. Thus we state that this actually motivates entrepreneurial aspects.

In conclusion, we set out a direction for further research. We observed that Sri Lanka as a nation holds characteristics of collectivism. Provided what Lumpkin and Dess (1996) proposed, autonomy can be identified as a dimension which defines independence of an entrepreneur. Thus we integrate collectivism culture and autonomy as a dimension of entrepreneurial orientation and state that the link between being collective and the relation it has with autonomy would provide a good avenue for future research. Also, we observed that, in a country like Sri Lanka, opportunity seeking behavior and advantage seeking

behavior are less in practice among entrepreneurs, and thus less entrepreneurial. Also we noted that Sri Lankan entrepreneurs are mostly female. The relationship between female entrepreneurship and the less entrepreneurial behavior (less opportunity seeking and less advantage seeking) would be an interesting context specific problem to address.

#### Nomenclature

SME Small and Medium Size Enterprise

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#### AUTHORS

First Author – Dissanayake D.M.N.S.W, Lecturer (Probationary), Department of Commerce and Financial Management, Faculty of Commerce and Management Studies, University of Kelaniya, Sri Lanka, srinath@kln.ac.lk Second Author – Semasinghe D.M, Senior Lecturer, Department of Commerce and Financial Management, Faculty of Commerce and Management Studies, University of Kelaniya, Sri Lanka, semasinghe@kln.ac.lk

#### Means for Cultural Dimensions

#### (Source: Research data)

Items	Colombo	Kegalle
Power Distance		
be consulted by your boss in decisions involving your work	1.65	1.75
have a boss (direct superior) you can respect	1.80	1.76
How often, in your experience, are subordinates afraid to contradict their boss (or students	2.30	2.39
their teacher?)		
An organization structure in which certain subordinates have two bosses should be	3.17	2.82
avoided at all cost		
Individualism		
have security of employment	1.78	1.74
have sufficient time for your personal or home life	1.91	1.37
have a job respected by your family and friends	2.13	1.75
do work that is interesting	1.47	1.66
Masculinity		
have pleasant people to work with	1.76	2.04
get recognition for good performance	1.82	1.92
live in a desirable area	2.15	1.71
have chances for promotion	2	2.03
Uncertainty Avoidance		
All in all, how would you describe your state of health these days?	2	2.13
How often do you feel nervous or tense?	3.30	3.19
One can be a good manager without having a precise answer to every question that a	2.93	2.34
subordinate may raise about his or her work		
A company's or organization's rules should not be broken - not even when the employee	2.91	2.95
thinks breaking the rule would be in the organization's best interest		
Long Term Orientation		
doing a service to a friend	2.19	1.85
thrift (not spending more than needed)	1.56	2
How proud are you to be a citizen of your country?	1.84	1.98
Persistent efforts are the surest way to results	1.63	1.62
Indulgence		
moderation: having few desires	2.23	2.45
keeping time free for fun	2.36	2.32
Do other people or circumstances ever prevent you from doing what you really want to?	3.26	3.41
Are you a happy person?	1.80	1.64

### Presenting the Step up Process of Research Career Development

#### D.M.N.S.W.Dissanayake

Lecturer (Probationary), Department of Commerce and Financial Management, Faculty of Commerce and Management Studies, University of Kelaniya

**Abstract-** Mainly, due to new scientific inquiries and technological advancements knowledge becomes obsolete. So it creates a dilemma where the applicability of so called theories and models which we learnt in class can still be applied to solve problems? Thus, the scholars bring the notion of RESEARCH as a definite solution which enriches the existing understanding of a phenomenon. So, what is research? Research can be simply defined as an attempt to create new knowledge. Having known what research is, this essay suggests a step up process to commence a research career. Suggested process consists of six steps concisely, and process development was exposed to subjective angles of the author.

*Index Terms*- Conferences, Impact factor, Journals, Literature, Research, Process, Symposiums

#### I. INTRODUCTION

In simple terms, research encompasses a large spectrum of knowledge. Every day, there are new things to know about research which are really interesting and appealing. Theories that we learn in class become outdated. Theoretical inferences that drawn in the past which either may or may not have the applicability to use at present. That inapplicability is refined by research by means of producing new knowledge. Despite the wide definitional angles, research can be conducted either by means of theory testing or theory extending (theory building) approaches. Having said that, research is fundamental to academics and it has become one of the main roles an academic should play. So therefore, this essay suggest a step up approach to commence a research career.

The remainder of this chapter details a process that you need to know when you step into a research career. It starts with an identification of an area based on your preference. The first step details the importance of having an area identified and very importantly the area identification merely depends on the person's perceived desirability to continue his/her studies in the identified area. The second step details about the importance of identifying some top scholars in your field of interest. Once you identified them, it is really easy to continue your studies because those scholars will act as benchmarks in your scholarly works. Thereafter, the next step elaborates about the importance of touching some literature in relation to the discipline. This is fairly important because referring literature is a real boost to commence your academic writing. Then the next section advices you to start writing something. This has been given much emphasis because, if you read entirely without writing, nothing will happen. Thus it is advised that you commence your writing.

The next step depicts the importance of attending some conferences as a preliminary step in developing your academic network and as a learning process of research. Finally, the last step convinces you about the importance of publishing your work in scholarly journals.

#### II. STEP ONE: IDENTIFY AN AREA YOU PREFER.

Different people perceive differently in selecting a discipline to develop a research career. The most important consideration is, you should like it. If you don't like the discipline though the area is contemporary it will not work out. So the first and foremost consideration is, select an area or a discipline you like. Say for an example, either Strategic Management, Accounting, Entrepreneurship, Information Technology, Economics or etc., can be perceived as study disciplines a typical student can select as a discipline and it is entirely a subjective decision. One can possibly argue stating that a researcher has to specialize on different study disciplines and thereby he may touch a diverse range of areas. But the author's personal view in this regard is, selecting more than one study discipline would possibly not develop a framework for a researcher to think. At this point I must mention that research is more important to academics. Being an academic researcher becomes a vital part in his career development and at that point, selecting one single study area may confine an academic into a box. Thus it can be mentioned that for an academic, teaching should be in diverse areas of studies, but still research should touch one core study discipline. So overall, identifying an area you prefer to conduct research in is placed as the first step in this process.

### III. STEP TWO: IDENTIFY SOME TOP SCHOLARS IN THE FIELD DESIRED

Having identified an area of interest, next I would like to propose to spot some top scholars in that field. For each and every study discipline there is a set of scholars who are perceived as best among the academic community. Having identified the prominent scholars in your field sooner, you will be able to consider them as benchmarking figures in your life. If you are a beginner, search in Google. Say for an example, in the field of Entrepreneurship Per Davidsson<sup>133</sup>,Frederic Delmar<sup>134</sup>, Johan

<sup>&</sup>lt;sup>133</sup> Google Scholar Citations Index:

http://scholar.google.com/citations?user=qSH38oAAAAAJ&hl= en
Wiklund<sup>135</sup>, Dean A. Shepherd<sup>136</sup>, Donald F. Kuratko<sup>137</sup> and the like are considered as leading scholars in the world. Having identified the scholars you can possibly read what they publish. Those scholars' objective is to advance the knowledge in existence. Therefore, knowing them will allow you to identify contemporary issues in relation to your discipline. Not only that you will learn how those scholars use academic language in writing a scholarly work. Thus it is very important to identify prominent scholars in your preferred study discipline. Furthermore, since those prominent scholars only articulate issues correctly you will not be misdirected in doing research. Therefore, identifying prominent authors in your preferred discipline is of vital importance.

# IV. STEP THREE: TOUCH SOME LITERATURE IN RELATION TO YOUR STUDY DISCIPLINE

In the above step, we discussed the importance of identifying top scholars in your interested field. This step is all about reading what they publish. In order to read what prominent scholars publish in relation to your study discipline, you are required to identify where they publish. Usually, top scholars publish in top journals. In class you would have learnt what a journal is and it is very important to identify good journals in your discipline as well. So how do you identify a good journal? For each and every discipline there are listed journals that exist. Various universities list and rank different journals differently and internet is a good source to identify those listings. Furthermore, one of the most recognized listing of journals is the Web of Science<sup>138</sup>. Web of Science rankings are available in the internet and it is free to download.

Furthermore, in General Management<sup>139</sup>, Administrative Science Quarterly, Academy of Management Review, Academy of Management Journal, Strategic Management Journal, Management Science and etc., are considered as the top journals in the world. In entrepreneurship Journal of Business Venturing<sup>140</sup>, Small Business Economics<sup>141</sup>, Entrepreneurship:

<sup>134</sup> Google Scholar Citations Index:

http://scholar.google.com/citations?user=Ewm9Aj8AAAAJ&hl= en <sup>135</sup> Google Scholar Citations Index: http://scholar.google.com/citations?user=UuEAJ9wAAAAJ&hl= en

en <sup>136</sup> Google Scholar Citations Index:

http://scholar.google.com/citations?user=UT3 bnIAAAAJ&hl=e n

 $\frac{n}{137}$  Google Scholar Citations Index:

http://scholar.google.com/citations?user=az9goSMAAAAJ&hl=e n

<sup>138</sup><u>http://thomsonreuters.com/web-of-science-core-collection/</u>
 <sup>139</sup> Management Journal Rankings: <u>http://www.journal-</u>

ranking.com/ranking/listCommonRanking.html?selfCitationWei ght=1&externalCitationWeight=1&citingStartYear=1901&journ alListId=353 Theory & Practice<sup>142</sup> and Journal of Small Business Management<sup>143</sup> are considered as top journals. Likewise target some journals in your preferred area. Having identified the journal the next step is to read the articles published frequently. For academics I would like to create a content alert at this point. Content alert is an option provided by each journal to be aware of a new issue.

#### Wiley Online Library



Let us now assume that you logged in to Journal of Small Business Management through the link provided below and you also want to create a content alert. Once you enter a journal a link will appear as 'Get New Content Alerts' (below picture). What you have to do is click on that and save your email address. Once you save your email, frequently the journal will send you new issued publishing to your mail box. This step is very important to academics as well. They are required to do research and they want to keep their knowledge updated. These content alerts is a good way to update your literature review as well, because of the frequent alerts. Downloading<sup>144</sup> and reading those articles will provide academics as well as students information about new research issues and gaps. Having identified an area, scholars, journals and importance of reading articles, you can start your research career. Knowing all these insights the next step is to start writing.



<sup>141</sup><u>http://www.springer.com/business+%26+management/busines</u> <u>s+for+professionals/journal/11187</u>

<sup>142</sup>http://onlinelibrary.wiley.com/journal/10.1111/%28ISSN%291 540-6520

<sup>143</sup>http://onlinelibrary.wiley.com/journal/10.1111/%28ISSN%291 540-627X

<sup>&</sup>lt;sup>140</sup><u>http://www.journals.elsevier.com/journal-of-business-</u> venturing/

<sup>&</sup>lt;sup>144</sup> High rank journals does not provide free access to download articles. Mostly universities subscribe to those journals and thus downloadable.

# VII. STEP SIX: PUBLISH YOUR WORK IN SCHOLARLY JOURNALS.

V. STEP FOUR: START WRITING SOMETHING

It is very important, nothing will happen only if we read throughout our life. Thus we have to start writing something. In the academic world, research is done at individual or collaborative Furthermore, undergraduate levels. and postgraduate research is certainly conducted with the assistance of one or more supervisors. The commencement of a research career will be more productive if your work is backed by a second party. That is because when it comes to research the areas or points that can mislead are many. Thus it is very important to have a supporter for more productive scholarly works. Initially, you will not be able to conduct a complete research, but you can possibly draft a literature review at least to enhance your academic writing. However, writing is more important than remaining still.

# VI. STEP FIVE: ATTEND SOME ACADEMIC CONFERENCES AND SYMPOSIUMS

Having a drafted paper of your own, the next step is to publish it. The main purposes of publishing are to contribute theory and practical advancements, to build academic recognition, self-satisfaction and so on. Initially, top journals are not viewed as good avenues to publish your work. Journal publishing is a different art that should be developed day by day. Therefore, academic conferences and symposiums are good avenues. Generally academic conferences are held with the objective of networking, knowledge sharing and not merely as a place to publish. The objective of submitting a conference paper is to obtain feedback from the academic community and thereby to develop the paper thoroughly and subsequently to submit to a journal and get published without any single error. An error can be a single missing coma in your paper. Top journals maintain a high level of quality, and that is why I mentioned, publish without a *single* error.

Generally, conferences and symposia are held at local and at international levels. Your first step can be a local conference and subsequently you can target international ones. There are top ranking conferences in the world. For an example, Australian Centre for Entrepreneurship Research Exchange Conference<sup>145</sup> and Babson College Entrepreneurship Research Conference<sup>146</sup> are considered as premier academic conferences in the world in the field of entrepreneurship. Importantly, these conferences do not motivate earning money, but sharing and building research capabilities of researchers. If you attend these conferences, you may notice that top scholars are present.

We detailed above that academic conferences are held with the purpose of building networks, sharing knowledge and etc. The comments that you will get will sometimes be very appealing and sometimes very intimidating. However, take all the comments and refine your paper targeting a good journal. We detailed about good journals above and let us now assume that you have a conference paper and now you have developed it up to the journal standard. Prior to submitting a journal article, there are things to keep in mind. Different journals maintain different levels and requirements that a typical researcher has to comply with. First you should comply with all the necessary requirements of the journal. If not, the editor will reject your paper without even reviewing because of the noncompliance with the journal requirements. Thus pay attention to those journal requirements. So what are those journal requirements? Simply put, those are the requirements a researcher has to follow in order to maintain the consistency and compatibility of the research paper with the other papers of the journal. Typically, those requirements include referencing style, footnotes style, formatting the article, copyright statements, and etc, (for example see<sup>147</sup>).

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		5-Ye	ar Impact Factor 3.954
		Imp	orint: ELSEVIER
		ISS	SN: 0883-9026

It is very important to recognize that largely the today's world is driven by money purposes. Simply there are a number of academic journals which are driven by money purposes. Indeed those journals are of low quality. They will ask you money to

<sup>&</sup>lt;sup>145</sup>http://acereconference.com/

<sup>&</sup>lt;sup>146</sup><u>http://www.babson.edu/Academics/centers/blank-</u>center/bcerc/Pages/home.aspx

<sup>&</sup>lt;sup>147</sup><u>http://www.elsevier.com/journals/journal-of-business-venturing/0883-9026/guide-for-authors</u>

publish a paper. My advice is do not publish articles in those low quality papers since those journals have no academic impact. What is this impact? The impact factor of an academic journal is a measure reflecting the average number of citations to recent articles published in the journal. All good journals have an impact factor (below picture). As elaborated above impact factors depict the quality of a journal.

#### Figure: Step up process of research career development

#### six five four three two Attend one some Touch academic some conferences literature in and relation to symposium Identify an your study area you prefer Publish your work Start Identify in scholarly writing some top ~ --- ~ **41**- **:** -journals scholars in the field AUTHORS

development below.

**First Author** – D.M.N.S.W.Dissanayake, Lecturer (Probationary), Department of Commerce and Financial Management, Faculty of Commerce and Management Studies University of Kelaniya, Email: srinath@kln.ac.lk

VIII. SUMMARY

shows a very practical approach one can follow. Nevertheless

that is the author's view. Synthesizing the elaborations above, I

have reproduced the six step up process of research career

The above six step process of research career development

# Supply Chain Strategic Alliances Partner Selection for Rizhao Port

# Libin Guo

School of Management, Qufu Normal University, Rizhao276826, China

*Abstract-* Under the background of port supply chain strategic alliances, we clarify the current situation of Rizhao Port by SWOT analysis and find out the ST strategy for it, furthermore, we screen out the optimal cooperation partner for Rizhao Port under different alliance forms range from horizontal integration and vertical integration to the blended dynamic logistics alliance.

Index Terms- Port Supply Chain; the SWOT Analysis; RiZhao Port; Strategical alliance

#### I. INTRODUCTION

**P**ort supply chain, a main constituent of port logistics, includes the levels such as informationization, automation and networking, and emphasizes the modern management of material transportation chain of each link and the extension of comprehensive services. Meanwhile, due to the connection between ports and suppliers and consumers all over the world through shippping companies and land forwarding agents, a port supply chain integrating many means148 of transportation and types of logistics is formed, and it becomes a relatively best main part and link for the coordinated management of supply chain. Therefore, we can start from the analysis of the SWOT of Rizhao port supply chain, and find out the cooperative partners suitable for the strategical alliance of Rizhao port supply chain among different types of alliance.

#### II. THE SWOT ANALYSIS OF RIZHAO PORT SUPPLY CHAIN

The SWOT analysis, a commonly used method of strategic competition, is based on analyzing the internal conditions of enterprises itself, and finds out the strengths, weaknesses and core competence. S stands for strengths, W for weaknesses, O for opportunities, and T for threats. Among them, S and W are internal factors, while O and T are external ones, as shows in Chart one. According to the whole concept of enterprise competition strategy, strategy should be an organic combination of "can-do"(namely the strengths and weaknesses of an organization) and "may-do"(namely the opportunities and threats arising from the environment).

rganization	Helpful to achieving the objective	Harmful to achieving the objective
Intenal origin Attributes of the o	Strengths	Weakness
Extenal origin Attributes of the envirome	Opportunities	Threats

Chart one: swot analysis

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#### III. THE STRENGTHS OF RIZHAO PORT

#### Geographical advantages

Rizhao Port has evident geographical advantages, and abounds in gifts of nature. The Port is located in the middle part of China's coastline, with the Yellow Sea on its east, adjacent to Qingdao Port in the north and Lianyungang Port in the south, and with Japan, South Korea and North Korea on the other side of the sea. The port district boasts wide bays, deep waters, vast hinterland, a mild climate, and is an ice-free and a non-silting port, which make it a suitable place for building a large-scale deep water berth about  $200 \sim 300$  thousand-ton, especially for industrial layout in the port areas with large inflows and outflows.

# **Climate conditions**

Rizhao Port enjoys south wind all the year round, of which the frequency rate is 10.95%. And the frequency rate of wind of more than 6 scale for the whole year is 0.51%. Typhoon has a minimum influence on the port because there is no typhoon landing here. Its annual precipitation on average is 955mm. Foggy days mostly occur between February and July, accounting for 90% of its yearly foggy days, and the number of annual foggy days with visibility less than 1km is on average about 11.4 days. The annual average temperature is 12.5°C, with the highest being 37.5°C, and the lowest —14.5°C. The sea surface is ice-free all the year round, and so it is with the port.

#### Infrastructure capabilities

Rizhao Port, now having five port districts: Donggang District, Zhonggang District, Xigang District, Lanshan District and Lanshan Beigang District, has 28 production berths, and the throughput capabilities of berths are 41320 thousand tons. Among them, Donggang District and Xigang District have 19 production berths, among which two berths are used for 125 thousand-ton coal, and there are 11 berths of a tonnage of over 10 thousand; Lanshan District and Lanshan Beigang District have 7 production berths, among which there are 4 berths of a tonnage of over 10 thousand; Xigang District has 2 production berths of a tonnage of 10 thousand.

Donggang District and Zhonggang District: the throughput capabilities are 31580 thousand tons. Coal dock: 2 berths of 125 thousand-ton. There are 9 berths(except the coal dock) more than 10000t, among which Number 4 berth is Daewoo bulk cement berth. There are 8 berths less than 10000t, which are mainly used for the acceptance of small and medium vessels, and the acceptance of break bulk cargoes and general cargoes. Xigang District: a newly-built port district during the Period of ninth-five year plan, with 1wood dock of a tonnage of 40 thousand and 1 universal bulk, and the throughput capability of 1340 thousand tons. Lanshan District and Lanshan Beigang District: now having 7 production berths, 4 berths of a tonnage of more than 10 thousand, and the throughput capability of 4800 thousand tons.

# Collecting and distributing ability

The collecting and distributing of Rizhao Port are convenient and efficient. Yanshi Railway and Pinglan Railway connecting Rizhao Port with other places run westwards through Xinxiang, Houma, and Xi'an before they end in Alashankou of Xinjiang Autonomous Region. They are parallel to Lianyungang-Lanzhou Railway, and intersect with Beijing-Shanghai Railway, Beijing-Jiulong Railway, Beijing-Guangzhou Railway, Jiaozuo-Zhicheng Railway, and Datong-Puzhou Railway, which forms a railway network that connects Rizhao Port with the vast regions of East China, Central China, and Northwest China. The completion of Jiaozhou-Xinyi Railway, and the construction of Dongdu-Pingyi Railway, Zaozhuang-Linyi Railway and the railways in south-central Shanxi Province will further enhance the collecting and distributing ability of Rizhao Port.

Port highway is connected with Rizhao-Dongming Highway and Lianyungang-Huoerguosi Highway, and intersects with Tongjiang-Sanya Highway, Beijing-Shanghai Highway and Beijing-Fuzhou Highway. Four National Highway trunk lines connecting Rizhao Port with other places have access to all parts of the country, forming a highway transport network which extends in all directions. Two railway arteries run through Rizhao port district, and they are Rizhao-Lankao Highway and Shenyang-Haikou Highway, and new Eurasian Continental Bridge and the south-central railway in Shanxi Province under construction. Rizhao-Yizheng Pipeline, Rizhao-Dongming Pipeline and Rizhao-Puyang Pipeline under construction run through Rizhao port district.

Rizhao now has opened eight aviation agencies, which allows doing passenger and cargo business at any time. Round trip tickets from Qingdao to all parts of the country, from Qindao to South Korea, and to Hong Kong, tickets from Jinan to all parts of the country, and tickets from Lianyungang to all parts of the country can be booked; air cargo transportation business from Qingdao to all parts of China can also be done. The 168km between Rizhao and Qingdao Airport, and the 120km between Rizhao and Lianyungang Airport are both within two-hour ride.

The sea routes of Rizhao Port can reach any port in the world, and Rizhao Port has been open to navigation with over 100 countries and regions in the world. Rizhao Port has 3 modernized container berths, which is at present one of container docks with deepest draft and biggest container yard among coastal ports all over China. Rizhao Port, with its annual throughput capability amounting to 5000 thousand tons, is China's biggest transshipment port, boasting 2 specialized bulk cement berths which can berth vessels of a tonnage of 40 thousand and world-class cargo handling technology. Rizhao Port, at present, has China's most advanced and specialized wood chip and timber berths and supporting equipment. Its storage capability amounts to 500 thousand cubic meters. Its annual import volume of timber reaches almost 1000 thousand cubic meters, and more than 1000 thousand tons of wood chips are imported annually, which make Rizhao Port the biggest wood chip and timber distributing center in the north of Yangtze River. Rizhao Port has all kinds of advanced rolled steel loading and unloading facilities and devices, which can satisfy the handling, storage and transportation of all kinds of rolled steels such as billet steel, steel plate, steel wire rod, steel pipes, and section steel. Rizhao Port has launched international passenger-cargo liner, which is twice weekly, from Rizhao to Pyongtaek of South Korea; Rizhao Port has first-class

international ship hall, with its reception capability hitting over 1000 passengers at one time, and annual passenger capability reaching 150 thousand persons.

#### **Economic hinterland**

The economic hinterland of Rizhao Port is vast. Rizhao Port adjoins to Southern Shandong energy base, which, having many kinds of mineral resources, especially building material resources famous for their superiority in quality and abundance in quantity, is an important building material base in East China. The direct economic hinterland of Rizhao Port covers regions like the south of Shandong Province, the north of Henan Province, the south of Hebei Province, the south of Shanxi Province and Guangzhong Region in Shaanxi Province, with a population of more than 80 million and an area of 180 thousand square kilometers. Its indirect economic hinterland ranges over Central China and Northwest China such as Gansu Province, Ningxia Autonomous Region, Xinjiang Uyghur Autonomous Region, with an area accounting for 20% of the whole country. The indirect economic hinterland is an important exit of the strategy of "Western Development".

# The Analysis of Disadvantages Faced by Rizhao Port and Strategies

# The relatively low informationization level of the Port

Although Rizhao Port has invested markedly more in informationization when accelerating the infrastructure construction, there is still a gap between the overall informationization level of Rizhao Port and China's advanced ports, such as Qingdao Port, Dalian Port and Yingkou Port. The informationization of a port includes not only manufacturing information system, but also all kinds of support service systems, such as human resources, equipment, goods and materials, assets, engineering management, finance, CRM, and logistics information platform; comparatively speaking, there is still a relatively big gap.

Dalian Port, Tianjin Port, Qingdao Port, and Qinhuangdao Port have invested a great sum of money in building e-commerce websites, with which e-port and logistics trade platform built by EDI center are combined to divert logistics and trade information even transaction to the Internet; the coal trade net of Qinhuangdao Port and the coke trade net of Tianjin Port have become the e-commerce platform of online trade delivery, and the coal price index issued by them has been recognized by the industry and the country; Qingdao Port and Lianyungang Port have respectively their own e-commerce, with the two Internet portals of logistics net and trade net providing trade services to users, and both ports are actively developing iron ore trade net and releasing so-called authoritative indexes.

Rizhao Port should step up efforts to build e-commerce platform and logistics information platform centering on EDI and e-port, which is to make use of information networks to combine goods owners, charters, traders, manufacturing enterprises, logistics companies, customs, commodity inspection with the port, thus providing all parties with regional shipping information of comprehensive and intelligent information services and providing users with better services; at the same time Rizhao Port customer call center should be built as soon as possible, and unified customer service call should be opened. All those measures are to take the overall information level of Rizhao Port into the rank of China's advanced coastal ports.

#### Lack of linkage among the three industries

The linkage of the three industries is shortening product cycle from raw material purchase to end consumers by information sharing among manufacturing industry, commercial circulating industry and logistics industry. It's mainly reflected in the aspects of suppliers and manufacturers sharing the information such as plans, manufacturing, storage and logistics, manufacturers and distributors sharing product information, consumer demands, shipment information, inventory and so on, and facilitators and logistics enterprises serving the supply chain making logistics plans also by sharing information.

Rizhao Port should enhance the investment and construction of modern logistics parks to build international logistics park; the modern model park, with the linkage of manufacturing industry, commercial circulating industry and logistics industry, should be based on the sea and land transport hub, be characterized by regional distribution, be led by industrial logistics, center on the third party logistics cluster and logistics resource integration, regard the processing and distributing of raw material as an expansion, and be supported by logistics technology application.

#### Relatively low industrial level in port-surrounding areas, and the underdeveloped direct economic hinterland

The industrial development in port-surrounding areas can drive the development of the port. Rizhao should make efforts to create a modern port industry system which is under the leadership of the port and develops simultaneously the steel industry, petrochemical industry, wood industry, and food and drug industry. Lanshan District can focus on developing steel industry, chemical industry, ships and equipment manufacturing, modern logistics, wood processing, soybean and aquatic products processing and so on, building it into a world class steel base, a heavy and chemical industries clustering region at Haizhou Bay, the biggest distribution hub of imported wood in the north, and a trade and logistics center of marine products, chemical liquids and rolled steel.

The direct economic hinterland of Rizhao Port includes 18 municipalities, and they are: the seven municipalities in the south of Shandong Province(Rizhao, Linyi, Zaozhuang, Jining, Heze, Tai'an, Laiwu), the five municipalities in the north of Henan Province(Xinxiang, Jiaozuo, Hebi, Anyang, Puyang), the four municipalities in the south of Shanxi Province(Changzhi, Jincheng, Linfen, Yuncheng) and two municipalities in the Guanzhou region of Shaanxi Province. The main characteristics of the hinterland: the disparate economic development of the hinterland; industrial structure characterized with the problems such as "low, small and loose". Different regions can make use of and step up efforts to develop their domestic resources so as to give full play to their advantages. **The backwardness of logistics service** 

Rizhao should enhance the construction of logistics parks such as bonded logistics center, comprehensive port logistics parks, wood processing logistics parks, and aquatic products logistics parks. The goods supply of Rizhao Port is composed of ten dominant

types of goods, which are coal, iron ore, container, grain, liquid chemical and oil, aluminum oxide, coke, cement, wood and steel; the auxiliary types of goods have all kinds of bulk cargoes such as non-metallic ore and chemical fertilizer, and roll-on roll-off transport of passengers and cargoes has been launched. The logistics service focuses on the development of building steel logistics parks, coal logistics distribution center, bonded logistics warehouse and so on.

# The Opportunities of Rizhao Port

# Policy orientation: blue opportunities

During the 12th Five-Year Plan period, Shandong Province builds the blue economic zone of Shandong Peninsula and the port industry clustering zone in the south of Shandong; Rizhao implement the strategical plan of building emerging cities with characteristics; the major port and hinterland projects, such as Rizhao-Yizheng Petroleum Pipeline, Rizhao-Dongming Petroleum Pipeline, Rizhao-Puyang Petroleum Pipeline, the railway passage in the central and south part of Shanxi Province, and high-quality steel base of Rizhao, has sped up. All those above provide Rizhao Port with crucial golden opportunities to achieve the sustainable and fast development.

# The restructuring of energy resources

The orientation of energy resources restructuring is "transferring the mode and adjusting the structure". The change of energy resources structure will directly influence China's coastal transport demand of coal, natural gas and petroleum in the future, thus leaving quite large room for the development of coastal port. Rizhao Port being a young port, with the arrival of low carbon economy era, the fact that Rizhao Port speeds up the construction of green and ecological port will lay the foundation for the sustainable development of the port.

# The Threats Confronting Rizhao Port

# The contraction of the world's economy

International trade suffers severe shrinking under the influence of global financial crisis. Especially the container handling capacity related with ports is exposed to more influence. At present, the obstruction in the way of foreign trade recovery is relatively large, and the demand from the US is weakening a lot. During the 12th Five-Year Plan period, there are many uncertainties with the development of foreign trade.

# The intensifying competition among regions

The competition of ports is mainly reflected in the aspects of the competition among different port groups, among different ports within the same port group, and among different port enterprises within the same port. The battle among ports are mainly for hinterland resources, transit goods supply, berthing vessels, investment amounts and so forth. China has five major port groups: Bohai Bay Rim, Yangtze River Delta, Southeast Coast Area, Pearl River Delta and Southwest Coast Area.

In the Bohai Bay Rim port group, the three central ports, Dalian Port, Tianjin Port and Qingdao Port, are all comprehensive ones, which are almost on a par in development history, location conditions, hinterland economy and port business. From the perspective of hinterland, they have overlapping parts, which means the fierce competition among them at present and in the future. Dalian Port, which relies on the position of northeast Asian shipping center, is sparing no effort to build international comprehensive logistics port; Tianjin Port, as the core carrier of international shipping center in the north of China, poses "four major industries" to be the pillar expanding functions, and transforms itself into international port operator; Qingdao Port sets up its goal of becoming the economic center of coastal region in the east, the modern service center, and the culture center. 2011 witnessed the "4+1" port strategic alliance framework agreement, driven by Shandong Provincial Government, signed by Qingdao Port, Rizhao Port, Yantai Port, Weihai Port and Busan Port of the South Korea, which means their concerted efforts to build a northeast Asian international logistics hub and a shipping center. Although the leadership of northeast Asia is still unknown, the intense competition is evident and becoming more and more fierce. Therefore, the strategical alliance among ports becomes a quite good development direction.

# The Choice of the Strategical Alliance of Rizhao Port Supply Chain

As is showed in the SWOT analysis, advantages outweigh disadvantages of Rizhao Port supply chain, and opportunities and threats both exist, so the ST strategy, in the SWOT analysis matrix, of drawing on advantages and avoiding disadvantages can be adopted. For this reason, our emphasis is how to choose appropriate strategic alliance partners for Rizhao Port supply chain, the way of cooperation, and the feasibility of cooperation.

# The Way of Strategic Alliance Cooperation for Supply Chains in Rizhao Port

The port Strategic Alliance should be based on cooperation agreements or network cooperative relationships established among ports or upstream and downstream firms in supply chains for their common goal. It aims at taking full advantage of the limited resources of the ports to exert our greatest strengths and promoting the close cooperation with other ports and firms to meet our own demand for some resources. Following the alliance, we can better realize the goal of intensive management and market competition strategy.

# Divided according to the properties of subject in alliance

According to the subject in alliance, we can divide the dynamic logistics alliance into three forms: horizontal integration, vertical integration and blended integration.

Horizontal integration dynamic logistics alliance is the logistics alliance that is formed by core competitive port enterprises and other port enterprises with equivalent logistics capability, aiming at responding to market demand quickly and accelerate resource sharing and complementarity. Without market opportunity this kind of alliance will soon end and then port enterprises will make up another new logistics alliance to meet market demand. Under the influence of this alliance, port enterprises can make the best of the Vertical integration dynamic logistics alliance is a good cooperation in which one port enterprise is at the core and makes business with suppliers and customers on the basis of supply-demand relationship. This kind of alliance is also dynamic, and when market opportunity is over, the port enterprise will weigh the benefits brought by the suppliers and customers and revalue the possibility of cooperation with them. On the one hand, this dynamic logistics alliance can reduce the risks that are caused by long-term cooperation; on the other hand it can also contribute to saving transaction cost.Meanwhile, the alliance enterprises attempt to leave out the middle level of logistics so as to achieve seamless connection. In their alliance, the cooperation enterprises should share logistics information with each other, including supplication information, transportation information, market information, and the information about logistics control and management, and immediately master the overall situation of logistics operation to adjust their plan.

Blended integration dynamic logistics alliance is the alliance that is centered on core competitive port enterprises and links port enterprises at similar capacity and upstream and downstream suppliers. This type of alliance can help small and medium-sized port enterprises lower the logistics cost and concentrate on operating dominant business, and promote common development of alliances by sharing risks.

#### Divided according to the basic content of alliance

In the light of their basic content, the dynamic logistics alliance of port enterprises can be sorted into market alliance, technology alliance, R&D alliance, supplication alliance and some other non-property rights alliances.

Market alliance, technology alliance and R&D alliance belong to enterprise-to-enterprise alliances, and they are the embodiment of horizontal integration dynamic logistics alliance. Under the influence of these alliances, port enterprises constantly enhance their competitiveness and ally with other ports on the aspects of logistics marketing, port logistics technology and R&D. On the one hand, greater economies of scale are achieved; and on the other hand, the problem of singular enterprises' high expenditure is solved to a great extent.

#### Divided according to the intensity of cooperation

The cooperative objects and partners of strategic alliances in port supply chains include ports, port logistics parks, the owner of cargo and their association, shipping and logistics companies, and neighboring port industrial parks. The alliances can be achieved in the following ways:

# Contractual agreement

For instance, port logistics parks can sign a deal on lands, storages and yards with ports, owners and shipping companies to introduce interflow of commodities, or make a treaty with them on logistics operation in the logistics park so as to provide all-embracing logistics services.

# Informal cooperation

For example, ports, shipping companies, owner units and logistics park staff can develop a non-contractual cooperation through accessing each other or exchanging staff in due time.

#### Joint venture enterprise

Joint venture enterprise refers to a form of enterprise cooperation in which two or more companies can operate one enterprise by co-funding, facing risks and sharing profits. In a broad sense, it belongs to the alliance and now it has been widely adopted. Rizhao and Qingdao Container Terminal Co., Ltd. is a typical example of joint venture enterprise.

Ports, shippers and shipping companies jointly invest in the establishment of logistics enterprises. Under the competitive and cooperative conditions, these companies tend to extensive cooperation, forming a new independent economic entity—— joint venture enterprise. For example, logistics parks can transfer lands for shippers, port and shipping companies, so that these companies can, on the basis of their business need, build appropriate storages or equipment and conduct enterprise management.

# Equity transfer

Most enterprises take equity stakes of other enterprises, aiming at assuring the capability of suppliers and establishing informal cooperation. That is to say, the companies participating in logistics business continue to operate their own business in the form of independent entity, and they can also get the benefits from both sides.

#### Virtual enterprise

A virtual enterprise is an enterprise alliance entity by which companies with different resources and advantages can tap markets and battle their rivals when new opportunities appear in the market. It is organized on the basis of sharing technology and information of information networks and sharing the cost, contributing companies' co-development and mutual benefits. Virtual Enterprise helps participating companies realize the extraordinary goal which cannot be achieved through their own ability, i.e., this goal is beyond the limit of companies' own resources. Therefore, expecting to build a virtual enterprise and break through their own limits, companies must cooperate with other enterprises with common goals and realize strategic alliance in all directions.

The virtual enterprise can be realized by electronic network. The application of network technology provides great convenience for logistics cooperation, which includes that it connects a mountain of core competence of enterprises by the internet to complement each other's advantages and drives to achieve the 1+1>2 systematic synergy effect, making enterprises reap more benefits and create more and better products and service. Ports logistics parks, ports, shipping companies, owners and harbor-neighboring industrial parks can form a temporary and dynamic alliance among enterprises. In this alliance, companies can make up enterprise nets through online agreement, have enough reserves and share resource. So when the market timing comes, they can jointly take this opportunity and achieve common development.

# The Partner of Strategic Alliance Cooperation for Supply Chains in Rizhao Port Horizontal integration alliance partners

*Choose alliance partners in the light of the comprehensive competitiveness of their ports.* 

On the basis of integrated evaluation index system, multi-level grey assessment method of comprehensive empowerment is applied to choosing alliance partners of Rizhao Port and 16 influential ports in China are sorted in order. The result of this research shows Ningbo-zhoushan Port, ranking the top of the list, becomes best partner for Rizhao Port.

Choose alliance partners based on their international ports.

Deals	name of port	January - December, 2013	January– December,2012	Increase over last	
Kalik		( ten thousand TEU ) (ten thousand TEU )		year %	
1	Shanghai port	3361.70	3252.90	3.34	
2	Singapore port	3260.00	3166.00	2.90	
3	Shenzhen Port	2327.80	2294.13	1.46	
4	Port of HongKong	2228.80	2311.00	(3.60)	
5	Busan Port	1765.00	1703.00	3.70	
6	Ningbo-zhoushan port	1732.68	1617.50	7.12	
7	Qingdao port	1552.00	1450.00	7.00	
8	Guangzhou port	1530.92	1474.36	3.83	
9	Dubai port	1363.00	1327.00	2.71	
10	Tianjin port	1300.00	1230.00	5.69	
11	Rotterdam Port	1167.00	1187.00	(1.70)	

#### Chart 2 The world's 10 largest container port throughput rankings in 2013

According to ports' structures and geological locations of the world, we use fuzzy comprehensive evaluation to analyze the data and find out that: East Asia can choose Busan Port as its partner; Southeast Asian can choose Singapore; America's Pacific Coast can choose Los Angeles; the Atlantic coast can choose Boston; the Gulf of Mexico can choose New Orleans; Europe can choose Rotterdam; and Middle East can choose Dubai.

# Choose technology alliance partner.

The top priority of Rizhao Port is to accelerate its development and boost the energy conservation and emission reduction of the port. Compared with 2005, the unit consumptions of integrated energy, production and water in RizhaoPort have been respectively decreased by 35.39%, 19.38%, 72.33% by the end of 2011. According to the Medium- and Long-Term Plan for Energy Conservation in Highway and Waterway raised by Ministry of Transport, coastal ports should, by 2015, reduce their production unit consumption by 8% of 2005. Rizhao Port has realized this goal in advance.

The technology alliance is of great necessity for Rizhao Port.

First, cooperate with high-end scientific research agencies and then put the technical results into every production procedure. Rizhao Port has made strategic cooperation with Waterborne Science Institution of Transportation Ministry and achieved great success, which includes building academician and expert workstation, enhancing the exchange and cooperation with high-end scientific research agencies and accelerating the application of technical achievements to production.

Second, Rizhao Port can seek cooperation with Tianjin Port for its coal conveying technology and share technology with each other. Due to the application of new technology, new equipment and new process, Tianjin Port boasts high-level modernization and

information which rank the top around the whole China. Tianjin Port employs the world's first-class consecutive lading and unlading equipment and its 10 km-long belt and corridor coal convey technology used in Nanjiang Port also hits the world's record.

Third, as for the shipping service center and one-stop service, Rizhao Port needs to draw experience from and cooperate with Tianjian Port in order to make great process. Tianjian Port has established international trade and shipping service center and electronic ports, providing customers with quick and efficient one-stop service ports. In 2010, Tianjian Port began to execute the relevant Business Process Reengineering (BPR), and as a result its data process was optimized and the decision support system was developed on the foundation of its database and expert system (ES). In addition, Tianjian Port built port Electronic Commerce (EC) system based on the EDI system and set up Tianjian Port ICP to expand its ISP function. Its international trade and shipping service center has co-worked with some shipping enterprises and government shipping sectors such as Customs, Inspection & Quarantine, Border Inspection, Maritime Department, port groups, and electronic port. Over 300 service windows are set in the service center, among which there are 133 customs service windows, 43 inspection & quarantine service windows, 18 maritime service center is also equipped with over 30 banks, customs clearances, customs inspections, ship agencies, forwarding companies and other intermediary organizations. They provide customers with various shipping and logistics business, including conducting the shipping exchange, passing customs and inspection, offering port services, financial settlement services, ship and cargo agent services, and information and consultation services.

Fourth, on the aspect of container terminal's central dispatch, Rizhao Port can choose Shenzhen Port as the partner. Shenzhen Port boasts world's advanced container terminal's central dispatch system. The functions of this system include the wireless data terminal, the container location, the remote login and query etc., providing automated, professional and intelligent services for customers. With the advanced facilities such as 65m-outreach shore cranes and 8 stories yards and multi-layered warehouses, Shenzhan Port now can operate ships with the world's biggest containers and offer comprehensive and professional logistics added services at any time.

#### Choose marketing alliance partner.

First, Hefencity Port, Hamburg can be taken into consideration. The development of ports need be driven by the harbor city. If the harbor city is charming, the related effects will rise. Therefore, building Rizhao into a harbor city image with global investmentattracting is essential for Rizhao Port to develop in its globalizing process. Taking Hefencity Port as example, Hamburg of German regards huge project constructions as globalizing development strategy and creates a global image of capital-attracting by setting up a new paradigm of European urban, displaying the process of project constructions, holding international architecture contest and creating marketing strategic system on culture capital. All of these reveal that local government can play a role in promoting the city's international development, that is, major development projects, historical and cultural features and appropriate marketing system are

effective methods to help the city build a globalizing image, attract global investment and promote its internationalization.

Second, it's Ningbo—Zhoushan Port. Ningbo—Zhoushan Port is a rapidly developing port in the Yangtze River Delta region, and has great common with Rizhao Port. So both ports can make close cooperation with each other, especially in the fields of investment, business, information technology and maritime affairs. Ningbo—Zhoushan Port and Shanghai Port are always in competition. From the General Plan of Ningbo—Zhoushan Port in March, 2009, we can see that Ningbo—Zhoushan Port would work with Shanghai Port to build an international shipping center, which would generate an important effect on Ningbo—Zhoushan Port to develop into world-top port. The dislocation development and function distinction are the foundation of the two ports. In addition, in order to face with financial crisis, Ningbo—Zhoushan Port exerts its leading advantages, and has singed cooperative agreements with

Jiaxing, Wenzhou, Taizhou and other ports. Now the transfer amount of containers in Jiaxing and Taizhou increases significantly. <sup>[15]</sup> What's more, Ningbo—Zhoushan Port take an active part in building "waterless port" in hinterland cities of Zhejiang province and launch the direct sailing to Taiwan, constantly strengthening the ports' radiation force.

Third, it's Shenzhen Port. The relationship between Shenzhen port and Hong Kong Port is similar to that between Rizhao Port and Qingdao Port. In recent years, Shenzhen Port and Hong Kong Port have achieved extensive and outstanding cooperation in many fields, including the investment and construction, the business management, the application of science and technology, the operation

specification, maritime researches, the search and rescue, the pilot transition, business negotiations and customer services. <sup>[16]</sup> Without Hong Kong industries' help and participantion, Shenzhen Port would not reach such great achievements. Meanwhile, the rise of Shenzhen Port also helps Hong Kong industries promote their business upgrading and extend their development space. So the relationship between the two ports can be regarded as the division and cooperation in a virtuous circle.

#### IV. VERTICAL INTEGRATION DYNAMIC LOGISTICS ALLIANCE

Vertical integration mainly embodies the alliance between ports and cargo, ports and shipping, as well as ports and parks. In supply chains, the ports, owners, shipping companies, logistics parks, and industrial parks can contribute to cargo supplying and seamless link of distribution, and thus enhance the quality and efficiency of ports.

Alliance between ports and cargo

Yanzhou Mining Group, China National Coal Group, Zibo Mining Group and Lu'an Mining Group are not only the comperative partners of Rizhao Port Group but also its stockholders. So Rizhao Port has mature alliance with these owners. For

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owners, they expect suppliers can provide "less bulks, less inventories, while more batches and more varieties" services, and "door-todoor", "self-to-shelf" or "line-to-line" logistics services with low cost. Under the influence of economic globalization, ports have to face with the constant profit decline in harbor handling and freight transport brought by the intensively competitive market. So ports have to seek broader space for development. Ports constantly develop their integrated services and meanwhile take their information advantages to expand the services to enterprises' whole process of production and operation, such as sales planning, inventory planning, order planning and production planning. The ports and cargo alliance is necessary for ports to stabilize their goods supply

and can be regarded as the logistics service aim for ports. <sup>[17]</sup>

#### Alliance between ports and shipping

Rizhao Port can build partnerships with world well-known shipping companies, such as Mearsk Group, Cosco Group, P&O Nedlloyd, CMA-CGM Group, China Shipping Group, the Korean Air, the NYK(Nippon Yusen Kaisha Line Ltd) and SIT Group. The container handling capacity of ports is an important indicator of international logistics center. Therefore, in logistics field ports undertake a wide variety of partnerships with shipping companies, especially with container liner companies. For instance, ports and shipping companies jointly take up stakes, operate some inland shipping and wharfs, transfer shares, and allow container liner companies' stake participation and management, so as to realize asset complementing and resource sharing of each party. Mearsk Group can be the example. Mearsk takes up 30% stake of Tanjung Pelepas Port and positively engages in cooperating with Shanghai Waigaoqiao and managing the fourth-phrase stocks. Ports can make cooperation with liner companies on the stocks of wharf bonded areas, storage yards and warehouses. In addition, both sides can jointly present a third logistics service and develop information platform.<sup>[17]</sup>

#### platform.

# Alliance between ports and parks

Rizhao Port can work with some mature logistics parks like Zhengzhou International Logistics Park, Xuzhou Logistics Park, Lanhua International Logistics Park in Shanxi Province, Gaijiagou International Logistics Park of Ji'nan, Jinxiang International Logistics Park, Jinhua International Logistics Park, Chengdu International Logistics Park and so on. Harbor-neighboring industrial parks and logistics parks are the important positions for innovative alliance. Ports are logistics distribution centers and harbor-neighboring industries are the best integration of production factors and meet for the needs of supply chains. Considering ports' effects on logistics industries and harbor-neighboring industries, we need to take full use of harbor-neighboring limited land resources and make good arrangements for logistics parks and harbor-neighboring parks. Therefore, when planning logistics parks in the ports and harbor-neighboring areas, we should construct a variety of storage yards and supporting facilities, improve ship agents, freight forwarding, information providing, road transportation and other supporting functions, and launch logistics business to draw domestic and foreign enterprises. We expect tha the improvement of logistics services and structures can bring the better convenience for our owners.

#### V. BLENDED DYNAMIC LOGISTICS ALLIANCE

Blended dynamic logistics alliance depends on suitable ports and upstream & downstream resources in ports' supply chains. As for Rizhao Port, it can choose the ports whose business scopes are similar to it and handling capacity is within the field's standard. So considering the container, Rizhao Port can choose Shanghai Port; as for the iron ore, it can choose Ningbo-Zhoushan Port; as for the cement, it can choose Yantai Port; on the coal, it can choose Qinhuandao Port and on the liquid chemical and oil product, it can choose Lianyun Port.

Viewed from the fierceness of competition and cooperation and the overlapping of economic hinterland, Rizhao Port is suitable to cooperate with Weihai Port, Yantai Port and Qingdao Port in Shandong Province, which needs the government's efforts and the positioning of every port in the strategic alliance. China and South Korea "4+1" Port Strategic Alliance Operation Rules signed by Qingdao Port, Rizhao Port, Yantai Port, Weihai Port and South Korean Busan Port market the operation of "4+1" port cooperation mode driven by Shandong Provincial Government.

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#### AUTHORS

First Author - Libin Guo, School of Management, Qufu Normal University, Rizhao276826, China

# Antibacterial And Phytochemical Evaluation of *Pergularia daemia* from Nagapattinam Region.

# Vijaya Packirisamy <sup>\*</sup> Vijayalakshmi Krishna Moorthy <sup>\*\*</sup>

<sup>\*</sup>Department of Biochemistry, Bharathiar University, Coimbatore, Tamilnadu, India. <sup>\*\*</sup> Department of Biochemistry, Bharathi women's College, University of Madras, Tamilnadu, India.

*Abstract*- The present study deals with the phytochemical examination and therapeutic importance of *Pergularia daemia*. The plant *Pergularia daemia* has been traditionally used as laxative ,antipyretic ,expectorant and also used to treat infantile diarrhea and malarial fever. This study involves the preliminary phytochemical screening followed by antibactertial activity. The phytochemicals such as Tannins ,Saponins ,Flavonoids ,Quinones, Phenols and Alkaloids,Steroids,Glycosides were present in the hydroalcohol of *Pergularia daemia* leaf extracts was higher amount than the other solvent extracts. In the Antimicrobial activity both gram

*Index Terms*- Phytochemical, Antipyretic, Antibactertial activity, *Pergularia daemia*, MIC.

#### I. INTRODUCTION

The medicinal plants are useful for healing as well as for L curing human diseases because of the presence of the phytochemical constitutents(Nostro et al.,2000). They are grouped as alkaloids, glycosides ,steroids, coumarins, flavonoids and essential oils. Over 50% of all modern clinical drugs are of natural origin(Cordell. G, 1995). Research in medicinal plants has gained a renewed focus recently. The prime reason is that other system of medicine although effective and it has a number of side effects that often lead to serious complications. Plant based system of medicine being natural does not pose serious problems. Pergularia daemia also called as Pergularia extensa or Daemia extensa, belongs to milky weed family Asclepiadaceae. Generally, the family Asclepiadaceae includes more than 2000 species classified under 280 genera are distributed world wide in the tropical and subtropical regions(Pankaj et al.,2003).

ASCLEPIADACEAE is a large genus of shrubs, and *Pergularia daemia* (forsk) chiov belongs to this family. Asclepiadaceae is foetid smelling Laticiferous twiner found in the plains though out the hot pasts of India, ascending to an altitude of 1000 meters in Himalayas (Anonymous,1997). *Pergularia daemia* asclepiadacae (Khare. C.P, 2007) known as *Pergularia* in English, Veliparuthi in Tamil, Uttaravaruni in Sanskrit and Utranajutuka in Hindi belongs to the *Pergularia* Species is a perennial twining herb and is widely distributed in the tropical and subtropical regions of Asia and South Africa and have multiple applications in different folk medicines.

Traditionally the plant *Pergularia daemia* is used as antihelmintic, Laxative, antipyretic, expectorant and also used

to treat infantile diarrhoea and malarial intermittent fevers(Kirtikar. K.R, Basu.B.D, 1999; Nadkarani. A.K, 1976) Anonymous, 1995). Latex of this plant is used for toothache ( Hebbar et al 2004). Stem barks are used for cold&fever (Dokosi .O.B, 1998; Bruce .T.B.F, 1998&2000). Aerial parts of this plant have been reported for the various pharmacological activities hepatoprotectivity (Suresh kumar like et al.,2006), antifertility(Golam Sadik et al., 2001), antidiabetic (Wahi et al 2002) analgesic, antipyretic and anti inflammatory. The phytochemical investigation shows the presences of cardenolides, alkaloids and saponins(Sathish et al., 1998). The plant was found to contain various triterpenes and steroidal compounds(Anjaneyulu et al.,1998).

Many antibacterial agents are available in the Market, which are developed by the scientists. But still the microbes are challenging the scientist by developing the resistance to the presently available drugs. Plants are known to produce a variety of compounds to protect themselves against a Variety of pathogens and therefore Considered as potential source for different classes of antimicrobial Substances(Micheal.J, Pelezec, Chan. E.C.S, 1998). So, the present investigation has been carried out to shed light on the preliminary phytochemical Screening and to study the antibacterial activity of *Pergularia daemia* leaf extracts.

#### II. MATERIALS AND METHODS

A. **Collection of Plant Sample**: The fully mature *Pergularia daemia* leaves were collected in August – September 2012 from south poigainallur village in Nagapattinam district of Tamilnadu, India and the Plant was taxonomically identified by Dr.P.Jayaraman, Plant anatomy research centre, Chennai, Tamilnadu, India. The Voucher Specimen of *Pergularia daemia was (PARC/2013/2118)*.

**B.** Processing of plant sample: The leaves of *Pergularia daemia* are properly washed in tap water and then rinsed in distilled water. The rinsed leaves are shade dried and powdered using electrical blender. The powder was stored in air tight glass containers, protected from Sunlight until required for analysis . Solvent extraction:

About 10 gm of powdered plant material was soaked separately in 100ml of methanol, ethanol, hydro alcohol (1:1), ethylacetate, chloroform for 3-4 days at room temperature in dark condition. The extracts were filtered by using what man filter paper. The filtrate was concentrated to dryness under reduced pressure at 40  $^{\circ}$  C using a rotary evaporator and stored at 4 $^{\circ}$  C for

further use. Each extracts was resuspended in the respective solvent and used for the qualitative and quantitative analysis of phytochemicals. For the antimicrobial testing the extracts were reconstituted to a specific concentration in dimethyl sulphoxide (DMSO).

#### Aqueous extraction:

10 gm of dried powdered plant leaves was soaked in 100ml of distilled water for 3-4 days at room temperature in dark condition. Then the water extract was filtered through filtered through filter paper and the filtrate was used for the phytochemical analysis.

#### C. Phytochemical Analysis:

The tests were done to find the presence of the active chemical Constituents such as alkaloids, glycosides, terpenoids, steroids, flavonoids, tannins by the following Procedures.

**Alkaloids:** Alkaloids are basic nitrogenous compounds with definite physiological and pharmacological activity. Alkaloid solution produce white yellowish precipitate when a few drops of Mayer's reagents are added (Siddiqui et al.,1997). Most alkaloids are precipitated from neutral or slightly acidic solution by Mayer's reagent(Evans, W.C, Trease,2002). The alcoholic extract was evaporated to dryness and the residue was heated on a boiling water bath with 2% hydrochloric acid. After cooling, the mixture was filtered and treated with a few drops of mayer's reagents. The sample were then observed for the presence of turbidity or yellow precipitation.

**Steroids:** 1ml of the plant extract was dissolved in 10 ml of chloroform and equal volume of concentrated sulphuric acid was added by sides of the test tube. The upper layer turns red and sulphuric acid layer showed yellow with green fluorescence. This indicated the presence of steroids( Gibbs ,1974).

**Terpenoids:** To 2ml of the plant extract was added to 2ml of acetic anhydride and concentrated  $H_2SO_4$ . The formation of blue green ring indicate the presence of terpenoids(Ayoola et al., 2008).

**Tannins:** 2ml of extract was added to few drops of 1% lead acetate , and the yellowish precipitate indicated the presence of tannins(Treare, G.E, and Evans W.C ,1985).

**Saponins:** 5ml of Extract was mixed with 20ml of distilled water and then agitated in a graduated cyclinder for 15 minutes. Formation of foam indicates the presence of Saponins( Kumar et al.,2009).

**Anthocyanins**: 2ml of extract is added to 2ml of 2 N Hcl and ammonia. The appearance of pink-red which turns to blue-violet indicates the presence of anthocyanins (Paris. R and Moyse. H 1969).

**Coumarins:** 3ml of 10% NaOH was added to 2ml of extract and the formation of yellow colour indicates the presence of coumarins(Rizk. A.M,1982).

**Flavonoids :** 1 gm of the powdered sample was boiled with 10 ml of distilled water for 5 minutes and filtered while hot and few drops of 20% sodium hydroxide solution was added to 1ml of the cooled filtrate .A change to yellow colour which on addition of acid changed to colourless solution depicted the presence of flavonoids (Sofawora. A,1993; SomoLenski. S.J,1974; Harbone. J.B,1973).

**Cardiac glycosides :** 5 ml of extract was treated with 2ml of glacial acetic acid containing one drop of ferric chloride Solution. Then 1ml of concentrated sulphuric acid was added . A

brown ring at the interface indicated the deoxy sugar characteristics of cardenolides. A Violet ring may appear below the ring while in the acetic acid layer, a green ring may be formed (Sofawora. A,1993; SomoLenski. S.J,1974; Harbone. J.B,1973).

**Glycosides:** Glycosides are compounds which upon hydrolysis give rise to one or more sugars(glycones) and a compound which is not a sugar (aglycone or genine). To 1 ml of the extract in glacial acetic acid, few drops of ferric chloride and concentrated sulphuric acid was added and observed for a reddish brown colour at the junction of 2 layers and the bluish green colour in the upper layer) (Siddiqui, A.A et al. 1997).

**Phenols & Tannins :**Crude extract was mixed with 2ml of 2% Fecl<sub>3</sub> solution. A blue green or black colour indicated the presence of phenols & tannins(26 Sofawora, 1993; Trease. G.E,1989; Harborne. J.B,1974).

**Quinones :**Dilute sodium hydroxide was added to the 1ml of crude extract and the blue green or red coloration indicates the presence of quinones.( Sofawora, 1993; A, Harbone. J.B,1973; Trease G.E,1989).

**Betacyanin** :About 2ml of extract was added with 1ml of 2N NaOH and heated for 5min. The Formation of bluish green colour indicates the presence of antho cyanin and Formation of yellow colour indicates the presence of beta cyanins(Yadav et al.2011).

#### **D. Bacterial Cultures:**

Gram Positive bacterial cultures like *Staphylococcus* aureus, Bacillussubtilis, Staphylococcuspyogenes and gram negative Organisms like Klebsiella pneumoniae, Aeromonas hydrophila, Escherichia coli, Pseudomonas aeruginosa, Vibrio Harveyi are used as test organisms. All the test strains were maintained on nutrient agar and were sub cultured once in every two weeks.

#### Antibacterial assay:

Antibacterial activity of the plant extract was determined using a Kirby- Bauer disk diffusion method( Bauer et al.,1966). Briefly, 100 µl of the test bacteria were grown in 10ml of fresh media until they reached a count of approximately  $10^8$  cells of bacteria . And then 100µl of microbial suspension was spread on to the Muller Hinton Agar(MHA) Plates and sterile wells were made with the help of sterile cork borer.The hydro alcohol extract of *Pergularia daemia* (250, 500, 750 µg/ml) were added to the wells in aseptic conditions. The above Plates were incubated at  $37^{0}$ C for 24 hours, then the diameters of the inhibition zones were measured.Each antibacterial assay was performed in triplicate & Mean Values were reported. Standard antibiotic, cipiofloxacin (10µg/well) served as positive controls for antimicrobial activity.

#### E.Minimum inhibitory concentration (MIC):

The minimum inhibitory concentration(MIC) of the extracts was determined by broth dilution method. The decreased concentrations of the extract were prepared ( $3000-250\mu g/ml$ ).The extracts were weighed and reconstituted appropriately in sterile distilled water.In each tubes containing 8ml of sterile Mueller Hinton broth,1ml of the different concentration of extract,1ml overnight broth culture of the test organisms were introduced. The tubes were rolled between the palms for even mixing and incubated at 37<sup>°0</sup> C for 24 h.Turbid tubes after incubation indicates negative and the least extract concentrations where

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clarity in the medium is visible to the naked eyes, determined the MIC of the extracts(Akharaiyi et al.,2011).

## III. II. RESULTS & DISCUSSION

The preliminary phytochemical analysis of different solvents extracts of *Pergularia daemia* revealed the presence of alkaloids, flavonoids, tannins, phenolic compounds, Quinones, steroids, terpenoids and saponins as illustrated in table- 1.

The results of antimicrobial activities of 3 different concentration of (250, 500,750µg/ml) hydro alcohol (1:1) extracts of *Pergularia daemia* showed wide spectrum of activity against test organisms namely *Staphylococcus aureus, Bacillus substilis, Staphylococcus pyogenes*(gram positive), *E.coli, Pseudomonas aeruginosa* and *Klebsiella pneumoniae, Aeromonas hydrophila, Vibrio harveyi*(gram negative)(Table-2,3).

Table-2 summarised the(gram positive) microbial growth inhibition of hydro alcohol extract of Pergularia daemia, The lower concentrations (250,500µg/ml) of hydro alcohol extracts does not shows any inhibitory activity on both of the bacterial strains. The results shows that the hydro alcohol extract with increased concentration (750 µg/ml) has increased inhibitory activity against Pseudomonas aeruginosa, E.coli, Vibrio harvevi, Aeromanas hydrophila, klebsiella Pneumoniae (ie) 12.5, 12.3, 12, 10.2, 8.2 mm.Similarly table-3 shows that (Gram negative) microbial growth inhibition of hydro alcohol extracts of Pergularia daemia. The Maximam zone of inhibition was observed in 750 µg/ml of plant extracts against Bacillus substilus and Staphylococcus aureus(ie) 10.2, 8.4mm. But the Staphylococcus pyrogenes does not show any inhibitory activity against the 3 different concentration of hydro alcohol extract of Pergularia daemia. The zone of inhibition produced by ciprofloxacin against gram positive and negative organism was range from 22-26.3 mm.

The MIC of hydro alcohol extracts of *Pergularia daemia* was determined by NCCL & two fold serial dilution broth method. Table-4,5,6 shows the extract of *Pergularia daemia* inhibited the growth of the *Klebsiella pneumonia*, *Aeromonas hydrophila*, *Staphyto coccus aureus*, *Staphylo coccus pyrogenes* at the concentration of 1500  $\mu$ g/ml. similarly MIC of hydro alcohol extract of *Pergularia daemia* inhibited the growth of the *E.coli*, *Pseudomonas aeruginosa*, *Vibrioharveyi*, *Bacilles subtilis* was found to be 750  $\mu$ g/ml.

Anthocyanins, glycosides, coumarins, saponins, steroids and triterpenoids were observed in a majority of species whose may attributed to the medicinal properties of presence plants(Senthilkumar. M, Gurumoorthy et al., 2011). The daemia Pergularia contains alkaloids .tannins and flavonoids, cardiac glycoside and terpenes. The antimicrobial activity is probably due to the membrane disruption by terpenes and their activity might be due to their ability to form complex with extra cellular, soluble proteins and bacterial cell wall and disrupt microbial membrane (Deepika thenmozhi et al.,2011).

Several benzoquinones, naphthoquinones and athraquinones have also shown antibacterial and antiviral activities of *Pergularia daemia* (Savarimuthu ignacimuthi et al.2009). Plant based antimicrobials have enormous therapeutic potential as they serve the purpose with lesser side effect that are often associated with synthetic antimicrobials(Iwu.M.W,Duncan.A.R,Okunji. C.O,1999).

The overall results focuses that plant extracts may be potent bacteriostatic/ bactericidal agents against bacterial strains. The results from this investigation indicates that the medicinal plants extracts offer significant potential for the development of noval antibacterial therapies and the treatments of several disease caused by microorganisms.

#### IV. CONCLUSION

From the present experiment the hydroalcohol extracts of *Pergularia daemia* has antibacterial activity due to the presence of active constituents. However further research will be needed for identification of the bioactive compounds of the plant which are responsible for the pharmacological action against the disease causing microorganisms.

S.No	Phytochemicals	Aqueous extract	Ethyl acetate extract	Ethanol extract	Hydro alcohol extract (1:1)	Methanol extract	Chloroform Extract	Petroleum ether extract
1.	Tannins	++	+	+++	+++	+	++	-
2.	Saponins	-	-	++	++	+	++	-
3.	Flavonoids	++	-	++	+++	-	-	-
4.	Quinones	++	-	+++	+++	+	-	+
5.	Betacyanins	++	-	++	++	+	+	-
6.	Anthocyanins	-	-	-	-	-	-	-
7.	Steroids	++	-	+++	++	+	-	+
8.	Alkaloids	-	+	+	+	+	+	-
9.	Glycosides	-	-	+	+	+	-	-
10.	Terpenoids	+	-	++	++	+	-	+
11.	Cardiacglycosides	-	-	-	-	-	-	-
12.	Phenols	+	+	++	++	+	-	-
13.	Coumarins	++	-	++	+	-	-	-

# Table I. Phytochemical analysis

Where as:+++:Strongly present,++:Mildly present

,+ Present and – Absent.

Table II.	Antibacterial a	ctivity (gram	positive organisms)
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S.NO	Organisms	Zone of Inhibition(mm)				
		Ciprofloxacin Hydroalcohol extracts				
		(standard)	250µg	500µg	750µg	
1.	Staphylococcus aureus	23.4±0.4	NA	NA	8.4±0.4	
2.	Bacillus subtilis	22±0.1	NA	NA	10.2±0.3	
3.	Staphylococcus pyogenes	25.3±0.3	NA	NA	NA	

The values are expressed as mean ± SD of three samples(n=3).

S.NO	Organisms	Zone of Inhibition(mm)				
		Ciprofloxacin	Hydroalcohol extracts			
		(standard)	250µg	500µg	750µg	
1.	Klebsiell pneumoniae	24±0.3	NA	NA	8.2±0.25	
2.	Aeromonashydrophila	25.2±0.25	NA	NA	10.2±0.25	
3.	E.coli	25.4±0.36	NA	NA	12.3±0.30	
4.	Pseudomonas aeruginosa	26.3±	NA	NA	12.5±0.25	
5.	Vibrio harveyi	24.1±	NA	NA	12±0.20	

## Table III. Antibacterial activity (gram negative organisms)

The values are expressed as mean $\pm$  SD of three samples(n=3).

Table IV.	Minimum	Inhibitory	Concentration(µg/ml)
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Concentration/Organisms Klebsiell pneumoniae		Aeromonashydrophila	E.coli
3000ug	0.52+0.02	0.44+0.03	0.54+0.04
1500 μg	0.30±0.02	0.31±1.4	0.57±0.03
750 μg	0.44±0.03	$1.4{\pm}0.25$	$0.5 \pm 0.02$
500 μg	1.1±0.02	1.24±0.03	0.62±0.02
250 μg	$1.4{\pm}0.02$	$1.28 \pm 0.03$	1.3±0.3
Negative control	No growth	No growth	No growth
Control	1.2±0.21	1.13±0.25	1.4±0.3

The values are expressed as mean± SD of three samples(n=3)

## Table V. Minimum Inhibitory Concentration(µg/ml)

Concentration/Organisms	Pseudomonas aeruginosa	Vibrio harveyi
3000µg	$0.47 \pm 0.02$	0.45±0.02
1500 μg	0.34±0.03	0.33±0.03
750 µg	$0.27 \pm 0.02$	0.25±0.02
500 µg	$0.57 \pm 0.02$	1.3±0.25
250 µg	$0.76 \pm 0.01$	1.4±0.25
Negative control	No growth	No growth
Control	$1.7{\pm}0.5$	1.2±0.1

The values are expressed as mean $\pm$  SD of three samples(n=3).

# Table IV. Minimum Inhibitory Concentration(µg/ml)

Concentration/Organisms	Staphylococcus aureus	Bacillus subtilis	Staphylococcus
			pyogenes
3000µg	0.45±0.01	0.47±0.03	0.44±0.03
1500 μg	0.33±0.03	0.26±0.03	0.33±0.03
750 μg	0.84±0.04	0.24±0.03	$0.74{\pm}0.02$
500 µg	0.96±0.02	0.25±0.03	1.1±0.02
250 μg	0.97±0.01	0.57±0.02	1.3±0.25
Negative control	No growth	No growth	No growth
Control	0.86±0.02	0.88±0.01	1.5±0.2

The values are expressed as mean $\pm$  SD of three samples(n=3).

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#### AUTHORS

**First Author**- VijayaPackirisamy,M.Sc.,M.Phil., Department of Biochemistry, BharathiyarUniversity, Coimbatore,

geethaa\_samy@yahoo.com, v.sulakshavelmurugan@yahoo.com Contact number-4426180333,9787351744.

Second Author- Dr.Vijayalakshmi Krishna Moorthy, Associate Professor,Department of Biochemistry ,BharathiWomen's College, University of madras, ,Chennai-108, Tamilnadu viji42research@yahoo.co.in

**Corresponding Author-** Dr.K. Vijayalakshmi, ,Associate Professor,Department of Biochemistry ,BharathiWomen'sCollege, Tamilnadu,Chennai-00108 . viji42research@yahoo.co.in Contact

number:04426185030/9884418074.

# Relationship between Service Quality and Customer Satisfaction in Sri Lankan Hotel Industry

**Umesh Gunarathne W.H.D.P** 

Department of Marketing Faculty of Management and Finance University of Ruhuna Matara: SRI LANKA

*Abstract*- After 30 years war, as a country Sri Lanka has a great opportunity to develop tourism industry and there are lot of tourists visit to spend holidays in Sri Lanka from around the world. In tourism industry Hotels play a major role. Therefore the hotels should be provided excellent services quality for their customers.

Services quality is considered substantial when it comes to define organizational success. The winning strategy is to deliver best services quality to customers. Today, need to improve services quality in Sri Lankan hotel industry have come under limelight due to stiff competition where hotels are trying to attain competitive advantage through the human factor. Excellent quality service not only results in a profit strategy but also it is energizing for employees to perform to their potential to meet challenges. By providing quality service, hotels can sustain customers' confidence and gain competitive advantages over their competitors. This study studies the relationship between Services Quality and Customer Satisfaction in Sri Lankan hotel industry.

In this research paper, quantitative methods were used. The data were collected through questionnaire which contained five point likert scale Statements. Results of different correlations, T-test and hypotheses testing revealed a great deal of existing services with customer satisfaction. In order to generate the results employed confirmatory factor analysis by using Smart PLS. Mainly courtesy of attendants, comfort in guestroom, cleanliness and environment of hotel have played vital role in creating serenity and subsequent contentment among customers. This study confirms direct relationship between Service Quality and customer satisfaction. It seems judicious to believe that understanding of customer satisfaction role is extremely significant as it appears key factor in the success of modern organization specially hotels.

Index Terms- Customer Satisfaction, Hotel Industry and Service Quality

#### I. INTRODUCTION

**S** ervice Quality receives a significant amount of attention from researchers (e.g., Parasuraman, 1988, Markovic, S. (2005), Cronin, J. and Taylor, S. (1994)) When a country developing, it is quite general that service sector is getting higher proportion in the gross national production. Specially, after the industrial revolution the requirement of services to trade and services which not relevant to trade (E.g. - doctors, lawyers, teachers etc.)

have improved dramatically. So the service completion in the global market becomes stronger and shape. Unlike manufacturing organizations, service organizations have high involvement of human that is because service providers directly deal with customers than manufacturing organizations and overall performance of the organization is depend on how well the staff satisfied customer requirements via the superior Service quality.

As also service has to be consumed by customers at the time when the service provider delivers the service, if the service provider is not capable and experienced the whole organization image can be damaged with in a shorter period of time. Therefore it is obvious that quality is a critical factor for service organizations, in which customers get strong impression either service provider, respond positively or negatively. Especially with the growing completion it is essential that every organization should strengthen their quality in every aspect than competitors.

Service quality has been recognized as a key factor in differentiating service products. Customer satisfaction can be secured through high-quality products and services (Getty & Getty, 2003; Gupta & Chen, 1995; Tsang & Qu, 2000). Edvardsson (1996) highlighted that the concept of service should be approached from the customer's point of view, since it was his/her perception of the outcome that constituted the service. Customers may have different values and different grounds for assessment and, most of the time; they may perceive the same service in different ways.

#### **Problem Identification**

The quality of service in hotel industry is an important factor of successful business. The existing trend of complete quality management in hotel industry ensures the achievement of competitive advantage of hotel companies and is therefore the subject of contemporary research into service quality in hotel industry.

As the tourist Industry is well established & Blooming Industry in Sri Lanka Specially after the war, it is essential to identify the service Quality of them & whether the customers are given what they need & expect. So this research is purposed to identify whether there is a positive relationship between service Quality and customer Satisfaction in hotel industry as applying the existing theory to check the results in Sri Lankan hotel industry. Therefore throughout this study we hope to find a solution for following research question,

"What is the relationship between services quality and customer satisfaction in hotel Industry?"

# Objectives

- To examine the relationship between Service Quality and Customer Satisfaction.
- To identify major service Quality and Customer Satisfaction elements in the hotel industry.

# II. LITERATURE REVIEW

#### 2.1. Services Quality

There are many researchers who have defined service quality in different ways. For instance, Bitner, Booms and Mohr (1994, p. 97) define service quality as 'the consumer's overall impression of the relative inferiority / superiority of the organisation and its services'. While other researchers (e.g. Cronin and Taylor, 1994; Taylor and Cronin, 1994) view service quality as a form of attitude representing a long-run overall evaluation, Parasuraman, Zeithaml and Berry (1985, p. 48) defined service quality as 'a function of the differences between expectation and performance along the quality dimensions'. This has appeared to be consistent with Roest and Pieters' (1997) definition that service quality is a relativistic and cognitive discrepancy between experience-based norms and performances concerning service benefits.

Service quality is considered the life of hotel (Min &Min, 1996) and core of service management (Chen, 2008) Service quality is related with customer satisfaction (Shi &Su, 2007) and customer satisfaction is associated with customers revisit intention (Han, Back & Barrett, 2009). If an effective image is portrayed to customers, it will create competitive advantage for hotel (Ryu, Han & Kim, 2008). As a result of service development process three concept of service is composed and these three steps are service process, system and Service resources-structure (Edvardsson, 1997).

Marketing is the main factor that only focused on the Customer satisfaction (Flint & Woodruff & Gardial 1997 &Peter & Olson, 1996). Customer satisfaction plays an important role in financial performance of hotel (Nilssom Johnson & Gustafsson, 2001). In hotel industry, as service has direct interaction with customers, that is why customer satisfaction can be a replication of service quality in hotels.

# 2.1.1. Tangibility

The tangible Service Quality Dimension refers to the appearance of the physical surroundings and facilities, equipment, personnel and the way of communication. In other words, the tangible dimension is about creating first hand impressions. A company should want all their customers to get a unique positive and never forgetting first hand impression, this would make them more likely to return in the future (Delgado and Ballester, 2004).

# 2.1.2. Reliability

The reliability Service Quality refers to how the company are performing and completing their promised service, quality and accuracy within the given set requirements between the company and the customer. Reliability is just as important as a goof first hand impression, because every customer want to know if their supplier is reliable and fulfil the set requirements with satisfaction (Delgado and Ballester, 2004).

# 2.1.3. Responsiveness

The responsiveness Service Quality refers to the willingness of the company to help its customers in providing them with a good, quality and fast service. This is also a very important dimension, because every customer feels more valued if they get the best possible quality in the service (Delgado and Ballester, 2004).

# 2.1.4. Assurance

The assurance Service Quality refers to the company's employees. Are the employees skilled workers which are able to gain the trust and confidence of the customers? If the customers are not comfortable with the employees, there are a rather large chance that the customers will not return to do further business with the company (Delgado and Ballester, 2004).

#### 2.1.5. Empathy

The empathy Service Quality refers to how the company cares and gives individualized attention to their customers, to make the customers feeling extra valued and special. The fifth dimension are actually combining the second, third and fourth dimension to a higher level, even though the really cannot be compared as individuals. If the customers feel they get individualized and quality attention there is a very big chance that they will return to the company and do business there again (Delgado and Ballester, 2004).

# 2.2. Customer Satisfaction

Customer satisfaction is a business philosophy which tends to the creation of value for customers, anticipating and managing their expectations, and demonstrating ability and responsibility to satisfy their needs. Quality of service and customer satisfaction is critical factors for success of any business (Gronoos, 1990; Parasuraman etal., 1988). As Valdani (2009) points out: enterprises exist because they have a customer to serve. The key to achieve sustainable advantage lies in delivering high quality service that results in satisfied customers (Shem wellet al, 1998). Service quality and customer satisfaction are key factors in the battle to obtain competitive advantage and customer retention. Customer satisfaction is the outcome of customer's perception of the value received in a transaction or relationship, where value equals perceived service quality, compared to the value expected from transactions or relationships with competing vendors (Blanchard & Galloway, 1994; Heskett et al., 1990; Zeithaml et al., 1990). In order to achieve customer satisfaction, it is important to recognize and to anticipate customers' needs and to be able to satisfy them. Enterprises which are able to rapidly understand and satisfy customers' needs, make greater profits than those which fail to understand and satisfy them (Barsky & Nash, 2003).

Many researchers (Oliver, 1981; Brady and Robertson, 2001; Lovelock, Patterson and Walker, 2001) conceptualize customer satisfaction as an individual's feeling of pleasure or disappointment resulting from comparing a product's perceived performance (or outcome) in relation to his or her expectations. Generally, there are two general conceptualisations of satisfaction, namely, transaction-specific satisfaction and cumulative satisfaction (Boulding *et al.*, 1993; Jones and Suh, 2000; Yi and La, 2004).

#### III. CONCEPTUAL FRAMEWORK AND HYPOTHESES



#### Service Quality

# Hypotheses of the study

 $+H_{1=}$  There is a positive relationship between Tangibility and Customer Satisfaction.

 $+H_{2=}$  There is a positive relationship between Reliability and Customer Satisfaction.

 $+H_{3=}$  There is a positive relationship between Responsiveness and Customer Satisfaction.

 $+H_{4=}$  There is a positive relationship between Assurance and Customer Satisfaction.

 $+H_{5=}$  There is a positive relationship between Empathy and Customer Satisfaction.

#### IV. METHODOLOGY

#### 4.1 Research Approach

The research approach for the research study is "Descriptive Research". A deductive method refers to the use of logic of a theory to generate prepositions or hypothesis that can be tested. It also provides the need to explain the causal relationship between service quality and customer satisfaction in the hotel industry and also required the collection of quantitative data as well. This involves testing the theories that already exists and these tests will be carried out through questionnaires.

#### 4.2. Data Collection

Both primary and secondary data sources were used to ask research questions. In order to prepare the questionnaire, first, supervisor's views were elicited and then the research questionnaire was finally revised. Data were collected from foreigners who have visited Sri Lanka for spend holidays. 150 participants were involved in this study. After the distribution of questionnaire, there were only 134 complete questionnaires returned.

#### 4.3. Measurements

In developing measures to represent the concepts Service Quality and Customer Satisfaction, synthesized scales from the literature with those obtained in the field work. The initial measures were refined and pre tested to enhance the validity and accuracy of the questionnaire. Service Quality was measure under the 5 dimensions (Tangibility, Reliability, Responsiveness, Assurance and Empathy) and developed 23 Questions which are needed to cover 5 dimensions. Five point Likert scale were used (1= Strongly Disagree to 5= strongly agree). Customer satisfaction is the dependent variable of this study. By referring previous research findings developed 7 items which are relevant to measure customer satisfaction. Five point Likert scale were used. (1= Strongly Disagree to 5= Strongly Agree)

#### V. DATA ANALYSIS

#### 5.1. Results

The analysis of collected data was carried out through various statistical techniques and Structural equation modelling (SEM) is used to test the study hypotheses. A confirmatory factor analysis (CFA) is undertaken on the data to verify the dimensionality and reliability of the scale used to measure the customer satisfaction and Service Quality. Both Smart PLS 2.0 and SPSS (13) software packages were used in this Study.

#### 5.1.1 Validity and reliability

Based on the following table1 in Initial model column KMO for 30 items are .880, Chi Square value 2145.064, degree of freedom 435 and significance level is .000. It means that confidence level is 99.99%.

After deleting 2 items (One from Assurance, one from empathy and the items were deleted because the value of contribution to the variable was less than 0.5. Item A3 =0.23 and item E3 = 0.43) refined the new values and the values shows in final model column.

Based on the data illustrated in the following table1 final model column, it is seen that (KMO) coefficient for 28-item

questionnaire is 0.893, indicating the sample adequacy. Chi Square value 2057.156, Degree of Freedom 378 and Also Bartlett value is meaningful at 0.000 indicating that factors' separation has been appropriately done based on factorial loads and factors do not overlap each other. The coefficient of determination computed by using SMART PLS 2.0 and the value is .770. It means that 77%. Scholars like Bagozi (1988) accepted that r<sup>2</sup> value should be greater than 25% in order to become success research study. And also it represents the total impact of independent variables on dependent variables. Based on this study is a successful research study. ( $r^2 = 77\%$ )

Table no (1	) KMO	and	Bartlett	's	Test
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Initial Model	Final Model
.880	.893
2145.064	2057.156
435	378
.000	.000
	Initial Model .880 2145.064 435 .000

#### Table (2) Confirmatory factor Analysis (Final Model)

Constructs and Indicators	Standardised Loading ( t- values)	Composite Reliability/ AVE
<ul> <li>Service Quality <ul> <li>Tangibility</li> <li>Furniture in the hotel is modern and comfortable.</li> <li>The interior and exterior decoration in the hotel is quite appealing.</li> <li>The employees have neat appearance.</li> <li>The hotel facilities are up- to -date.</li> <li>The broaches and pamphlets are visually presented.</li> <li>The hotel is clean.</li> </ul> </li> </ul>	.82 (16.12) .81 (16.96) .75 (12.85) .66 (8.24) .71 (13.67) .75 (12.83)	.86/.57
<ul> <li>Reliability <ul> <li>The front desk employee accurately verified the reservation requests.</li> <li>The time it took to check in or check out is not too long.</li> <li>The reservation system is easy to use ( telephone and Internet reservation)</li> <li>Transport facilities are available.</li> <li>The employees provide error- free records.</li> </ul> </li> </ul>	.65 (9.61) .76 (13.87) .73 (10.72) .74 (12.94) .84 (24.85)	.86/.55
<ul> <li>Responsiveness</li> <li>The employees are courteous.</li> <li>The employees gave us special attention.</li> <li>The employees adopted Services to our needs.</li> <li>The staffs are willing to help guests.</li> </ul>	.75 (17.49) .82 (19.82) .80 (20.27) .85 (25.97)	.88/.68

703

<ul> <li>Assurance</li> <li>The Staff in the hotel is polite.</li> <li>The staff imparted confidence to the guests.</li> <li>The staffs are friendly.</li> </ul>	.82 (16.16) .80 (28.44) .90 (33.32)	.88/.71
<ul> <li>Empathy</li> <li>The employee quickly apologized when service mistakes are made.</li> <li>The employee listened carefully when you complain.</li> <li>Employees understand the customer's requirements.</li> </ul>	.83 (21.11) .73 (10.28) .66 (6.86)	.79/.56
<ul> <li>Customer Satisfaction <ul> <li>I intend to continue using this hotel</li> <li>I would recommend this hotel to other people</li> <li>I would like to stay in this hotel next time</li> <li>I would like repurchase many services in this hotel</li> <li>I would encourage friends and relatives to visit this hotel</li> <li>I consider the performance in this hotel strong</li> <li>I would consider this hotel as my first choice when I need a hotel service.</li> </ul> </li> </ul>	.81 (18.42) .77 (15.68) .76 (15.99) .77 (15.32) .79 (21.46) .78 (17.63) .75 (10.41)	.91/.61

Table no 2 Shows the confirmatory factor analysis. Confirmatory factor analysis assesses the degree to which the hypothesized structure of item is capable of representing the relationship in the data. After deleting 2 items (One from Assurance, one from empathy and the items were deleted because the value of contribution to the variable was less than 0.5. Item A3 =0.23 and item E3 = 0.43) the adjusted confirmatory factor analysis model shows in table 2. First, All composite reliabilities are .79 or higher, which indicates internal consistency among the measures far above the recommended level of .60 (Bagozzi and Yi, 1988). Second average variance extracted (AVE) ranged from .55 to .71. Bagozzi and Yi (1988) suggested a target level >.50.

# 5.2. Test of the Hypotheses

The Structural Equation Modeling (SEM) methodology was employed to test the hypotheses. Based on the values computed through the software it represent that the theoretical model fit the data well.

# 5.2.1. Tangibility and Customer Satisfaction

Hypothesis  $H_1$  states that there is a positive relationship between Tangibility and customer satisfaction. The hypothesis supported by the data because contribution to the customer satisfaction has taken positive value (+ **0.259**). Therefore developed hypothesis can be accepted. It means that there is a positive relationship between Tangibility and Customer Satisfaction.

#### 5.2.2. Reliability and Customer Satisfaction

Hypothesis  $H_2$  predicted that there is a positive relationship between Reliability and Customer Satisfaction. This prediction is supported by the data because according to the Smart PLS software Reliability contributes to the Customer Satisfaction by positive value (+ 0.116). The hypothesis which is developed by the researcher can be accepted.

#### 5.2.3. Responsiveness and Customer Satisfaction

Hypothesis  $H_3$  postulates that Responsiveness positively related with the Customer Satisfaction. The hypothesis supported by the data. The value of Responsiveness contribution to the Customer Satisfaction is (+ **0.440**). So the constructed hypothesis can be accepted. Finally it can conclude that there is a positive relationship between Responsiveness and Customer satisfaction.

# 5.2.4. Assurance and Customer Satisfaction

Hypothesis  $H_4$  states that there is a positive relationship between Assurance and Customer Satisfaction. The hypothesis not supported by the data because the contribution to the customer satisfaction has taken a negative value (-0.002). The hypothesis which developed is not match with the findings. Finally conclude that there is a negative relationship between Assurance and Customer Satisfaction.

#### 5.2.5. Empathy and Customer Satisfaction

Hypothesis  $H_5$  states that there is a positive relationship between Empathy and customer satisfaction. The hypothesis supported by the data because the value of Empathy contributes to the customer Satisfaction is (+ 0.140). Therefore the postulated hypothesis can be accepted according to the data. Therefore it can be concluded that there is a positive relationship between Empathy and Customer Satisfaction.

Relationship	Service Quality and Customer Satisfaction Hypothesis Number and Direction	
Tangibility and Customer Satisfaction	H1 (+)	Supported
Reliability and Customer Satisfaction	H2 (+)	Supported
Responsiveness and Customer Satisfaction	H3 (+)	Supported
Assurance and Customer Satisfaction	H4 (+)	Not Supported
<b>Empathy and Customer Satisfaction</b>	H5 (+)	Supported

#### Table (3): The relationship between Service Quality and Customer Satisfaction

The Summery of the hypotheses testing shows above table 3 and the left hand column shows that predicted hypotheses. The middle and right hand column show the direction of the hypothesized effect of service Quality on Customer Satisfaction and whether the hypothesized effects are supported by the findings or not.

#### VI. DISCUSSION AND CONCLUSION

The relationship between service quality and customer satisfaction (Caruana, 2002; Oh, 1999; Cronin etal., 2000; Parasuraman et al., 1988) has been the concern of many previous studies in the context of service industry. The purpose of this research is to investigate the relationship between Service Quality and Customer satisfaction. In the literature review section of the paper five dimensions (Tangibility, Reliability, Responsiveness, Assurance and Empathy) of service Quality are identified. The table 1 shows the major findings of this research study.

In this study, having knowledge on these areas would definitely help managers to meet the challenge of improving service quality in the hotel industry. This paper contributes to the theoretical orientation of tourism service quality and tourist's satisfaction in hotel industry literature by determining some major service quality levels. This study also identified five tourism service quality dimensions, namely, tangibility, reliability, responsiveness, assurance and empathy, all of which comprise the criteria tourists use to evaluate the service quality of Sri Lankan hotels. The findings of this study indicate that the most important factor in predicting tourism service quality evaluation was tangibility, followed by empathy, reliability, and responsiveness. The findings of this study suggest that among the five dimensions of service quality, assurance has a negative relationship with customer satisfaction. These results support the idea that despite the usefulness of the SERVQUAL scale as a concept, it should be adapted for the service environment as well.

In conclusion, knowing how consumers perceive service quality and being able to measure service quality can benefit management of hotel service. Measuring service quality can help management provide reliable data that can be used to monitor and maintain improved service quality. Using the SERVQUAL model to assess service quality enables management to better understand the various dimensions and how they affect service quality and customer satisfaction. This will help them to identify those that have strengths and weaknesses and thereby make necessary improvements. However, in this study, the researcher has been trying to measure service quality and customer satisfaction by using the SERVQUAL model and find out if it is an effective tool in assessing consumer's perceptions of service quality in hotels. Further, through this study the findings show that the SERVQUAL model is not a good tool to measure service quality in hotel industry because a dimension (Assurance) did not prove reliable for measurement and therefore the managers of the hotel industry can implement the strategies in order to enhance the employee performance through proper training and development programs about the hospitality and way of provide superior quality service. In conclusion, further the findings imply that different methods and models could be used to measure service quality and customer satisfaction in hotel industry.

#### **Future Research**

Several research implications and limitations emerged from this study. First, the study limited to examine only 5 hotels located in Galle district. It means that limited to geographical area and data analyzed only considering 105 questionnaires. The relevance of suggested consider other areas and analyzed data by using at least 300 completed questionnaires. Second the researcher developed questionnaire by referring literature review and it has been done based on one article which have conducted similar study in Ghana. For future researchers can choose different items by reviewing relevant more articles and this has to be explored further. Finally, the results of this study may not have been representative of the whole population, due to the fact that a convenience sampling method was used to collect the data. To be able to generalize the findings for this specific hotel segment, a study that would include more hotels in a variety of regional settings.

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#### AUTHORS

First Author - Umesh Gunarathne W.H.D.P



Appendix SMART PLS 2.0 Algorhythem conceptual frameworks (final Model)

# **Appendix2: t- values (final model)**



# **Rental House Management System**

Henry Peter Gommans<sup>\*</sup>, George Mwenda Njiru<sup>\*\*</sup>, Arphaxad Nguka Owange<sup>\*\*</sup>

\* SupplyChain Proffessional/Lecturer), Tradewinds Kenya Limited \*\* Scholar

*Abstract*-We are stuck with technology when what we really want is just stuff that works. With the current paradigm shift in technological field, there is an urgent need to embrace and appreciate the power of technology. Housing sector remains vigilant to face the challenges of change by employing a new strategy that facilitates easy management of rental houses. Hence there is need to develop a rental house management system that can simplify work for the rental managers so that all their work can be efficient and effective.

To get information about how rental houses are currently being managed, I prepared questionnaires and submitted them to a number of rental house managers and from the information I gathered I realized all work was done manually with a lot of paper work involved. Papers can easily get damaged or get lost leading to loss of data. It is also expensive to keep on buying files to store your records. A lot of files make a place look untidy and also consume a lot of space. Getting a certain file to check data from many files becomes a difficult task.

Considering those facts, I decided to develop a rental house management system that can solve all the problems experienced with the current manual system. The system was developed in such manner that it provides maximum user friendly interface.

Once you the user logs in the system automatically show three forms: houses form, rent payment form and tenants' registration form. Each form has several command buttons; new, save, cancel, delete, next, previous and exit. With the command buttons you can manipulate the database. If you want to add data to the database all you need to do is to click on new then input data in the textboxes provided then click save and the data will automatically be saved. If you want to view data in the database you just click next or previous and the data will be displayed for you. When you click delete you will be able to delete a record that you desire. You may enter data then decide to cancel it, it is simple click on cancel and it will be canceled.

For manager faced with management difficulties here is a perfect solution for you. The rental house management system is made for you.

#### I. INTRODUCTION

Rental house management has become important factor in modern society hence the need to have a rental house management system.

This chapter will provide a brief understanding about background of study, definition of the project problem statement, its objectives, scopes, project justification, risks, project deliverables and project budget and schedule.

#### 1.1BACKGROUND OF THE STUDY

Housing has a central importance to quality of life with considerable economic, social, cultural and personal significance.

Though a country's national prosperity is usually measured in economic terms, increasing wealth is of diminished value unless all can share its benefits and if the growing wealth is not used to redress growing social deficiencies, one of which is housing (Erguden, 2001). Housing plays a huge role in revitalizing economic growth in any country, with shelter being among key indicators of development.

The universal declaration of human rights gives one of the basic human rights as the right to a decent standard of living, central to which is the access to adequate housing (United Nations, The Human Rights-article 25, 1948).

Housing as a basic human right demands that urban dwellers should have access to a decent housing, defined as one that provides a foundation for rather than being a barrier to good physical and mental health, personal development and fulfillment of life objectives (Seedhouse, 1986).

The focus of this research project is basically managing housing for low income, medium and high incomes households or what is commonly known as affordable housing. 'Affordable' is a term used to describe individuals' capability to pay for certain products or services because their income is enough to do so. Although the term 'affordable housing' is often applied to rental housing; that is within the financial means of those in the lower income ranges of a geographical area, the concept is applicable to both middle and high income individuals.

Most families choose to rent houses based on their income and family situations; unfortunately, there may not be enough good quality rental housing for these families (http://www.ehow.com).

Housing is a major problem in Kenya especially in Nairobi city. Millions of people are living in sprawling slams and also in other informal settlement around Nairobi (UN-Habitat, 2008).

This explains why many people have shifted their focus to developing rental houses in Nairobi and other parts of the country. The demand for rental houses is extremely high and more rental houses need to be put in place.

Developing rental houses comes with many advantages especially to the Landlords who are able to increase their profits through rent paid by the tenants.

Increased number of tenants and Landlords makes management difficult especially for the landlords who are losing huge sum of money through tenants who evade rent.

The above statement gives a clear declaration as to why rental house management system need to be developed.

#### **1.2 STATEMENT OF THE PROBLEM**

Over the years landlords/property managers have had a problem in maintaining and managing their customers and their own records.

Management has become difficult because of issues that include:

#### i) Data growth

Data increase day to day. Storing and maintaining all data manually is very difficult

ii) Lack of computerized system

Currently most landlords/property managers use the manual system in recording and maintaining their property and customers data

iii) Data security is not assured

In a manual way, data is recorded on books/papers which may easily get damaged leading to loss of data.

iv) There is no database to store information

Potential of data loss or damage is very high because data is stored on tangible files.

Lack of these crucial requirements makes management of the tenants and houses very difficult as some tenants may end up not paying rent.

#### **1.3 PROJECT OBJECTIVES**

The following are the project objectives:

To develop a rental house management system that allows the user to view customers' data as well as houses record

To develop a system that allows the users to add, edit, search and delete data from the database

To study and analyze the requirement specifications of the rental house management system

To produce the Software Requirement Specification of the system

To produce the Software Design Document of the system

#### 1.4 PROJECT SCOPE

The project scope defines the description of the work that is required in delivering the rental house management system. The following are the scopes of work during the course of the project: Study and understand the requirement of this project

Construct Software Requirement Specification document of the system

Construct Software Design Document of the system

#### **1.5 PROJECT DELIVERABLES**

The main deliverables of this project will be the complete software system and the software engineering document that include:

Software Requirement and Specification

Software Design Document

The Software engineering document will be constructed

# 1.6 TIME SCHEDULE

ACTIVITY	DATES	DURATION
E	7th Less 20th Less	2 1
Feasibility Study	/ June-20 June	2 weeks
Project Proposal	21st June 17th July	1 weeks
- Hoject Hoposal	21statile-17 July	4 WEEKS
Analysis	18 <sup>th</sup> July-17 <sup>th</sup> August	4 weeks
Design	18 <sup>th</sup> August-14 <sup>th</sup> Sept	4 weeks
Development	15 <sup>th</sup> Sept-2 <sup>nd</sup> October	8 weeks
Testing	3 <sup>rd</sup> October- 14 <sup>th</sup> October	2 weeks
Implementation	15 <sup>th</sup> Oct- 27 <sup>th</sup> October	1 week
Provide a strike a sette of the	han totholana a succha	
Report writing 28. Octo	ber-12Nov 2 weeks	
	1	1

1.7 PROJECT COST

ITEM	COSTS
HARDWARE	
Laptop Computer	KSH 35,000
Flash disk	KSH 1,000
SOFTWARE	
Microsoft Windows 7 Operating System	KSH 12,000
Microsoft Office Word 2007	KSH 5,000
Microsoft Office Access 2007	KSH 5,000
Visual Basic studio 6.0 KSH 5,000	
OTHER COSTS	
Printing	KSH 5,000
Miscellaneous	KSH 5,000
Total KSH	73,000

# II. LITERATURE REVIEW

Literature review is a text written by someone to consider the critical points of current knowledge including substantive findings as well as theoretical and methodological contributions to a particular topic. Main goals are to situate the current study within the body of literature and to provide context for the particular reader (Cooper, 1998).

# 2.1 GOVERNMENT STRATEGY AND INCENTIVES IN THE HOUSING SECTOR

Some of the dominant strategies for housing and service provision for the Kenya's urban poor include slum upgrading and site and service schemes. However, the efficiency of these strategies has been limited by ambivalent government attitude to irregular settlement. These strategies have failed because of a reliance on inappropriate building by-laws and infrastructural standards and modern designs, construction technology and conventional building materials that all make housing unaffordable to the poor, even after subsidies.

Thus, government initiatives in assisting house owners in management have proven to be pathetically slow with many of the houses provided being economically and socially irrelevant, this further prompting the rise of informal settlement (Macoloo, 1994).

2.2 THE ROLE OF THE PRIVATE SECTOR IN HOUSE MANAGEMENT

Private sector housing management is defined as any process which is not connected at all with the actions of the state neither directly constructed by state nor financially sponsored by the state where production is not expected to have a social element (Golland, 1996).

(Ambrose and Barlow, 1987) have argued that three factors are important in influencing the level of new house building. These are direct capital investment by the state for public housing, state support for production and consumption and changes in the profitability of house builders in the private sector.

The private sector can play an important role in housing provision provided that the state offers sufficient and appropriate incentives to the sector (Mitullar, 2003).

The clear motivation that underlies the private sector is profit (or potential profitability) with profit maximizing options being in the context of housing, producing and selling more of the product; reducing the cost of production through lower raw material and wage costs and finally increasing the price of the product or service (Hancock, 1998).

Profitability in housing is advocated to be based on three variables; House prices, land prices and building costs, where: Profit=House prices-{Land prices + Building costs} (Golland, 1996).

2.3THE ROLE OF OBJECT ORIENTED PROGRAMMING (OOP)

The concept of object-oriented modeling is becoming increasingly practical because of its ability to thoroughly represent complex relationships as well as to represent data and data processes in a consistent manner. This concept has been implemented in computer software engineering; ranging from system analysis, system design, operating system, computer programming and database management system (Cohn, 1996). 2.4 THE ROLE OF RELATIONAL DATABASE

2.4 THE ROLE OF RELATIONAL DATABASE MANAGEMENT SYSTEM (RDBMS)

(Levin, 1999) Database Management System (DBMS) has replaced the file system data management by having a pool of data that can be shared by multiple application programs and users concurrently. DBMS also provide logical and physical data independence, so that changing of data structure or application program will not affect one another.

#### III. METHODOLOGY

The term methodology means the technique and procedure adopted by conducting a research study. It outlines how data will be collected and the tools for collecting data, system methodology, the proposed system input and output, users and systems development tools.

#### 3.1 FACTS FINDING TECHNIQUES

It shows how data will be collected from the users of the system. The data collection techniques to be used include: 3.1.1 Objectives

It will use this technique to collect information about how the current system operates and its processes. This involves systematically watching and recording the behavior and characteristics of operations and processes.

It gives more detailed and context related information and can adapt to event as they occur however the method may be time consuming.

# 3.1.2 Questionnaires

I will prepare a number of questionnaires whereby I will submit them to business owners (Landlords) to get a deeper insight of how the system is going to work. I prefer this method because it gives more information from various individuals and offers greater flexibility as the opportunity to restructure questions.

This technique is preferred because it will provide a closer contact between the users and the developer hence dispelling the probability of the completed system being rejected by user(s).

This technique also: Permits clarification Has high response rate than interviews. Helps get full range and depth of information

# 3.1.3 Secondary Data Collection

This data I will collect from existing sources e.g books, internet, journals and magazines that was collected by other researchers and analysis was done. It is from that data that I will then compare with the primary data and make a decision and conclusion.

#### 3.2 SYSTEM DEVELOPMENT AND METHODOLOGY

System development methodology is a technique that is used to show how the proposed system will be developed. In this case, the methodology used will be a waterfall model.

# 3.2.1 Waterfall Model

It is comprised of the stages that the developer will use when developing the system. It is a sequential model hence, the name waterfall. The developer has to finish with one stage before going to the next one. It comprises of the feasibility study, analysis phase, design phase, coding phase, testing phase, implementation phase and finally the maintenance phase. It is a simple model and easy to use and understand.

With waterfall development based methodologies, the analysts and users proceed sequentially from one phase to the next. The deliverables from each phase are voluminous and are presented to the project sponsor for approval as the project moves from phase to phase. Once the phase is approved by the sponsor it ends and the next phase begins. Diagram of waterfall model





#### 3.2.1.1 Feasibility study

Here, I will carry out a study to gain an understanding of the customers (tenants) current system and problems experienced in this system through interviews, observations, and participations. I will use the obtained data to determine the viability of the system being proposed in terms of technical, economic and social feasibility.

#### 3.2.1.2 Requirement and analysis

At this stage, I will gather information about what the customer needs and define the problems the system is expected to solve. I will also include customers' business context, products functions and its compatibility. I will gather requirement such as software like the programming language to use, database model and hardware needed such as laptop, printers etc

#### 3.2.1.3 Design

At this stage, I will make an overall design of the system architecture and physical design which includes User Interface and Database design. It is at this stage that I will identify any faults before moving onto the next stage. The output of this stage is the design specification which is used in the next stage of implementation.

#### 3.2.1.4 Coding/Implementation

At this stage, I will begin coding as per the design specification(s). The output of this step is one or more product components built according to a pre-defined coding standard and debugged, tested and integrated to satisfy the system architecture requirement.

#### 3.2.1.5 Testing

At this stage, I will ensure both individual and integrated whole are methodically verified to ensure they are error free and satisfy customer requirement. I will involve both unit testing of individual code module, system testing of the integrated product and acceptance testing conducted by or on behalf of customer. I will ensure bugs found are corrected before moving to the next stage. I will also prepare, review and publish product documentation at this stage.

#### 3.2.1.6 Installation

It is done once the product has been tested and certified as fit for use. The system is prepared for use at customer site.

3.2.1.7 Maintenance

This stage occurs after installation. It involves modifications on the system to improve performance. Such changes are user initiated or as a result of bug being discovered which were initially not known. These modifications are recorded for documentation and system update.

# IV. SYSTEM ANALYSIS AND REQUIREMENT MODELLING

## 4.1 INTRODUCTION

The system objectives outlined during the feasibility study served as the basis from which the work of system design was initiated. Much of the activities involved at this stage were of technical nature requiring a certain degree of experience in designing systems sound knowledge of computer related technology and through understanding of computers available in the market and the various facilities provided by the vendors. Nevertheless, a system could not be designed in isolation without the active involvement of the user. The user had a vital role to play at this stage too.

Data collected during feasibility study was utilized systematically during the system design. Designing a system is a creative process which calls for logical as well as lateral thinking Logical approach involves systematic moves towards the end product keeping in mind the capabilities of the personnel and the equipment at each design making step.

#### 4.2 EXISTING SYSTEM

Currently the most property managers manage property and tenants details on papers. Once customers finds a vacant house, they can call or email manager of the houses indicating the size of the house they would like rented to them.

The property manager can email them back giving them all the details about the house they are requesting. The details include;

Rent per month

Deposit paid

Terms and conditions to follow acceptance

#### 4.3 PROBLEMS OF EXISTING SYSTEM

With the current system recording the details of various activities of user is completely manual and entails a lot of paper work. Each house has a file that contains the house: number, size, rent per month, expected deposit, occupant and status.

Rent payment table contains tenants: first name, last name, Phone number, date of payment, amount and balance if any.

The existing system only provides text based interface which is not as user friendly as Graphical user interface. Since the system is implemented manually, the response is very slow.

The transactions are not secure as papers may get lost or damaged. Hence, there is need of reformation of the system with more advantages and flexibility. The system eliminates most of the limitations of the existing system. 4.4 REQUIREMENTS ANALYSIS Requirement analysis involved defining customer needs and objectives in the context of planned customer use, environments and identified system characteristics to determine requirements for system functions.

#### 4.4.1 User Requirements

It entailed user involvement and statements of facts and assumptions that define the expectations of the system in terms of mission objectives, environment, constraints and measures of effectiveness and suitability. Basically the users:

i) A system that improves on the efficiency of information storage and retrieval.

ii) A system that is easy to learn and use

iii) A system that is fast in processing transactions

iv) A system that is flexible, safe and convenient

**4.4.2Functional Requirements** 

This is a necessary task, action or activity that was accomplished. The proposed system is able to:

i) Allow administrator to add a houses, tenant and defaulters details

ii) Allow the administrator to delete houses, tenants and defaulters details

iii) Allow the administrator to search data in the database

iv) Allow the administrator to edit data in the database

4.4.3 Hardware Requirements

i) Processor 2.0 Ghz processor speed

ii)Memory 2GB RAM

iii) Visual Display Unit 800\*600 colors

4.4,4 Software Requirements

i) Operating System- windows 7

- ii) Microsoft Office Power point- Used during presentation
- iii) Microsoft visual basic 6

#### V. SYSTEM DESIGN

#### 5.1 DESIGN PHASES

The user's requirements document was analyzed for better understanding of what was required of the system. Ways of implementing these requirements were analyzed. Physical modules of the system were designed and identifying of the operating environment in which they were to work on. The system was a visual basic system/application. The database was updated each time the administrator; add, deletes or deletes data on the system.

It's only the administrator who has access to the system to view or make changes when necessary. The system was designed to allow the administrator to view, edit, delete and add data to the database

Each time a customer comes, he/she is registered in the tenant registration table of the database with other relevant details about the tenant.

System design involved transforming the software requirements into an architecture that described its top-level structure and identified the software components and developed a detailed design for each software components. For each requirement, a set of one or more design elements was produced.

# 5.1.1 Conceptual Design

Conceptual design was the very first phase of design in which drawings or solid models were the dominant tools and products. The conceptual design phase provided a description of



#### 5.1.2 Database Design

The general theme behind a database is to handle information as an integrated whole. A database is a collection of interrelated data stored with minimum redundancy to serve the users quickly and effectively. After designing input and output,

Tables used

#### User table

for other users.

	Data Type	Description
Usemame	Text (25)	Primary Key
Password	Text (15)	-

the analyst must concentrate on database design or how data

should be organized around user requirement. The general

objective is to make information access, easy, quick and flexible

riouses table
---------------

Field Name	Data Type	Description
number	Text (15)	Primary Key
size	Text (15)	-
rent	Text (15)	-
deposit	Text (15)	-
status	Text (15)	-
occupant_ID	Text (15)	-
Fname	Text(15)	-
Lname	Text(15) -	

# Tenants Registration table

Field Name	Data Type	Description
ID_No	Text (15)	Primary Key
first_name	Text (15)	-
last_name	Text (15)	-
phone_No	Text (15)	-
date_admitted	Text (15)	-
house_No	Text (15)	-
	1	

# Rent Payment table

Field Name	Data Type	Description
tenan_Phone_No	Text (15)	Primary Key
tenant_ID	Text (15)	-
first_name	Text (15)	-
second_name	Text (15)	-
amount_due	Text (15)	-
amount_paid	Text (15)	-
date_paid	Text (15)	-
arrears	Text (15)	-

5.2 SOFTWARE INTERFACE LOGIN MENU

Enter Your Name /	And Password	Then Click Login	
name:	admin		
password:	NNH		
la	ain		
	-gin		


## HOUSES MENU

home view rent payment record here	
Houses	s Record
number:	
oizol	
size:	
rent:	
denosit	
ueposit.	
status:	
occupant ID:	
occupant D.	
First Name:	
Second Name:	
	8R
anua nau dalat	a cancel neut previous
<u>Percent</u>	

## TENANTS RENT PAYMENT MENU



TENANTS REGISTRATION MENU

home back click here to view user account	
Tenants Registration Record	
ID No:	
first name:	
last name:	
phone No:	
date admitted:	
house No:	
<u>s</u> ave <u>n</u> ew <u>d</u> elete <u>c</u> ancel n <u>e</u> xt	previous

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USER ACCOUNT MENU	
home back	
create	a new account
enter username:	admin
enter password:	RECK
confirm	clear

## VI. SYSTEM IMPLEMENTATION

Implementation is the stage in the project where the theoretical design is turned into a working system. The implementation phase constructs, installs and operates the new system. The most crucial stage in achieving a new successful system is that it will work efficiently and effectively.

There are several activities involved while implementing a new project. They are End user training

## End user Education Training on the application software Post implementation Review

1. End user Training:

The successful implementation of the new system will purely upon the involvement of the officers working in that department. The officers will be imparted the necessary training on the new technology

#### 2. End User Education:

The education of the end user start after the implementation and testing is over. When the system is found to be more difficult to understand and complex, more effort is put to educate the end user to make them aware of the system, giving them lectures about the new system and providing them necessary documents and materials about how the system can do this.

3. Training of application software:

After providing the necessary basic training on the computer awareness, the users will have to be trained upon the new system such as the screen flows and screen design type of help on the screen, type of errors while entering the data, the corresponding validation check at each entry and the way to correct the data entered. It should then cover information needed by the specific user or group to use the system.

4. Post Implementation review:

The department is planning a method to know the states of the past implementation process. For that regular meeting will be arranged by the concerned officers about the implementation problem and success

#### 6.1 SOFTWARE TESTING

Is it possible to invoke each menu function using logical assumptions that if all parts of the system are correct, the goal will be successfully achieved? In adequate testing or non-testing will leads to errors that may appear few months later. That's why it is very important to always test the new software.

This create two problems

The purpose of the system testing is to consider all the likely variations to which it will be suggested and push the systems to limits.

The testing process focuses on the logical intervals of the software ensuring that all statements have been tested and on functional interval is conducting tests to uncover errors and ensure that defined input will produce actual results that agree with the required results. Program level testing, modules level testing integrated and carried out.

There are two major type of testing they are

- 1. White Box Testing.
- 2. Black Box Testing.
- White Box Testing

White box sometimes called "Glass box testing" is a test case design that uses the control structure of the procedural design to drive test case.

Using white box testing methods, the following tests were made on the system

a) All independent paths within a module have been exercised once. In our system, ensuring that case was selected and executed checked all case structures. The bugs that were prevailing in some part of the code where fixed

b) All logical decisions were checked for the truth and falsity of the values.

## Black box Testing

Black box testing focuses on the functional requirements of the software. This is black box testing enables the software engineering to derive a set of input conditions that will fully exercise all functional requirements for a program. Black box testing is not an alternative to white box testing rather it is complementary approach that is likely to uncover a different class of errors that white box methods like..

1) Interface errors

2) Performance in data structure

3) Performance errors

4) Initializing and termination errors

## VII. RECOMMENDATIONS

Our project is meant to satisfy the needs of rental house owners. Several user friendly interfaces have also been adopted. This package shall prove to be a powerful in satisfying all the requirements of the users

It is with utmost faith that I present this software to you hoping that it will solve your problems and encourage you to continue appreciating technology because it is meant to change and ease all our work that seems to be very difficult. I don't mean that my project is the best or that I have used the best technology available it just a simple and a humble venture that is easy to understand.

However, I would encourage anyone who has the ability to advance it using advanced technologies so as to increase its capabilities.

## 7.1 CONCLUSION

In conclusion, the software can be used as an inventory system to provide a frame work that enables the mangers to make reasonable transactions made within a limited time frame. Each transaction made on the system go hand in hand with the data being updated in the database in our case it is Microsoft Access 2007 which is the back end. Last but not least it is not the work that played the ways to success but ALMIGHTY GOD.

## APPENDIX I MOUNT KENYA UNIVERSITY QUESTIONNAIRE TO BE ADMINISTERED TO RENTAL HOUSES MANAGERS/OWNERS

Dear respondent;

I am Njiru Mwenda George a student at Mount Kenya University, school of Pure and Applied Science undertaking a research project on Rental House Management. Your support towards this research will be appreciated and be treated with utmost confidentiality and for only academic purposes.

SECTION A: Background information of the respondents

Fill in the questions below by ticking where appropriate
1. Kindly indicate your gender
Male Female
z. which is your age bracket?
18-25years26-32years33-55years56 and above
3hat is your highest academic drammer cation?
PhD Masters Degree Diploma Certificate
4. What motivated you to venture into rental houses business?
5 H
5. How many rental nouses do you nave?
Indicate Number
6. Do you have challenges in managing your houses?
Yes No
he trindly at some of the shallonger you food
i)
i)
II) ;;;)
iii)iw)
IV)
v)
۷۱ بن
VII
vIIIiv)
IA)
<ul> <li>X)</li></ul>
a. Kinuty indicate the greatest chanenge(s)?
i)
ц <i>)</i> iii)
in)
1V <i>J</i>
<i>v</i>

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vi).....

8. Would you like to have a system that can assist you in management?

Yes	

No

SECTION B: Management System Please indicate your level of agreement with the statements below

Statement	Strongly Agree	Agree	Strongly Disagree	Disagree	Not Sure
	1	2	3	4	5
The main objective of					
developing rental houses is					
to make money through					
rent paid by tenants					
Rental houses need to be					
managed by a system					
Management will assist to					
achieve the objective of					
owning rental houses					
The managing system should					
be easy to understand, flexible					
and quickly accessible					

## APPENDIX II

Login Code Private Sub cmdlogin\_click() Dim username As String Dim password As String Dim admin As String Dim pass As String Dim msg As String register.adorecorddb.Refresh admin = txtusername.Text pass = txtpassword.Text Do Until register.adorecorddb.Recordset.EOF If register.adorecorddb.Recordset.Fields("username").Value = admin And register.adorecorddb.Recordset.Fields("password").Value = pass Then Me.Hide frmwelcome.Show Exit Sub Else register.adorecorddb.Recordset.MoveNext End If Loop msg = MsgBox("invalid password, try again!", vbOKCancel) If (msg = 1) Then login\_form.Show txtusername.Text = "" txtpassword.Text = "" Else End End If End Sub Houses Code Private Sub cmdcancel click () txtnumber.Text = "" txtsize.Text = "" txtrent.Text = "" txtdeposit.Text = "" txtstatus.Text = "" txtoccupant.Text = "" End Sub Private Sub cmddelete\_click() confirm = MsgBox("are you sure you want to delete this record?", vbYesNo, "deletion confirmation") If confirm = vbYes Then adorecorddb.Recordset.Delete MsgBox "record deleted", , "message" Else MsgBox "record not deleted", , "message" End If End Sub Private Sub cmdhome\_Click() Me.Hide frmwelcome.Show End Sub Private Sub cmdnew\_click() adorecorddb.Recordset.AddNew End Sub Private Sub cmdnext\_click() If Not adorecorddb.Recordset.EOF Then

adorecorddb.Recordset.MoveNext If adorecorddb.Recordset.EOF Then adorecorddb.Recordset.MovePrevious End If End If End Sub Private Sub cmdnxt\_Click() Me.Hide rent\_payment.Show End Sub Private Sub cmdprevious click() If Not adorecorddb.Recordset.BOF Then adorecorddb.Recordset.MovePrevious If adorecorddb.Recordset.BOF Then adorecorddb.Recordset.MoveNext End If End If End Sub Private Sub cmdsave\_click() adorecorddb.Recordset.Fields("number").Value = txtnumber.Text adorecorddb.Recordset.Fields("size").Value = txtsize.Text adorecorddb.Recordset.Fields("rent").Value = txtrent.Text adorecorddb.Recordset.Fields("deposit").Value = txtdeposit.Text adorecorddb.Recordset.Fields("status").Value = txtstatus.Text adorecorddb.Recordset.Fields("occupant\_ID").Value = txtoccupant.Text adorecorddb.Recordset.Fields("Fname").Value = txtname.Text adorecorddb.Recordset.Fields("Lname").Value = txtnm.Text adorecorddb.Recordset.Update End Sub Private Sub cmdhouse\_Click() Me.Hide form house.Show End Sub

Private Sub cmdout\_Click() Me.Hide login\_form.Show Exit Sub End Sub

Welcome Code Private Sub cmdrent\_click() Me.Hide rent\_payment.Show End Sub Private Sub cmdtenant\_click() Me.Hide tenant\_data.Show End Sub Private Sub cmduser\_click() Me.Hide register.Show End Sub

Private Sub cmdbak\_Click() Me.Hide International Journal of Scientific and Research Publications, Volume 4, Issue 11, November 2014 ISSN 2250-3153

tenant data.Show End Sub Private Sub cmdclear\_click() txtusername.Text = "" txtpassword.Text = "" End Sub **Registration Code** Private Sub cmdconfirm\_click() adorecorddb.Recordset.Fields("username") = (txtusername.Text) adorecorddb.Recordset.Fields("password") = (txtpassword.Text) adorecorddb.Recordset.Update End Sub Private Sub cmdhom\_Click() Me.Hide frmwelcome.Show End Sub Private Sub cmdnewaccount\_Click() MsgBox "enter new username and password, then confirm", , "message" End Sub

**Tenants Registration Code** Private Sub cmdbk Click() Me.Hide rent\_payment.Show End Sub Private Sub cmdcancel\_click() txtidno.Text = "" txtfirstname.Text = "" txtlastname.Text = "" txtphoneno.Text = "" txtdateadmitted.Text = "" txthouseno.Text = "" End Sub Private Sub cmddelete click() confirm = MsgBox("are you sure you want to delete this record?", vbYesNo, "deletion confirmation") If confirm = vbYes Then adorecorddb.Recordset.Delete MsgBox "record deleted", , "message" Else MsgBox "record not deleted", , "message" End If End If End Sub Private Sub cmdexit\_Click() Me.Hide frmwelcome.Show End Sub Private Sub cmdhm\_Click() Me.Hide frmwelcome.Show End Sub Private Sub cmdnew click() adorecorddb.Recordset.AddNew End Sub Private Sub cmdnext click() If Not adorecorddb.Recordset.EOF Then adorecorddb.Recordset.MoveNext

If adorecorddb.Recordset.EOF Then adorecorddb.Recordset.MovePrevious End If End If End Sub Private Sub cmdprevious\_click() If Not adorecorddb.Recordset.BOF Then adorecorddb.Recordset.MovePrevious If adorecorddb.Recordset.BOF Then adorecorddb.Recordset.MoveNext End If End If End Sub Private Sub cmdsave\_click() adorecorddb.Recordset.Fields("ID\_No").Value = txtidno.Text adorecorddb.Recordset.Fields("first\_name").Value = txtfirstname.Text adorecorddb.Recordset.Fields("last\_name").Value = txtlastname.Text adorecorddb.Recordset.Fields("phone\_No").Value = txtphoneno.Text adorecorddb.Recordset.Fields("date admitted").Value = txtdateadmitted.Text adorecorddb.Recordset.Fields("house No").Value = txthouseno.Text adorecorddb.Recordset.Update End Sub Private Sub cmdxt Click() Me.Hide register.Show End Sub Rent Payment Code Private Sub cmdarrears\_Click() Dim ad, ap, a As Integer ad = Val(txtamountdue.Text) ap = Val(txtamountpaid.Text) a = ad - aptxtarrears.Text = aEnd Sub Private Sub cmdback Click() Me.Hide form\_house.Show End Sub Private Sub cmdcancel\_click() txttenantphoneno.Text = "" txttenantid.Text = "" txtfirstname.Text = "" txtsecondname.Text = "" txtamountdue.Text = "" txtamountpaid.Text = "" txtdatepaid.Text = "" txtarrears.Text = "" End Sub Private Sub cmddelete\_click() confirm = MsgBox("are you sure you want to delete this record?", vbYesNo, "deletion confirmation") If confirm = vbYes Then adorecorddb.Recordset.Delete MsgBox "record deleted", , "message" Else MsgBox "record not deleted", , "message" End If

End Sub Private Sub cmdhome\_Click() Me.Hide frmwelcome.Show End Sub Private Sub cmdnew\_click() adoracorddh Paccordset AddNaw

adorecorddb.Recordset.AddNew End Sub Private Sub cmdnext\_click() If Not adorecorddb.Recordset.EOF Then adorecorddb.Recordset.MoveNext If adorecorddb.Recordset.EOF Then adorecorddb.Recordset.MovePrevious End If End If End Sub

Private Sub cmdnt\_Click() Me.Hide tenant\_data.Show End Sub

Private Sub cmdprevious click() If Not adorecorddb.Recordset.BOF Then adorecorddb.Recordset.MovePrevious If adorecorddb.Recordset.BOF Then adorecorddb.Recordset.MoveNext End If End If End Sub Private Sub cmdsave click() adorecorddb.Recordset.Fields("tenant\_phone\_No").Value = txttenantphoneno.Text adorecorddb.Recordset.Fields("tenant ID").Value = txttenantid.Text adorecorddb.Recordset.Fields("first\_name").Value = txtfirstname.Text adorecorddb.Recordset.Fields("second\_name").Value = txtsecondname.Text adorecorddb.Recordset.Fields("amount due").Value = txtamountdue.Text adorecorddb.Recordset.Fields("amount\_paid").Value = txtamountpaid.Text adorecorddb.Recordset.Fields("date\_paid").Value = txtdatepaid.Text adorecorddb.Recordset.Fields("rent\_arrears").Value = txtarrears.Text adorecorddb.Recordset.Update End Sub

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#### AUTHORS

**First Author** – Henry Peter Gommans (SupplyChain Proffessional/Lecturer), Tradewinds Kenya Limited e-mail: henrygommans@gmail.com **Second Author** – George Mwenda Njiru (Scholar), e-mail: georgemwenda135@yahoo.com Third Author - Arphaxad Nguka Owange (Scholar)

# Toxicity study of metals contamination on vegetables grown in the vicinity of cement factory

## Geetanjali Chauhan

Department of Environmental Biology, A.P.S. University Rewa -486003, Madhya Pradesh, India

*Abstract-* The aim of this study was to measure the toxicity levels of heavy metals (Fe, Zn, Cu, Pb, Cd, Mn and Cr) found in tested vegetables (Spinach, Cabbage, Cauliflower, Brinjal, Lady's Finger, Tomato and Radish) grown in contaminated Cement Factory area compared with those grown in reference Clean (control) area. When compared with the reference in contaminated area, water, soil and vegetables contents of all analyzed metals was significantly higher, usually over normally content for Fe, Zn, Cu, Pb, Cd, Mn and Cr. Particularly, higher values than safe limits were found for Pb, Cd, Mn and Cr in water and for Cd in soil and Pb, Cd and Cr were observed higher in leafy vegetable especially Spinach, in contaminated (Cement Factory) areas. In an attempt to understand the pattern of metal contamination in the area, useful tools including Enrichment Factor were also employed to indicate the sources of soil contamination were anthropogenic in character.

*Index Terms*- Industrial Effluent; Industrial Pollution; Toxic Heavy Metals; Quantification; AAS; Water Pollution; cement factory (Industrial Area).

## I. INTRODUCTION

Ithough all industries in India function under the strict guidelines of the Central Pollution Control Board (CPCB) but still the Aenvironmental situation is far from satisfactory. According to Kumar et al., (2003) Cement industry is one of the 17 most polluting industries listed by the Central Pollution Control Board (CPCB).Different norms and guidelines are given for all the industries depending upon their pollution potentials. Most major industries have treatment facilities for industrial effluents. But this is not the case with small scale industries, which cannot afford enormous investments in pollution control equipment as their profit margin is very slender. As a result in India there are sufficient evidences available related with the mismanagement of industrial wastes. Consequently, at the end of each time period the pollution problem takes menacing concern. During the past few decades Indian industries have registered a quantum jump, which has contributed to high economic growth but simultaneously it has also given rise to severe environmental pollution. Consequently, the water quality is seriously affected which is far above in comparison to the national and international standards. The surface water is the main source of industries for waste disposal. Untreated or allegedly treated effluents have increase the level of surface water pollution up to 20 times the safe level in 22 critically polluted areas of the country. The problem of water pollution has become still worse due to toxic heavy metals. The increasing trend in concentration of heavy metals in the environment has attracted considerable attention amongst ecologists globally during the last decades and has also begun to cause concern in most of the major metropolitan cities. Untreated or allegedly treated industrial effluents and wastewater contains variable amounts of heavy metals such as arsenic, lead, nickel, cadmium, copper, mercury, zinc and chromium, which have the potential to contaminate vegetables growing under such irrigation. These heavy metals have a marked effect on crops and vegetables through which bio-accumulator enter the food chain and ultimately affect the human beings as well. Cement is produced world-wide in large amounts as an important binding agent for the construction industry. Cement factory through the release of waste effluents such as heavy metals (HM), generated in the process of crushing limestone, bagging, and transportation of cement are carried by wind and/or water and deposited on soil, plants and water bodies. Globally, the problem of soil contaminated due to heavy metals has begun to cause concern in most cities since this may lead to geoaccumulation, bioaccumulation and biomagnifications in ecosystem. Several studies have been carried out on effect of cement and stone dust on stomatal clogging of Iphonia grantioides Boiss leaves (Abdullah and Igbal, 1991), groundnut (Prasad and Inamdar, 1990), chlorophyll contents of selected plants (Shah et al., 1989), periodical effect on growth of some plant species in Karachi, Pakistan (Iqbal and Shafig, 2001), production externalities and profitability of crop (Tijani et al., 2005) and growth of Phaseolus vulgaris L. cv. (Ade-Ademilua and Umebese, 2007) in the vicinity of a Cement Factory, Nigeria. However, very limited studies have been carried out on cement site in India. Extensive literature search showed that very few or no apparent toxicity studies were undertaken on heavy metals concentration in soil and vegetables in cement factory locations in India. However wastewater uses for agricultural irrigation can have multiple benefits for almost all countries, but it is particularly beneficial and cost-effective in low-income arid and semi-arid countries. In such areas additional low-cost water resources can have a high payoff in human welfare and health, with increased possibilities for food production and increased employment opportunities for poor population groups living in the peripheries of towns and cities, which are the source of copious wastewater channel. However, in humid areas of low- and middle-income countries, including India, wastewater flows from large industrial areas are untreated and laden with heavy metals in the nearby farmlands, thus presenting a serious health risk when entering water sources used for irrigation. The use of wastewater for irrigating agricultural crops, including high-value crops such as fruits and vegetables is common practised in India because of the scarcity of clean water resources and because wastewater is seen by smallscale producers as a cheap means to improve soil fertility and add essential nutrients for their crops. Although wastewater has a high nutrient value, it also has a food-safety risk due to the possibility of the transmission of many diseases through consumption of wastewater irrigated crops and vegetables and posing a potential human health hazard. In addition, farmers and irrigation workers can acquire toxic heavy metals due to direct contact with untreated wastewater and contaminated soils, especially if exposed for a long duration (Ensink, 2006). Despite this knowledge, it is often difficult to get farmers, particularly poor small-scale producers, to alter behaviour by applying risk-reducing practices to wastewater irrigation, because food production using wastewater generates significant livelihood1 opportunities (Buechler and Devi 2002a, 2003b; Hamilton et al., 2005; Toze, 2006). Therefore, effective risk reduction strategies must account for farmers' practices and attitudes towards the adoption of intervention to mitigate these risks. The present day by day increasing tremendous industrial pollution has prompted to carry the toxicity study of heavy metals contamination on vegetables grown in the vicinity of Cement Factory, Rewa, India, which is considered as the India's 3rd largest cement producer Factory in the country. It is estimated that up to 447.8 hectares of agricultural land in Rewa city is being irrigated with cement wastewater (According to J.P. Cement plants, official data). This wastewater had been generally used as irrigating crops and vegetables. Along the industrial agricultural land the water had supplied directly to the fields. No canals, tanks and/or channelled to the fields for irrigation were available. Hence more than 94 per cent of the water supplied to the agricultural land to the industrial sites (Cement plants) of Rewa city returns as waste water. The discharge of untreated waste water into agricultural field had made it highly polluted due to accumulation of heavy metals. Many of peoples in these sub urban area of Rewa city have been depending upon wastewater irrigated vegetables for their food requirement. Agriculture land livestock rearing had amongst the most important livelihoods of the villages. So the main purpose of the present study was to determine the toxicity level in vegetables due to wastewater from A Cement Factory in North- East Region of Rewa within a rural area with no other industrial source in the area. Specifically, the study focuses on the distribution of heavy metals in soils and vegetation around the Cement Factory. Enrichment Factor was also employed to improve whether the source was anthropogenic or natural in contents?

## II. MATERIALS AND METHODS

## EXPERIMENTAL Study Area



Figure 1. Location site map for experimental sites

The study area is bounded between  $24^{0}28'24''$  to  $24^{0}39'11''$  north latitude and  $81^{0}05'46''$  and  $81^{0}17'23''$  east longitude (Approx). The J.P. Cement (Rewa) Limited factory is operating a 2.8 MTPA cement manufacturing plant at Jaypee nagar which is 18 km north of the Rewa Township in the Rewa District. There are no other industrial developments within the area. The cement factory plays a significant role in the local building industry in the economy of Rewa. The annual rainfall of this region is 1139.15 mms and average maximum and minimum temperature are  $36.8^{\circ}$ C and  $12^{\circ}$ C respectively. More than 90% annual rainfall occurs during the monsoon months. The factory's surrounding area is essentially rural with minor agricultural activities. Settlements are scattered houses at varying distances with the nearest settlement of about 200m. Three sites following different irrigation sources (Bela, Naubasta and

Bhiti) were selected as the experimental sites. Bela and Naubasta are two large industrial areas in which cements are produced. The bulk of this untreated industrial effluents are mixed with water which is known as wastewater, used to irrigate vegetables and Bhiti site was rural area where irrigation was done by clean (ground) water on agricultural land, was selected as control site, around the Rewa city. **Map of the sampling site is shown in Figure 1.** 

## **Sample Collection**

The sampling sites were selected in such a manner to cover the entire vicinity of the Cement Factory. Surface water samples were taken from the route into which waste water from factory is discharged; but also from vegetable fields where wastewater was used for irrigation. As control, surface water was sampled in fields irrigated with clean (deep bore well) water. Wastewater irrigated soil samples were collected from the cultivated fields near the Cement Factories Bela and Naubasta Limited along a distance of 60m from the Factory. Soil Samples were taken from the upper (0-20 cm) of soil because of the surfaces effective upper depth of cultivated soils, within the experimental sites with the help of a 25 mm diameter stainless steel tube auger which was pushed to the required depth when the tube had been removed from the soil, the core was extruded from the corer with the aid of a stainless steel rod and packed into polyethylene bags. Clean water irrigated soils (control soil) was also sampled for comparison. Vegetable samples were taken in the agricultural fields around the commune where they were known to be affected by waste water and where they were not (control). Samples of seven different kinds of vegetables; leafy vegetables included Spinach (*Betavulgaris L. CV.* All green), and Cabbage (*Brassica oleracea L. Var. Capatuta*). Inflorescence vegetable included Cauliflower (*Brassica oleracea L. Var. botrytis*), Fruit vegetables included Lady's Finger (*Abelmoschus esculentus L.*), Brinjal (*Solanum melongena L.*), Tomato (*Lycopersicon esculentum L.*) and Root vegetable included Radish (*Raphanus sativus L.*) were taken from the same experimental sites where waters and soils samples were taken .The detailed of the vegetable samples collected from the experimental sites are given in Table 1.

	Designation	Scientific Name	Edible Parts
Common			
Name			
Spinach	SP	Betavulgaris L. CV.	Leaf
Cabbage	CA	Brassica oleracea L. Var. Capatuta	Leaf
Cauliflower	CF	Brassica oleracea L. Var. botrytis	Inflorescence
Lady's Finger	LF	Abelmoschus esculentus L.	Fruit
Brinjal	BR	Solanum melongena L.	Fruit
Tomato	ТО	Lycopersicon esculentum L.	Fruit
Radish	RA	Raphanus sativus L.	Root

## Sample digestion

Water samples were digested according to APHA, (2005); the irrigation water sample, 50 ml. was transferred into beaker and 10 ml. of concentrated nitric acid (HNO<sub>3</sub>) was added. The beaker with the content was placed on a hot plate and evaporated down to about 20 ml at  $80^{\circ}$ C. The beaker was cool and another 5 ml. concentrated HNO<sub>3</sub> was also added. The beaker was covered with watch class and returned to the hot plate. The heating was continued, and then small portion of HNO<sub>3</sub> was added until the solution appeared transparent. The beaker wall and watch glass were washed with distilled water and the solution was filtered through whatman NO. 42 filter paper and the total volume were maintained to 50 mL with distilled water. Soil and vegetable samples were digested according to Allen *et al.*, (1986). To 5g of each of the air dried and sieved samples was thoroughly grinded, 1.0g of each of the ground samples were placed in 100 ml beaker. 15 ml of HNO<sub>1</sub> H<sub>2</sub>SO<sub>4</sub> and HCl mixture (5:1:1) of tri-acid were added and the content heated gently at low heat on hot plate for 2 hrs at  $80^{\circ}$ C until a transparent solution was obtained. After cooling, the digested sample was filtered using whatman NO. 42 filter paper. It was then transferred to a 50 mL volumetric flask by adding distilled water. Triplicate digestion of each sample was carried out together with blank digest without the sample.

## Sample analysis

Concentrations of Fe, Zn, Cu, Pb, Cd, Mn and Cr in the filtrate of digested soil, water and different kind of vegetables samples were estimated by using an Atomic Absorption Spectrophotometer (AAS, Perkin Elmer analyst 400). The instrument was fitted with specific lamp of particular metal. The instrument was calibrated using manually prepared standard solution of respective heavy metals as well as drift blanks. Standard stock solutions of 1000 ppm for all the metals were obtained from Sisco Research Laboratories Pvt. Ltd., India. These solutions were diluted for desired concentrations to calibrate the instrument. Acetylene gas was used as the fuel and air as the support. An oxidising flame was used in all cases. Guideline for maximum limit of heavy metals (Fe, Zn, Cu, Pd, Cd, Mn and Cr) in irrigation water, soil and vegetable was adopted from the reference by Indian Standard, WHO/FAO, European Union Standard and USEPA (see table 2).

	Tuble 2. Guideline for sure mints of neuvy metals							
Samples	Standards	Fe	Zn	Cu	Pb	Cd	Mn	Cr
Water	Indian Standard (Awashthi 2000)	NA	5.0	0.05	0.10	0.01	0.1	0.05
	WHO/FAO (2007)	NA	2.0	0.20	5.0	0.01	0.2	0.10
	European Union Standards (EU2002)	-	-	-	-	-	-	-
	USEPA (2010)	NA	2.00	1.00	.015	.005	.05	0.10
	Kabara-Pendias (2010)	0.80	NA	NA	NA	NA	NA	NA
Soil (mgkg <sup>-1</sup> )	Indian Standard (Awashthi 2000)	NA	300-600	135- 270	250-500	3-6	NA	NA
	WHO/FAO (2007)		-	-	-	-	-	-
	European Union Standards (EU2002)	NA	300	140	300	3.0	NA	150
	USEPA (2010)	NL	200	50	300	3.0	80	NA
	Kabata-Pendias (2010)	1000	NA	NA	NA	NA	NA	NA
Plant (mgka <sup>-1</sup> )	Indian Standard (Awashthi 2000)	NL	50.0	30.0	2.5	1.5	NL	NA
(ingkg )	WHO/FAO (2007)	450	<u>60.0</u>	40.0	5.0	0.2	500	5.0
	European Union Standards (EU2002)	NL	60	40	0.30	0.20	NL	NA
	USEPA (2010)	-	-	-	-	-	-	-

 Table 2: Guideline for safe limits of heavy metals

Source: CPCB

## Enrichment Factor (EF)

The enrichment factor (EF) has been calculated to derive the degree of soil contamination and heavy metal accumulation in soil and in plants growing on contaminated site with respect to soil and plants growing on uncontaminated soil (Kisku et al., 2000). According to Ergin *et al.*, (1991) and Rubio *et al.*, (2000) the metal enrichment factor (EF) is defined as follows: Enrichment Factor (EF) =  $\frac{[M_x / M_{ref}]Sample}{[M_x / M_{ref}]Background}$ 

Where M = Metal Concentration in soil sample and EF is the enrichment factor.  $(M_x/M_{ref})$  sample is the ratio of metal and  $(M_x/M_{ref})$  background is the ratio of metals and heavy metal concentration of a background. The background concentrations of metals were taken from an undisturbed area.

Five contamination categories are recognized on the basis of the enrichment factor as follows:

EF<2 is deficiency to minimal enrichment

EF<2-5 is moderate enrichment

EF<5-20 is significant enrichment

EF20-40 is very high enrichment

EF>40 is extremely high enrichment

(Sutherland 2000)

Despite certain short comings, the enrichment factor, due to its universal formula, is relatively simple and easy tool for assessing enrichment degree and comparing the contamination of different environment.

## **Quality assurance**

Appropriate quality assurance procedures and precautions were taken to ensure the reliability of the results. Samples were carefully handled to avoid contamination. Glasswares were properly cleaned, and reagents were of analytical grades. Deionized water was used throughout the study. Reagent blank determinations were used to correct the instrument readings. For validation of the analytical procedure, repeated analysis of the samples against internationally certified plant standard reference material (SRM-1570) of National Institute of Standard and Technology were used, and the results were found within  $\pm 2\%$  of the certified values.

## **Statistical analysis**

The recorded data were subjected to two-way analysis of variance (ANOVA) to assess the influence of different variables on the concentrations of heavy metals in the vegetables tested. All the statistical analyses were computed with SPSS software version 17.

### III. RESULTS AND DISCUSSION

#### Metal concentrations in irrigation water and soil

Tables 3 summarize the concentrations of seven heavy metals, respectively, in water and soil and samples collected in the vicinity of the J.P. Cement factories as well as control site. All the seventh elements display their presence in all the water and soil samples used for the study. It is clear from the results that the concentration of heavy metals in contaminated water (wastewater) samples obtained from the two source sites: Bela and Naubasta Cement Limited were significantly higher than those of the samples of control (clean) water obtained from Bhiti village (Table 3). In Bela and Naubasta Cement Limited sites, the concentration of Zn and Cu were however below the permissible limit set by Indian Standard (Awashthi, 2000), FAO/WHO (2007), EU Standard (EU 2002) And USEPA (2010), but the concentration of Pb by USEPA (2010), Cd by Indian Standard (Awashthi, 2000) and FAO/WHO (2007), Mn by FAO/WHO (2007) and Cr by Indian Standard (Awashthi, 2000) were higher than permissible limits. However, because no permissible limits were available for Fe, level of Fe suggested by Kabata Pendias (2010) was used for Fe and it was found that Fe concentration in all three sites were below the permissible level (see Table 2 Guideline & 3). In comparison of the concentration of heavy metals in contaminated water of J.P. Cement Factory Rewa with Cement Factory of NIGERCEM, Nigeria showed that Cd (0.04 mg L<sup>-1</sup>) and Cr (0.149 mg L<sup>-1</sup>) were lower, but for Fe (0.298 mg L<sup>-1</sup>) and Zn (0.069 mg L<sup>-1</sup>) were higher during the present study. The data obtained from heavy metals in waste water from the present study varied more or less regularly with the findings of the other authors (Khan *et al.*, 1998; Nakshabandi *et al.*, 1997 and Sridhara *et al.*, 2008).

Soils around cement factories showed high concentrations of metals especially Cd ,which showed exceed the permissible limit set by EU Standard (2002) and USEPA (2010) (Table 2 & 3) on top soils of 0-20 cm deep. Since there were no other sources of contamination in the area, the source of Cd in soil may be attributed to dust particles from cement factory (Bela). The lower concentrations of remains heavy metals (except for Cd ) than the safe limits may be due to the continuous removal of heavy metals by the vegetables and cereals grown in this contaminated areas and also due to leaching of heavy metals into the deeper layer of soil (Singh *et al.*, 2010). This highest conc. of Cd in contaminated soil of Bela Cement Factory was significantly higher than 3.02 mg/kg at Nigeria Cement Company (NIGERCEM) site reported by C. Ogbonna *et al.*, (2011) but significantly lower than 7.84mg/kg reported by Mandal and Voutchkov (2011) in the vicinity of cement factory. Whereas the lower (within safe limits) concentration of all seven metals at control site, indicating that there were no sources of contamination in the area, hence the site is free of contamination, represented as control site.

				Mean Heav	y Metal Conce	ntrations		
		<u>P</u> e	Zn	Cu	Pb	Cd	Mn	Cr
ted W)	WWI-I	0.689±0.445	0.248±0.005	0.041±0.013	0.067±0.013	0.031±0.006	0.375±0.024	0.077±0.010
	WWL-II	0.371±0.093	0.109±0.0513	0.025±0.004	0.105±0.081	0.027±0.006	0.230±0.030	0.036±0.009
	CWI-LII	0.005±0.0032	0.003±0.0008	0.002±0.0008	ND	ND	0.001±0.0002	ND
ted (w)	WW1-L	174.38±3.39	163.42±5.77	29.19±3.03	20.08±1.74	4.03±0.053	66.08±2.41	21.05±0.779
	WWI-11	185.22±6.12	156.95±11.06	40.70±4.95	14.47±0.799	3.24±0.353	57.88±3.03	24.84±2.02
	CWI-III	61.01±8.25	43.75±6.71	16.54±2.87	7.4±1.04	0.65±0.023	44.52±9.38	5.76±2.27

**Table 3:** Mean heavy metals concentration in irrigated water and soil

Mean±SD Values ; ND= Not Detected; Student t- test was done for mean heavy metal concentrations between WWI and CWI sites ; Level of significance: p<0.001

#### Metal concentration in plants

It is observed from the results Pb (8.9 mg/kg), Cd (2.39 mg/kg) and Cr (5.25 mg/kg) conc. in all vegetables (Highest for Spinach) exceeded the permissible limits for contaminated cement areas. Present study revealed that the conc. of Pb was exceedingly and/or slightly above in all seven vegetables at all sites including control and crossed safe limits. Pb concentration in all vegetables from both contaminated sites were exceedingly high whereas at control site, was slightly high concentration. As there was no industrial unit near the control area, it seems soil of that area naturally have high concentrations of those elements which may be come from atmospheric deposition by air or other anthropogenic sources. Accumulation of Pb mainly due to J.P. Cement plants due to transportation, re-suspended road dust and diesel generator sets. The reason for highest Cd accumulation in contaminated vegetables especially for greens (Spinach) from cement factories was that they were Cd sensitive and relatively high Cd accumulators. Cd was easily taken up by food crops especially leafy vegetables. The concentration of Cd (2.39 mg/kg) was much higher than 0.85-1.186 ppm and  $0.92 \pm 0.92 \mu$ g/g in greens and Piptatherum sp. around cement factories in Konya, Turkey (Onder *et al.*, 2007) and Vallcarca, Spain (Schuhmacher *et al.*, 20098), respectively. Plants absorb Cd from the soil via the roots (Pip 1991; McLaughlin *et al.*, 1999) and can become toxic by displacing Zn (Singh *et al.*, 2010). Also, comparable to others studies the highest mean concentration of Cd from cements factories was higher than 0.15-0.60mgkg<sup>-1</sup> reported by Sardans *et al.*, (2005). This was also similar to Demirezen and Ahmet (2006) that highest Cd accumulation in leafy vegetables from industrial area of Turkey and of Greece, reported by Fytianos *et al.*, (2001). Present results are in conformity with Farooq *et al.*, (2008), Singh *et al.*, (2010), Sharma *et al.*, (2010) Yogananda *et al.*,

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(2012) and Yadav *et al.*, (2013) who reported that this high concentration of Cd in leafy vegetables might be a threat for the consumers. The highest Cr conc. obtained in this study was much higher than world average of Cr (0.06 mg/kg) reported by Forstner and Whittmann(1984). Also comparable to others studies the highest conc. was higher than concentration of Cr (0.217 mg/kg) Industrial site of Faisabad, reported by Farooq *et al.*,(2008) but several fold lower than Cr concentration in Spinach (70.79mg/kg) from Industrial area of Bellandur,Bangalore, reported by Ramesh and Murthy (2012).

## **Enrichment Factor (EF)**

Tables 4 display a summary of the EF values for each heavy metal in terms of Different irrigation sources. According to Zhang and Liu, EF values between 0.5 and 1.5 indicate that a metal is entirely from crusted material or natural processes, whereas EF values greater than 1.5 suggests that the source were more likely to be anthropogenic. The result of the present study showed that, the enrichment factor for Fe and Zn in all studied sites were within 0.5 and 1.5, indicated that factors mostly from natural sources. Enrichment factors (EF) for Cu showed that they were deficiency to minimally enriched (EF <2), since the EF values of the metal (Cu) were less than 2. Enrichment factors for Pb showed that with the exception of samples from  $C_{B}$ -V  $C_{N}$ -II  $C_{N}$ -V and  $C_{N}$ -VII sites Pb enrichment for all sites were moderately enriched (EF<2-5) whereas for Cd enrichment for all sites were deficiency to minimal enriched(EF <2) except from C<sub>B</sub>-III C<sub>B</sub>-V and C<sub>N</sub>-VI which showed moderately enriched (EF <2-5) while for Mn samples from  $C_B$ -VI  $C_N$ -IV and  $C_N$ -VII sites indicated that they were moderately enriched (EF <2-5) while from remaining site it showed minimally enriched (EF <2). Enrichment factors for Cr showed that Chromium is the only metal with significantly enriched (EF>5-20) from  $C_B$ -V and  $C_B$ -VII sampling sites while from remaining site it was found to be moderately enriched (EF <2-5). The result of the present study show that, with the exception of Fe and Zn enrichment, all the metals were over deficiency to minimally enriched to significantly enriched (EF>5-20) in all the studied sites (Table 4). Since the EF values of the metals are greater than 1.5 (except for Fe and Zn) this indicated that the environment under the study is minimally/ moderately enriched to significantly enrich with all the metals. The differences in the EF values may be due to the difference in the magnitude of input for each metal in the soil and/or differences in the removal rate of each metal from the soil. All these prediction were made in accordance with Zhang and Liu (2002). Environment and human health impact of toxic trace metal contamination is a function of mobility and phytoavailalability The movement of heavy metal down the soil profile is often evident in high applications of heavy metals, usually in sewage sludge, in soils with low organic matter and clay contents, acidic conditions and when high rainfall or irrigation water rules have been applied. The movement occurs through soil macropores or cracks which is also referred to as preferential flow (Dowdy and Volk, 1983).

Sampling							
areas	Fe	Zn	Cu	Pb	Cd	Mn	Cr
C <sub>B</sub> -I	<mark>0.78</mark>	1.06	1.69	3.76	<b>1.90</b>	<b>1.55</b>	2.38
C <sub>B</sub> -II	<mark>0.22</mark>	<mark>0.67</mark>	<b>1.51</b>	<b>2.99</b>	<b>1.93</b>	1.57	2.32
C <sub>B</sub> -III	0.67	<mark>0.78</mark>	1.65	<mark>4.22</mark>	<b>2.45</b>	1.55	4.67
C <sub>B</sub> -IV	1.29	1.06	1.89	<b>3.90</b>	<b>1.78</b>	<b>1.90</b>	4,90
C <sub>B</sub> -V	<b>0.57</b>	<b>1.4</b> 0	<b>1.5</b> 0	<b>1.95</b>	2.99	1.89	7.00
C <sub>B</sub> -VI	<b>0.47</b>	<mark> .99</mark>	1.56	2.67	<b>1.90</b>	2.45	4,33
C <sub>B</sub> -VII	<b>1.23</b>	<mark>0.98</mark>	1.85	<b>2.45</b>	1.60	<b>1.50</b>	10.95
C <sub>N</sub> -I	0.65	1.04	<b>1.79</b>	<b>2.55</b>	1.56	1.67	2.99
C <sub>N</sub> -II	1.18	<b>0.55</b>	1.56	<b>1.89</b>	1.88	1.59	2.67
C <sub>N</sub> -III	1.29	1.00	1.50	<b>2.41</b>	<b>1.52</b>	<b>1.94</b>	<b>3.</b> 09
C <sub>N</sub> -IV	1.37	<mark>0.83</mark>	1.63	3. <mark>1</mark> 1	1.57	2.84	4.67
C <sub>N</sub> -V	0.78	1.00	1.58	1.67	1.90	1.81	3.70
C <sub>N</sub> -VI	1.16	0.57	1.77	<b>2.5</b> 6	2.15	1.55	5.00
C <sub>N</sub> -VII	1.20	0.90	1.51	1.53	1.85	2.10	4.23

|--|

 $C_B$  = Contaminated areas of Bela cement Ltd;

 $C_N$ = Contaminated areas of Naubasta cement Ltd.

## IV. CONCLUSION

Around the world as countries are struggling to arrive at an effective regulatory regime to control the discharge of industrial effluents into their ecosystems, Indian economy holds a double edged sword of economic growth and ecosystem collapse. Heavy metals accumulation increases with time in the soils when irrigation is carried out using wastewaters. In this scenario the present study gains

significance indicating the need for proper disposal of wastewater and further abatement of metal pollution and associated risk due to the consumption of foods grown on wastewaters. The present experimental data indicates high level of pollution along Cement Factories of Rewa, India. The experimental data suggests a need to implement common objectives, compatible policies and programmes for improvement in the industrial waste water treatment methods. It also suggests a need of consistent, internationally recognized data driven strategy to assess the quality of waste water effluent and generation of international standards for evaluation of contamination levels. The existing situation if mishandled can cause irreparable ecological harm in the long-term well masked by short term economic prosperity. The study showed elevated concentrations of metals in all environmental media suggesting a definite adverse impact on the environmental quality of the disposal area. All these studies have clearly indicated the distressing situation and warrant the need for controlling the metal pollution from industrial wastewater .From this study Concentrations of metals were found to be high in vegetables with special reference to Pb, which were found to be very high.

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#### AUTHORS

Author – Geetanjali Chauhan (PhD Scholar), M.Sc. in Environmental Science, Allahabad Agricultural Institute- Deemed University, Allahabad . Email :<u>geet.chauhan27@yahoo.com</u>.

Correspondence Author – Geetanjali Chauhan; Email : geet.chauhan27@yahoo.com; Contact No. +918127453338.

"Factory farming cement is one of the biggest contributors to the most serious environmental problems. Cement industry causes more heavy metals emissions than all the cars, trucks, planes and ships in the world. We must reduce all the emissions that are destroying the planet. We must go from capitalism to socialism."

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## Waste heat Utilization of vapour compression cycle

## S. N. Vedil, A. Kumar, D. Mahto

Department of Mechanical Engineering, BIT Mesra

*Abstract*- There are two types of energy i.e. high grade energy and low grade energy. Majority of the processes require high grade energy which is depleting day by day. Hence, it has become a matter of great concern to use the non conventional source of energy or to recover the waste heat liberated from the processes. This paper studies theoretical approach to recover the waste heat liberated from vapour compression cycle, which is used to run vapour absorption cycle. The required heat has been given by solar energy. The work evaluated the performance of combined cooling cycle

*Index Terms*- combined cooling cycle, waste heat recovery, Vapour compression cycle, vapour absorption cycle, solar heat

## I. INTRODUCTION

Energy is the driving force of civilization and it measure prosperity of the nation. Now a day, per capita energy consumption is directly related with per capita income of the people. All developed and developing countries are using conventional energy rapidly. Due to high rate of consumption of energy, sources available in earth surface will exhaust after some period. Therefore, engineers and scientists are trying to see new possibilities to use sources efficiently and utilize waste heat. Waste heat is the heat which gets untapped and directly released into the atmosphere. It is released in the form of streams of gases and liquids which leaves the system at a temperature higher than the surrounding.

List of	symbols
COP	Coefficient of performance
VCC	Vapour compression cycle
VAC	Vapour absorption cycle
Q	Heat energy (kW)
h	Enthalpy (kJ/kg)
S	Entropy (kJ/kgK)
Х	Quality of steam
Subscr	<i>ipts</i>
g	Generator
с	Condenser
а	Absorber
e	Evaporator

In present work combined cooling has been carried out. In this combined cycle, vapour compression cycle (VCC) is topping cycle and vapour absorption cycle (VAC) is bottoming cycle. The exhaust of topping cycle is utilized by bottoming cycle. Mahto & Pal(1) reported the utilization of exhust gas of topping cycle(gas turbine) to run bottoming cycle (Rankine cycle). In their work they used exhaust of gas turbine cycle to run the Rankine cycle.

Maurya and Avasthi(2) evaluated the waste heat from vapour compression cycle and utilized it using an ejector. They studied at a generator temp.  $64^{\circ}$ C, condenser temp.  $44^{\circ}$ C and evaporator temp.  $10^{\circ}$ C and plant capacity 7tons and there refrigerant was F12. They found that the cop of the plant increased by 50% if the waste heat was utilized using an ejector.

Renjith and Joshi (3) concluded in their work that ammonia water as a refrigerant for vapour absorption cycle is the most suitable pair. They also show that this pair of refrigerant eliminates dependency on fossil fuels and advantageous in ozone layer depletion.

Dipak Jagdhane (4) elaborated double cooling effect with the waste heat liberated from the engine surface. They utilized exhaust heat of engine surface to heat the aqueous ammonia solution in the generator section of the vapour absorption cycle. They found an additional cop of 0.4.

Kaushik and Singh(5) reported the analytical study of vapour absorption refrigeration cycle by applying energy and mass balance in each section of the absorption system. They designed lithium bromide-water (LiBr-H<sub>2</sub>O) absorption refrigeration system with capacity of 5.25 kW and the cop of the system was found 0.881.

Combined cycle performance is far better than single running cycle. Present work deals in improving the performance of a combined cooling cycle i.e vapour compression cycle and vapour absorption cycle. The exhaust of VCR is utilized to drive VAC with the help of solar energy.

## II. THEORY

In the present work two cooling cycle run parallel to each other. One is topping cycle and the other is bottoming cycle. Topping cycle is VCC and the bottoming cycle is VAC. It can be clearly observed from the combined diagram that the waste heat liberated from the condenser section of the vapour compression cycle is transferred to the generator section of the vapour absorption cycle, but this alone may or may not be sufficient to drive the bottoming cycle. Hence, some amount of heat energy is also taken from a non conventional source of energy i.e solar energy which is abundantly available. Solar heat is utilized by using a flat plate collector. The solar collector generates required heat at generator section of VAR. The main purpose of adding solar heat is to raise the temperature inside the generator which would be sufficient enough to convert liquid ammonia to vapour form.



#### III. ANALYSIS OF VAPOUR COMPRESSION CYCLE

Considering a F-12 vapour compression refrigeration(Topping cycle) plant of refrigeration capacity 10 TR working under following conditions.

Temp	$\mathbf{h}_{\mathrm{f}}$	h <sub>g</sub>	Sf	Sg
(°C)	(kJ/kg)	(kJ/kg)	(kJ/kgK)	(kJ/kgK)
30	64.56	199.62	0.2398	0.6853
-15	22.32	180.955	0.09045	0.7053



 $s_1 = s_2$   $s_1 = s_f + x(s_g - s_f)$  $s_2 = 0.6853 \text{ kJ/K}$ 

Therefore,

0.09045 + x (0.7053 - 0.09045) = 0.6853x = 0.9674

Therefore,

 $\begin{array}{l} h_1 = h_f \, + \, x(h_g \, - \, h_f) \\ h_1 = 22.32 \! + \! 0.9674 \; (180.955 - 22.32) \\ h_1 = 175.783 \; kJ/kg \end{array}$ 

$$m_r = refrigerant flow rate = \frac{10+3.5}{(h1-h4)} = \frac{10+3.5}{175.783-64.56} = 0.3146 \text{ Kg/s}$$

Rejected heat through condenser =  $m_r (h_3 - h_4)$ = 0.3146 (199.62 - 64.56) = 42.5kW

 $COP = \frac{h_1 - h_4}{h_2 - h_1} = \frac{175.783 - 64.56}{199.62 - 175.783} = 4.666$ 

#### IV. ANALYSIS OF VAPOUR ABSORPTION CYCLE

Let us consider a aqua ammonia(NH3-H20) vapour absorpsion plant working under the following considerations.

Concentration of strong solution	0.4
Concentration of weak solution	0.3
Condenser pressure	14 bar



From the h-c chart we find the enthalpies at various points and consequently the heat energy associated with each section of the vapour absorption cycle.

h1 =1620 kJ/kg	h8 = 400  kJ/kg
h2 = h3 = 510  kJ/kg	ha = 100  kJ/kg
h4 = 1600  kJ/kg	h9 = h10 = 100  kJ/kg
h5 = h6 = 50  kJ/kg	h11 = 1750 kJ/kg
h7 = 300  kJ/kg	h12 = 1850  kJ/kg

Heat given to generator is 80% of heat supplied by vapour compression cycle

i.e. considering 20% losses.

Therefore,  $Q_{g=} 34 \text{ kW}$ 

Refrigerant flow rate =  $m_r = \frac{34}{h12 - ha} = 0.0153 \ kg/s$ 

Therefore,

$$Q_{e} = m_{r} (h4 - h3) = 16.677 \text{ kW}$$

$$Q_{c} = m_{r} (h1 - h2) = 16.983 \text{ kW}$$

$$Q_{a} = m_{r} (h4 - ha) = 26.01 \text{ kW}$$

$$Q_{e} = 0.49$$

$$Cop = Q_{g}$$

## V. RESULTS

In this paper a vapour compression cycle is proposed which is working under the temperature limits of  $-15^{\circ}$ C to  $30^{\circ}$ C i.e. evaporator temp is  $-15^{\circ}$ C and the condenser temp is  $30^{\circ}$ C. The refrigerant is F-12 and the system is designed for a capacity of 10 TR. The waste heat liberated from the condenser is utilized in a vapour absorption cycle working under the pressure limits of 14 bar and 2 bar . The refrigerant is ammonia and the absorbent is water and the concentration of the strong and weak solution is taken as 0.4 and 0.3 respectively. Analysis of work found an additional cop of 0.49.

## VI. CONCLUSION

By utilizing the waste heat released from vapour compression cycle to vapour absorption cycle we have increased the coefficient of performance by 10.5 %. As load on the evaporator section of the vapour compression cycle increases, more heat is released in the condenser section. Thus performance of the combined cooling cycle increases with increased loads in the topping cycle.

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#### AUTHORS

**First Author** – Sayeed Nawaz Vedil, ME Mechanical, BIT Mesra, snvedil.786@gmail.com

Second Author- Akhilesh Kumar, ME Mechanical, BIT Mesra, imakhilesh27@gmail.com

**Third Author** — Dhaneshwar Mahto, Assistant Professor BIT Mesra, <u>dmahto@bitmesra.ac.in</u>

Correspondance Author - Sayeed Nawaz Vedil, ME

Mechanical, BIT Mesra, <u>snvedil.786@gmail.com</u> - Dhaneshwar Mahto, Assistant Professor BIT Mesra,

 Dhaneshwar Manto, Assistant Professor B11 Mesra <u>dmahto@bitmesra.ac.in</u>

# A Practical Approach for Electrical Energy, Power Transfer Wirelessly-Green Technology

## Shreyansh Likhar<sup>#1</sup>, Devendra Goswami<sup>#2</sup>, Roopali Dahat<sup>#3</sup> Vaishali Holkar<sup>#4</sup>

<sup>1,3,4</sup> Electrical and Electronics Engineering Department, RGPV University, Chameli Devi Group of Institution (C.D.G.I.), Indore, Madhya Pradesh, India

<sup>2</sup>Medi-caps Institute of Technology and Management, Indore in Electronics and Instrumentation Branch

<sup>1</sup> shreyanshlikhar@gmail.com
 <sup>2</sup> devendragoswami40@gmail.com
 <sup>3</sup>roopali.dahat19@gmail.com
 <sup>4</sup>vaishali.holkar8@gmail.com

*Abstract*- This paper presents a practical approach for wireless power transfer by inductive coupling. As the protection of environment from pollution green cars (electric cars) are emerging out now a day increasing the requirement of electricity but lacks in electricity power sockets. So to solve this problem a new technology of wireless electricity can be used to charge these electric cars which are more reliable.

Under this research, working principle is presented about the design and implementation of wireless power transfer. The experiment results also show the validity of the theoretical analysis. During this research investigation for the need of wireless power transfer and comparison with different materials of coil used was done to demonstrate the power transfer.

The advantages, disadvantages, biological impacts and applications of WPT are also presented.

*Index Terms*- Inductive coupling, Nikola Tesla, Wireless Power Transmission.

## I. INTRODUCTION

HIS idea came from the availability of limited power sockets. Thus creating wireless power transfer system which is helpful in discarding a bunch of wires. Making the system more systematic. Wireless power transfer is devices which transmit a signal which is useful for electronic devices to charge or work. It is a means by which large amounts of electrical energy may be transmitted through the atmosphere from a power source in one location to a receiver and consumer of electric power at another location. Although these devices can be one of many portable electronic products utilized today (laptops, cell phones, iPods, PDAs, lawnmowers, etc.), the primary focus initially will be on electric vehicles, and in particular vehicles for public transportation.

According to the World Resources Institute (WRI), India's electricity grid has the highest transmission and distribution losses in the world – a whopping 27%. Numbers published by various Indian government agencies put that number at 30%, 40% and greater than 40%. This is attributed to technical losses (grid's inefficiencies) and theft [1]. This problem can be solved by an alternative option for power transmission which could provide much higher efficiency; low Transmissions cost and

avoid power theft. Power Transmission wirelessly is one of the hopeful technologies and may be the decent alternative for efficient power transmission.

## History- Electrical Energy Power Transfer Wirelessly

Nikola Tesla he is who invented radio and shown us he is indeed the "Father of Wireless". Nikola Tesla is the one who first conceived the idea Wireless Power Transmission and demonstrated "the transmission of electrical energy without wires" that depends upon electrical conductivity as early as 1891[2]. In 1893, Tesla demonstrated the illumination of vacuum bulbs without using wires for power transmission at the World Columbian Exposition in Chicago. The Wardenclyffe tower was designed and constructed by Tesla mainly for wireless transmission of electrical power rather than telegraphy [3].

#### II. COMPONENTS OF POWER TRANSFER WIRELESS SYSTEM

The Primary components of Wireless Power Transmission are Inductive coils, the transmitter consisting of a frequency amplifier circuit which increases the frequency of the supply voltage from 50Hz to 10 MHz; the components used to make the transmitter circuit are mosfets, resistors, capacitors and inductors.

## III. ADVANTAGES, DISADVANTAGES WPT

## A. Advantages

## Green

This Eliminate unnecessary cords and outdated battery solutions, while reducing energy wasted through inefficient battery chargers.

## Freedom of positioning

Wired circuits have limited flexibility of positioning while wireless circuits give the flexibility of operating electronic items without wires and independently.

## Eliminates power cords and adaptors

Multiple devices are supported by a single primary, eliminating the need for multiple separate power supplies or chargers.

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## B. Disadvantages

The Capital Cost for practical implementation of WPT seems to be very high and the other disadvantage of the concept is the high frequency which is harmful for long term use but the CEO of WiTricity Corporation says that WiTricity is safer than using a Smartphone.

## HEALTH AND SAFETY

If worried about the health implications of yet another wireless signal coursing through your body, according WiTricity corporation wireless electricity is safer than using a Smartphone. These technologies have long term effects.

#### IV. PRACTICAL APPROACH FOR ELECTRICAL ENERGY, POWER TRANSFER WIRELESSLY

The purpose of this project is to supply power wirelessly to the load which is connected to the secondary coil. The system includes a systematic process which is explained further



### Figure 1. Functional Block Diagram of Wireless Power Transmission System

A. POWER USAGE

The system uses 12V, 5A D.C power

P = V \* I

P = 12 \* 4

- P = 48 Watts
- B. REQIREMENTS
- Wireless power transfer-

Resonant inductive coupling or electrodynamics induction is the near field wireless transmission of electrical energy between two coils that are tuned to resonate at the same frequency. [1]

If resonant coupling is used, each coil is capacitive loaded so as to form a tuned LC circuit. If the primary and secondary coils are resonant at a common frequency, it turns out that significant power may be transmitted between the coils over a range of a few times the coil diameters at reasonable efficiency. Inductive coupling uses magnetic fields that are a natural part of current's movement through wire. Any time electrical current moves through a wire, it creates a circular **magnetic field** around the wire [2]. Bending the wire into a coil amplifies the magnetic field. The more loops the coil makes, the bigger the field will be.

#### Efficiency-

The major problem of inductive coupling is the output efficiency as the distance increases between the primary and secondary coils the efficiency decreases. Even the power at output is not equal as input, inductive coupling suffers from various losses of power during transmission.

The efficiency of the system depends on the size of the primary and secondary coils if the size of primary and secondary is same the efficiency will be maximum this phenomenon is also known as tuning as according to resonance condition.

$$\mathbf{C}_1 \ge \mathbf{L}_1 = \mathbf{C}_2 \ge \mathbf{L}_2$$

According to this the product capacitance and inductance in primary and secondary must be same for maximum efficiency. C. *Power Transfer* 

The power is wirelessly transferred via resonant inductive coupling. The primary and secondary is coupled with a resonant capacitor, the primary and secondary is tuned to a frequency to let them communicate to transfer power and to receive maximum frequency.



Figure 2. - Basic diagram of primary and secondary circuits

#### D. DESIGN

The transmitting and receiving coils is the main part of the system which is coupled with a capacitor as according to the condition of resonance the primary and secondary must be coupled with the equal value of capacitance and inductance.



Figure 3- Size of coil

TABLE IX coil parameters

Item	Diameter	No. of turns
Transmitting coil	50cm	4
Receiving coil	50cm	2

#### E. Constructions-

1) Transmitting and receiving 19Gauge copper super enameled wire-

The transmitting and receiving coils are made up of 19 gauge copper super enameled wire. The diameter of coils is 50cm.

## 2) Transmitting and receiving with breadboard aluminium wire-

The transmitting and receiving coils is made up of breadboard wire the diameter is 20cm.

#### F. Testing-1) Setup-

The transmitting and receiving coils is coupled with the resonant capacitors as to follow the condition of resonance. The supply is provided from a 12 volts 5A transformer which is connected to the transmitter circuit.



Figure 4- Setup of Wireless power transfer



Figure.5- Operating a lamp wirelessly via resonant inductive coupling.

## V. CALCULATIONS AND RESULTS

A lamp is connected to the secondary which is able to transfer 102MHz. successfully at 10watts another method of transmission is via microwaves which is ranging in kilometers.

The data below is the output voltages and efficiencies by using different coil material.

 TABLE XI

 Output voltages and efficiencies by using different coil material

Coil Type Copper	I/P volt age 12V	O/P volta ge 31V	I/P curr ent 4A	O/P curre nt 3.5A	I/P pow er 48W	O/P powe r 108
enameled wire(19gaug e)						W
Breadboard aluminium wire	12V	25V	4A	2.42A	48W	60.5 W

**Power = Voltage x Current Input Power =** 12 x 4 = 48 Watts

**Copper enameled wire-Output Power** = 31 x 3.5 = 108 Watts

**Breadboard aluminium wire-Output power** = 25 x 2.42 = 60.5 Watts As the diameter of secondary is decreased as compared to primary the efficiency also decreased.

In Figure 5 the secondary coil is inside the lamp which is much smaller than the primary as a result of which efficiency is directly affected.



Figure 6 -secondary coil of lamp along with the resonant capacitor and rectifier circuit.

Keeping the primary of 50cm diameter

#### TABLE XIII Parameter of smaller coil

Coil Type	Output Voltage	Output Current	power
Smaller than primary(copper)	20V	0.53A	10Watts

According to above result the output efficiency total depends upon the size of secondary coil.

As the size of secondary is reduced with respect to primary the efficiency will decrease vigorously.

So for maximum efficiency the diameter of coil must be same.

**Frequency-**As there are three methods of power transfer i.e. high Voltage, high frequency and microwaves. The method used in this project is via high Frequency; the frequency received on the lamp is 102 KHz .Similarly, on the secondary whose size is same as primary the frequency is 5 MHz



Figure 7 -Output frequency waveform with load.



Fig.8- output frequency of same sized coils without load.

TABLE XIIV output at secondary coil

Coil	Frequency
Lamp Coil	102 KHz
Secondary of 50cm too	5 MHz



Figure 9– Wireless car charging (Block Diagram)<sup>[6]</sup>

#### VI. CONCLUSION

The result obtained by the project is less than the  $Q_i$  standard. There are more complications which is responsible to make the system more difficult to build. With such a design, power transfer for laptop-sized coils is more than sufficient to run a laptop.

As long as the laptop is in a room equipped with a source of such wireless power, it would charge automatically, without having to be plugged in. In fact, it would not even need a battery to operate inside of such a room." In the long run, this could reduce our society's dependence on batteries, which are currently heavy and expensive.

At the same time for the long range power transmission, power can be sent from source to receivers instantaneously without wires, reducing the cost [7].

#### FUTURE SCOPE

As we know that for protection of environment from pollution green cars (electric cars) are emerging out now a day. This increases the requirement of electricity but lacks in electricity power sockets. So to solve this problem a new technology of wireless electricity can be used to charge these electric cars which are more reliable.

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#### AUTHORS

**First Author** – Shreyansh Likhar, Electrical and Electronics Engineering Department, RGPV University, Chameli Devi Group of Institution (C.D.G.I.), Indore, Madhya Pradesh, India, Email: shreyanshlikhar@gmail.com

**Second Author** – Devendra Goswami, 2Medi-caps Institute of Technology and Management, Indore in Electronics and Instrumentation Branch. Email:

devendragoswami40@gmail.com

Third Author – Roopali Dahat, Electrical and Electronics Engineering Department, RGPV University, Chameli Devi Group of Institution (C.D.G.I.), Indore, Madhya Pradesh, India, Email: roopali.dahat19@gmail.com

**Forth Author** - Vaishali Holkar, Electrical and Electronics Engineering Department, RGPV University, Chameli Devi Group of Institution (C.D.G.I.), Indore, Madhya Pradesh, India

# High Strength Concrete of M60 Grade for Highway Pavements for Heavy Vehicles

## Sanjay Srivastava<sup>\*</sup>, Dr S.S Jain<sup>\*\*</sup>, Dr M.P.S. Chauhan<sup>\*\*\*</sup>

<sup>\*</sup>Research Scholar, Deptt. Of Civil Engg., IIT, Roorkee
 <sup>\*\*</sup>Prof. & Head Transportation Engg. Group, IIT, Roorkee
 <sup>\*\*\*</sup>Ass. Prof. & Head, Deptt. Of Civil Engg., Pauri Engg. College, Pauri

*Abstract*- The cost of concrete is governed by the cost of material, plant and labour. The cost of cement is several times higher than the aggregate. Therefore, the objective is to produce the concrete mix as lean as possible and should be economical. That is why designed mixes are preferred to nominal mix. Generally in nominal mixes, cement in higher quantity is used than the designed mixes. Since in production of concrete, the cost of concrete, it is essential that concrete mixes must be designed.

*Index Terms*- High Strength High Performance Concrete, designed mixes, cement, fly ash, Super Plasticizer.

## I. INTRODUCTION

Mix design can be defined as the process of selecting suitable ingredient of concrete and determining their relative proportions with the objective of producing concrete of certain minimum strength and durability as economically as possible. The purpose of designing mix is two-fold. The first objective is to achieve the stipulated minimum strength and durability. The second object is to make the concrete in the most economical manner. Since main cost governing material is cement, therefore, much attention is given to the use of cement as little as possible consistent with strength and durability.

With the given material, the four variable factors to be considered in connection with specifying a concrete mix are-1)Water-cement ratio 2) Cement content or cement aggregate ratio3) Gradation of aggregate 4) consistency.

With the advent of plasticizer and super plasticizer, it has now been possible to produce the concrete of much higher strength than the normal concrete. Concrete of strength approximately 138 MPa is commercially available as High Performance Concrete (HPC).HPC are very common in North America, Japan and other European countries. High performance high strength concrete is very commonly used in building column, bridge super structures and decks. In India, the first prestressed concrete bridge was built in 1949 for Assam Rail Link at Silliguri. In fifty's a number of prestressed concrete structures were built using concrete of strength from 35MPa to 45MPa. But strength of concrete more than 35MPa was not commonly used in general construction practices. Probably concrete of strength more than 35MPa was used in large scale in Konkan Railway project during early 90's and construction of Mumbai Municipal Corporation roads. It is during 90's use of high strength concrete has taken its due place in Indian

construction scenario. Of late concrete of strength from 45MPa to 60MPa has been used in high rise buildings at Mumbai, Delhi and other metropolitan cities. High strength concrete was also employed in bridges and fly overs. Presently (year 2000) in India concrete of strength 75MPa is being used for the first time in one of the flyovers at Mumbai. Other notable example of high strength concrete in India is in the construction of Containment Dome at Kaiga power project. They have used high performance concrete of strength 60MPa with silica fume as one of the constituents. The different properties of high strength concrete have now been well understood. High strength concrete has not been used in the area of highway rigid pavement. Due to higher durability and low permeability of HSHPC, the pavement could be designed for longer design period. In the present research work, author has developed high strength high performance concrete of M60 grade using fly ash for highway pavement.

## II. HIGH STRENGTH HIGH PERFORMANCE CONCRETE (HSHPC)

As mentioned by P.K. Mehta (2004), according to a paper by Aitcin, what was known as high strength concrete in the late 1970s is now referred to as high performance concrete (HPC) because it has been found to be much more than simply stronger. High performance concrete has one or more of the properties like as low shrinkage, low permeability and high modulus of elasticity or high-strength. According to Henry Russel, ACI defines high performance concrete as concrete that meets special performance and uniformity requirements that cannot always be achieved routinely by using only conventional materials and normal mixing, placing and curing practices. The requirements may involve enhancement of placement and compaction without segregation, long term mechanical properties, early age strength, toughness, volume stability or service life in severe environments.

A major criticism presented by P.K. Mehta (2004) against the ACI definition of HPC is that durability of concrete is not mandatory. It is one of the options. Earlier, it was assumption that high strength concrete is durable, probably this assumption lead to cracks in many structures.

As per Indian Standard, the concrete having strength 60 MPa or more, are known as high strength concrete.

Typically, these mixtures are composed of a high cement content viz. 450-500 kg/m<sup>3</sup> Portland or blended Port land cement containing relatively small amount of silica fume and fly ash or slag, a low water/cement ratio of the order of 0.3 (with the help

of super plasticizer admixture) and an air entraining agent when it is necessary to protect the concrete from cycles of freezing and thawing.

In this regard, an earlier definition proposed by Mehta and Aitcin stated that the term HPC should be applied to concrete mixtures possessing the following three characteristics: high workability, high strength, and high durability.

The advantages of using high strength high performance concrete balance the increase in material cost. The use of HSC permits significant reduction in column dimensions, which gives 30% more free space in high rise building parking area. By using HSC it reduces the dimensions of members and hence reduction in dead weight accompanying with saving due to lighter foundation. With reduction in dimensions, directly saving in concrete volume and form work. Due to early gain in strength, form work could be removed earlier and hence speedy construction. Due to low creep, axial shortening of compression member is reduced. High strength high performance concrete has resistance to freezing and thawing, chemical attack and significantly improved long term durability and less maintenance work. By using HSC, the number of beams in bridge construction is reduced and longer span could be provided. In high strength high performance concrete, generally cement content is higher compared to normal strength concrete. Due to higher cement content it releases substantial amount of heat due to hydration reactions between cement and water. Each kilogram of cement added into concrete mix results in approximately 150 KJ of heat. Consequently, temperature rises significantly when more cement is mixed for HSC, especially for mass concrete structures. This problem leads to high temperature inside the concrete structures and is the main cause of cracks in concrete structures, especially, during early age. To reduce the cracks the concrete must be cured carefully. As a result, expenditure for curing work is significant and contributes to raise the total cost of concrete. Secondly, high cement binder content used for concrete creates free calcium hydroxide compound in cement paste. This lead to unstable volume as well as low water resistance of concrete structure. There is some inconvenience in using high strength high performance concrete, namely brittle failure, higher autogenous shrinkage and low fire resistance.

## III. THE MYTH ABOUT HIGH STRENGTH HIGH PERFORMANCE CONCRETE

According to Aitcin, Pierre-Claude, and Neville, Adam, high strength concrete differs from normal strength concrete in that it invariably contains a high-range water reducer(or super plasticizer), while normal strength concrete contains it only sometimes. All the other basic ingredients are the same-namely, Portland cement, aggregate, water and admixture. As for as other ingredients are concerned, such as retarders, fly ash, blast furnace slag and silica fume, they may or may not be present in either type of concrete.

## IV. EXPERIMENTAL PROGRAMME

The experimental work has been planned for development of high strength high performance concrete mix of M60 grade.

Number of specimen having different water cementitious material ratio were prepared. For each water cementitious material ratio, six cubes for compressive strength, six beams for flexural strength and three cylinders for modulus of elasticity were prepared. Finally water cementitious material ratio 0.29 was adopted. Locally available materials were used throughout the experiment, which have the following properties

#### A. Coarse aggregate

Locally available crushed stone coarse aggregate of maximum size 20 mm was used confirming to IS: 383:1970 was used. The fineness modulus of coarse aggregate in the study is 6.7. The gradation of coarse aggregate used and other properties are given in Table-2.

## Table-1 Grading and other physical analysis for Coarse Aggregate

1. Sieve analysis				
IS Sieve Size	weight retained in gm	%age weight retained	Cumulative Percentage weight retained	
20 mm	126	2.52	2.52	
10 mm	3224	64.48	67	
4.75 mm	1572	31.44	98.44	
2·36 mm	78	1.56	100	
1.18 mm	0	0	100	
600 µ	0	0	100	
300 µ	0	0	100	
150µ	0	0	100	
Total		667.96		
F.M			6.7	
2. Specifi	c gravity		2.656	
3. Aggreg	ate Crushir	10.81%		
4. Soundr	less Test	Negligible loss of weight in Na <sub>2</sub> SO <sub>4</sub> saturated solution		
5. Water absorption			0.20%	
6. Unit Weight			1631.72 Kg/m <sup>3</sup>	

#### B. Fine aggregate

Locally available fine aggregate confirming to IS: 383-1970 was used. The fineness modulus in the study used is 2.89. The gradation of fine aggregate and other properties are given in Table-3as below-

Table-2 Grading and other physical analysis for Coarse Sand

1. Sieve analysis					
IS Sieve	weight	Percentage	Cumulative		
Size	retained	weight	Percentage		

	in gm.	retained	weight retained
4.75mm	310	15.5	15.5
2.36mm	106	5.3	20.8
1.18mm	199	9.95	30.75
600 µ	228	11.4	42.15
300 µ	841	42.05	84.2
150µ	226	11.3	95.5
Total			288.9
F.M			2.89
2. Specifi	2.69		
3. Moistu	2.30%		
4. Unit W	1834.24 Kg/m <sup>3</sup>		

## C. Cement

Ordinary Portland cement, grade-43, confirming to IS 8112-1989 was used throughout the investigation. The cement used in the experiment has the properties given in Table-4.

Table-3Physical tests of cement

Type and BrandOPC- 43 Grade Jay Pee							
Cement							
Colour of cement Grey							
S. No.	Name of tests	Test results	Indian Standard Specifications as per IS 8112- 1989				
1	Standard Consistency Percentage mixing water by wt. of cement	30%	30%				
2	Fineness Specific Surface by Blaine's air permeability method (M <sup>2</sup> /Kg)	290	Not less than $225 \text{ M}^2 \text{ /Kg}$				
3	Soundness Expansion by Le-Chatelier method (mm)	1.0 mm	Not more than 10 mm				
4	Specific Gravity	3.15	3.15				
5	Setting Time(minu	ites)					
	a. Initial	65	Not less than 30 minutes				
	b. Final	158	Not more than 600 minutes				
6	Compressive Strength(MPa)						
	a. $72 \pm 1$ hour	28.3	Not less than 23				

b. hour	$168 \pm 2$	35.5	Not less than 33
c. hour	672 ± 4	43.8	Not less than 43

## D. Fly ash

Class F type fly ash, according to ASTM was used throughout the experiment. High fineness, low carbon content, good reactivity are the essence of good fly ash. The fly ash used in the experiment has the properties given in Table-5.

Table- 4: Properties of fly ash

S.		
No.	Property	
1	Fineness,cm <sup>2</sup> /gm	3500
2	Specific gravity	2.24
3	% coarser than 45 µm	5.6
4	Average particle size, µm	10.10
	Silicon dioxide,SiO <sub>2</sub> ,percent	
5	by mass	57.5
6	SiO <sub>2</sub> +Al <sub>2</sub> O <sub>3</sub> +Fe <sub>2</sub> O <sub>3</sub> ,by mass	91
	Loss on ignition, percent by	
7	mass	0.57

## E. Super plasticizer

Sikament N-170 was used. It is modified naphthalene formaldehyde sulphonate type. It is dark in brown and specific gravity is around 1.16 to 1.20. It complies with IS: 9103, ASTMC 494 Type F and BS: 5075 part 3.

## F. Water

Water used for mixing and curing should be free from injurious and deleterious materials. Throughout the investigation, potable tap water was used.

## E. Mix Proportion

## Table- 5: Results of Trial Mixes

Sl.	Mix	Water	Super	Percent	Slump	7 days	
No.	Ratio	cementi-	plasticizer	of fly in mr		average	
		tious	in percent	ash		compressive	
		ratio				strength of	
						five cubes	
						in N/mm <sup>2</sup>	
1	1:1.2	0.301	2	7	-	17.99	
	: 2.3						
		0.295	2	7	30	16.08	
2.	1:1.1	0.29	2	11	80	48.82	
	: 1.9						
		0.30	2	11	130	45.57	
		0.31	2	11	180	38.81	
		0.31	1.6	11	150	52.10	
		0.30	1.6	11	90	44.84	
		0.29	1.6	11	35	43.81	

Table: - 6: Results of Finally Adopted Trial Mix

Sl. No.	Mix Ratio	Water cementi-tious	Super plasti- cizer in	Percent of fly	Slump in mm	7 days compre-ssive	28 days compressive strength in
1	1:1.1 : 1.9	0.29	1.6	11	32	43.8 1 44.2 5 41.6 42.0 4 46.0 2	67.4 63.21 64.0 64.6 67.68
Av	Average						65.38

Finally, trial mix having mix proportion  $1:1\cdot1:1:9$  was adopted with water cementitious ratio 0.29. Fly ash was used approximately 11% and 1.6% high range water reducer was used.

#### V. EXPERIMENTAL METHODOLOGY

The batching of ingredients of aggregate and cement was done by weight mix ratio. A mixing machine was used for mixing the various constituent of concrete. A small amount of water was fed first followed by all solid materials simultaneously into the mixer i.e. the sand fed first, then part of coarse aggregate, cement and water and then the finally the remainder of coarse aggregate was fed into the machine so as to break up any modules of mortar. To check the workability, slump test was performed. The specimens were cast in steel mould. To measure the compressive strength, flexural strength and modulus of elasticity, the test specimen were prepared in the standard size 150 mm  $\times$ 150 mm  $\times$  150 mm cast iron cube mould for compressive strength and 150 mm diameter and 300 mm height cast iron cylindrical mould for modulus of elasticity and 100 mm  $\times$  100 mm  $\times$  50 mm beam for flexural strength. The mould was properly greased by using oil in order to prevent the adhesion of concrete to the mould. The concrete was poured into the mould in three layers and each layer being compacted by standard tamping rod uniformly. After compacting third layer, the upper surface of concrete was leveled. Precautions were taken to avoid over compaction which lead to segregation. After 24 hours in the mould, the specimen were removed and placed in water tank for 7 days and 28 days. The specimens were tested as per IS: 516-2004.

#### VI. RESULTS AND DISCUSSIONS

The values of compressive strength, flexural strength and modulus of elasticity for high strength high performance concrete are given in Table-6. Average 7 days and 28 days compressive strength found to be 42.5 N/mm<sup>2</sup> and 63.5 N/mm<sup>2</sup>. The values of

fle kural strength 7 days and 28 days come out as 4.82N/mm<sup>2</sup> and 6.4N/mm<sup>2</sup>. The modulus of elasticity for high strength concrete is found to be  $4.17 \times 10^4$  N/mm<sup>2</sup>. The workability is measured in terms of slump value and comes out as 30mm.

## Table-7 Properties Of High Strength High Performance Concrete

S. No	Mix	Comp ve str ,N/mr	pressi rength m <sup>2</sup>	Flexu streng N/mn	ral gth $n^2$	Modul us of elastici ty N/mm <sup>2</sup>	Slu mp mm
•		7 day s	28 days	7 day s	28 days		
1	CIEAL	41.6	60.6 3	4.0 6	6.1	$3.82 \times 1$ $0^4$	
2	C.FA: CA	42	62.6 2	4.9	6.3	$3.81 \times 1$ $0^4$	30
3	1.1.1.9	43.8	67.2 6	5.5	6.9	$4.88 \times 1 \\ 0^4$	
4	Avera ge	42.4 7	63.5 0	4.8 2	6.4	$4.17 \times 1$ $0^4$	30

#### VII. CONCLUSIONS

The author has developed high strength high performance concrete of M60 grade using fly ash for his research work. The different properties of fresh and hardened concrete were examined. The following conclusion were drawn-

1. In development of high strength concrete, the aggregate of smaller size play very important role. In the present mix design, the aggregate of 20 mm size is being used.

- 1. Fineness modulus of aggregate play very important role in development of high strength concrete. It affects the strength greatly. In the present mix design, the fineness modulus of coarse aggregate and coarse sand is 6.7 and 2.89 respectively.
- 2. 11% fly ash by weight of cement has been used in the mix design, which results in greater saving in cement and reduction in heat.
- 3. 1.6% Sikament N-170 high range water reducer by weight of cement has been used.
- 4. 30 mm slump of fresh concrete has been measured with the use of 1.6% high range water reducer.
- 5. The 7 days and 28 days average flexural strength are  $4.82 \text{ N/mm}^2$  and  $6.4 \text{ N/mm}^2$  respectively.
- 6. The 28 days average modulus of elasticity is  $4.17 \times 10^4$  N/mm<sup>2</sup>
- The mix proportion is 1:1:1:1.9, which give 7 days and 28 days average compressive strength, are 42.50 N/mm<sup>2</sup> and 63.50 N/mm<sup>2</sup> respectively.

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#### AUTHORS

**First Author-** Sanjay Srivastava, B.E., M.E. Executive Engg.,Irrigation Deptt. Uttarakhand, <u>srivastavairi.s@gmail.com</u> **Second Author-** Dr S S Jain, Professor in Department of Civil Engineering and Coordinator of Transportation Engineering Group, IIT Roorkee. <u>profssjain@gmail.com</u> **Third Author -** Dr. M.P.S. Chauhan, Ass, Professor, Deptt. of

Civil Engg., Pauri Engg. College, Pauri, drmpschauhan@gmail.com

**Correspondence Author** –- Sanjay Srivastava, B.E., M.E. Executive Engg.,Irrigation Deptt. Uttarakhand, srivastavairi.s@gmail.com
## The Risk Factors of West Africa Illicit Drug Trade

## Akonbede Rawlings UDAMA (Ph.D)

Department of Peace and Conflict Studies, Institute of Africa Studies, University of Ibadan, Ibadan, Nigeria

Abstract- West Africa region has seized to be the traditional warehouse and transit routes for illicit drugs from the Andeans stable to America and European drug markets. The influence of the culture of hard drugs has taken a more than a foothold in the region as production, manufacture/processing has passed the experimental stage and consumption is highly potent. The fear is that, the region may turn into theatre of conflict, crimes, violence and lawlessness which is even more favourable condition for the trade. Most scholars and extant literatures has focused on poor economies weak rule of law and corruption as the endogenous causative factors that has made the region vulnerability and flourishing of illicit drug trade, but importantly, deliberately overlooked the exogenous underpinnings such as high demand for drugs, and the vicious, desperate and determined traffickers to feed on this demand. The West and Europe comes to terms with reality, take responsibility, and develop a genuine and pragmatic approach to the issue of drug abuse without which the problem will persist for to eternity. One key area is refocusing on the current repressive drug control policy is imperative to a more humane approach is ideal. Caring for the needy and monitoring of children from onset and giving them proper training - the gap which has that led to the culture of drug abuse is important.

### I. INTRODUCTION

The current pattern of drug trafficking has not only turned West African transit axis into a key warehouse and a hub for the transhipment of regulated drugs from the Andean and Asia countries to America and Europe with inelastic demand but, where the production/manufacture, trafficking and abuse has become potent. This development is akin to the role Mexico played and continued to play in pushing drug to the US, and the greater and greater height reached, closed connection and alliance that Russia helped Columbia to distribute drugs in the 1990s to Europe, laundered drug money through their banks in the Caribbean and supply guns for the prolonged multi-sided civil war that kills an average of 3,000 Colombians a year as noted by Bruce Bagley an Andean specialist at the University of Miami (Juanita, 2000). Today, it is estimated that about 50 tons of cocaine with street value of US\$2 billion from Latin America are smuggled by boat or commercial flights through West Africa to the main entry point into America and Europe countries such as France, the UK, Spain and etcetera (UNODC, 2007).

Beyond the notion that West Africa is a transit zone the production and processing of illicit drug has been identified in some West African countries. For instance, in 2009, the authorities in Guinea Conakry alerted the UN drug office to the existence of elaborate laboratories and a vast cache of precursor chemicals, which could have been used to manufacture ecstasy drug worth as much as US\$ 170 million as well as to refine cocaine (Nayanka, 2012). In Nigeria, the productions of banned substances such as Methamphetamine and Ephedrine type have been added into the illicit drug phenomenon calculus in the country. Only recently, NDLEA in collaboration with the USDEA discovered and destroyed clandestine laboratories at the monkey village in Iba area of Lagos State and some cities in the southeast of Nigeria. The new pathetic twist in this trend is that in Nigeria, a new dimension of abused has been added into the illicit drug abuse calculus. There is the availability and preponderant use of unconventional drugs hitherto unknown and uncovered by the United Nations (UN) classification. They include drugs such as 'soak and die', rubber glue, petrol, lizard dung and zakimi (a local tree plant) and sniffing of pit latrine early morning by youth especially in the northern part of the country.

The major well known global heroin production has been from two regions. First, the Golden Triangle in countries such as Burma, Laos and Thailand, and Second the Golden Crescent encompassing countries such as Afghanistan, Iran and Pakistan. Cocaine is produced in South America countries such as Columbia, Bolivia, and Peru among others, but Mexico serves mainly as a bridge to America markets. Similarly, West Africa states do not produce cocaine and heroin however its geographical location made it an attractive opportunity for South America traffickers to push this class of drugs through its region to America and Europe. The most prominent West African countries affected by international drug trafficking include, Cape-Verde, Guinea Conakry, Guinea-Bissau, Benin, Gambia, Ghana, Guinea-Bissau, Nigeria, among others. This is a proof that drug smuggling is inherently flexible, moving and spreading from one country to another and from one region to the other and depends on the security measures in place, economic environments and the political will of states.

One adverse consequence of the region's illicit drug trend is that it has led to a rise in local consumption as a result of the spill-over effect from the transactions. Most times traffickers pay for drug service functionaries with products and not cash which they must necessary sort for buyers to sell and convert to cash. Thus the erstwhile traditional role of being a transit status has given way to a disturbing trend of production, or manufacture of amphetamine type drug in West African states. Atenga (1998) pointed that Africa has transformed from being a drug transit point because of its porous borders into being a large production and consumption region. This indicates that not only is the drug trade expanding, it has also created a veritable domestic consumption market in the continent. The UN Secretary General Ban Ki-Moon noted that: West Africa is no longer just a transit route for drug traffickers but a growing destination, with more than a million users of illicit drugs. Rising consumption aggravates an already challenging public health environment and threatens socio-economic development (David, 2014).

The huge production, desperate distribution and excessive consumption of these illicit drugs are the greatest modern blights and threat confronting both advanced and developing countries. This however, does not preclude societies that do not produce them as they are equally experiencing exponential and ubiquitous rise in this insidious trend. The volume and magnitude of illicit drug activities has become alarming in West Africa and has posed a serious threat to humanity. The production and processing, the trafficking and even consumption of prohibited drugs were naturally the exclusive preserve of some countries. However, most countries in the region have now acquired the notoriety. Most designated illicit drugs today find their way to far and remotest parts of other societies that do not produce them. This robust underground commerce is undertaking by international drug traffickers in collaboration with local distributors.

The common features of these countries that are germane to the development of this trend include and not limited to these countries' proximity and their being sandwiched between producing and consuming countries; their weak and soft rule of law, near absence of government (power vacuum) lack of institutional power, poor and a desperate hopeless citizenry. It also includes porous and poorly managed borders, ill-equipped, undertrained, and venal law enforcement officials. This means that the region offers everything the traffickers require to conduct their business relatively free. The Colombian economist Francisco Thoumi aptly captured the scenario when he succinctly stated that:

Profitable illegal economic activity requires not only profitability, but also weak social and state controls on individual behaviour... a society where government laws are easily evaded and social norms tolerate such evasion". West Africa's high level corruption makes effective law enforcement difficult to occur, since the continent suffers from hunger and unemployment (Akyeampong, 2009).

That West Africa countries have become an epicentre for drug trafficking and abuse is not a new phenomenon, but the capacity and degree which these narcotics rings have grown into is still a matter of conjecture due to the clandestine nature of the transactions. There are many reasons for the region's attractiveness to drug trafficking. First, most of these countries are poor, have opened business climate, some are weak and soft and unable to acquire the apparatuses required and empower their state institutions to effectively monitor illicit drugs and control their territories that has led to drugs to flow in torrent. The region has since changed from being just a stockpiling/warehouse into a key hub where banned drugs are traded. Taken for example, Nigeria's history in involvement in drug trade is a long and soured one. Moreover, Ghana which was seen as one of African's brightest star, its story has changed. The once known gold coast has turned into coke coast where traffickers use cash to corrupt and peddle illicit drugs. Kwesi pointed that apart from West Africa becoming a major transshipment zone for narcotics, local production and consumption is also on the rise.

Further, Guinea Bissau's case is pathetic. Because of poverty, traffickers have infiltrated both the military and government whose officials are neck deep into drug trade. The case of Mali is not different as Al Qaeda has long been suspected of using drug money to finance its operations.

The deviant culture and unguided use of drugs and the different patterns of dependence is a source of worry to many responsible governments of some countries due to their pernicious effects to the society. Though different measures have been taken by state authorities to limit the rising negative effects of illicit drug activities such as strict prohibitions, custodial sentences to offenders and fines in some cases, nevertheless, the problem persists. The preponderance of abuse of these drugs has resulted to several issues which include human health related problems, threat to social peace and security, and impediment to sustainable economic development. It is in this view that the United Nations (UN) General Assembly on June 10, 1998 identified and adopted a political declaration which stated thus:

Drugs destroy lives and communities, undermine sustainable human development and generate crimes. Drugs affect all sectors of society in all countries. In particular, drug abuse affects the freedom and development of young people, the world's most valuable asset. Drugs are a grave threat to the health and well-being of all mankind, the independence of States, democracy, the stability of nations, the structure of all societies, and the dignity and hope of millions of people and their families (Diane and James 2003).

The above declaration depicted the negative influences of hard drugs and society's perception towards it and concerns such as moral degeneration, economic disempowerment, and threats to social tranquillity and political stability they cause to societies. Although, governments of most West African states assumed they understand the problem of illicit drug activities in their countries and its magnitude, and politican use it as a campaign strategy during electioneering period however, their passive attitude towards it after gaining political power give course for concern. The aim of this paper therefore attempt to deduce why illicit drug production, distribution and abuse are so potent and why various governments in the region have failed to eliminate or curtail illicit drug activities in their states.

## Factors that Influences West Africa Drug Trafficking

Illicit drug activities in West Africa is reinforced and exacerbated by a large range of transnational dynamics and internal regional key challenges which include and not limited to the following:

#### II. PERSISTENT HIGH DEMAND FOR HARD DRUGS

One major factor that has led to sustainable illicit drug trade is that the demands for these drugs have continued to soar. The elementary economic theory which has global resonance but varies in local emphasis and scale typically fit into illicit drug trade. It stated that the higher the demand so also will be the need to push supply. The high demand for hard drugs has led to a correspondent push in supply and consequently a higher profit for traffickers. The consumption of illegal drugs worldwide has reached an alarming rate. For instance, in 2006, there was an estimated 3.5 million cocaine users in Europe, which increased to 4.5 million in 2007 and further increased to 5.5 million in 2008, and is still growing daily.

The large consumption and demand for drugs worldwide has given a wide opportunity for traffickers to be deeply involved

in the trade which give them lucrative returns by servicing end users around the world. Davin (2000) Opined that cocaine traffic might prove to be a fixture in West Africa and transhipments emerged because demand is growing in Europe. Cannabis use has doubled and tripled in some parts of Western Europe since 2000. Traffickers are not only shifting traffic to service preexisting demand, but are also establishing new routes for the growing drug markets. Interestingly, the UNODC (2007) noted that: Even if the entire supply of drugs could be eliminated at the source and seized along trafficking routes, there would still be millions of drug addicts looking for a way to satisfy their addiction (UNODC: World Drug Report 2007). Antonio (2008) observed that European countries consume large amount of cocaine. It is estimated that about four million people used about 36 thousand kilograms per year cocaine in Europe in 2006, on average. Based on these figures, European cocaine users would have to import a total of about 146 tons of cocaine from South America. Bruce (2008) noted that the heightened levels of drugs trafficking in Africa was due to the increase demand in the European Union from user population of 3.5 million that rose to 4.5 million over just one year, due to the geographical practicability of the trade. And that the annual global production increased to nearly 700 tons in recent years. For instance, the United States of America (USA) continued to consume by far more cocaine than any other nation in the world. The World Health Organisation (WHO) underscored this point that 16 percent of all Americans has used or tried drug at some point in their lifetime compared to New Zealand 4.3 percent the next country rated.

While the consumption of cocaine in US has remained more or less stagnant since 1995, on the streets of European cities drug use has continued to soar to an unprecedented level. UNDOC (2008) estimated that of the 14 millions who used cocaine annually more than 4 million live in Europe alone which tripled the number 10years ago, and 20 percent of them have tried cocaine at least once in their lifetime. Antonio Maria Costa opined that:

Drug traffickers found these new users in Western Europe. From the mid-1990s, cocaine markets in several European countries began to grow. In some areas, cocaine has become the drug of choice, as ecstasy and related substances become passé. For example, according to the British crime survey, the prevalence of cocaine use increase more than four-fold in the last decade, from 0.6% of the adult population in 1996 to 2.6% in 2007. Spain, Italy, and France have all seen cocaine use levels double or triple in recent years (UNODC, 2008).

This new trend has made drug traffickers to actively shun the dollar for the Euro as evidence by the confiscation of vast amounts of Euro from cocaine traffickers by drug enforcement agents across the world. The International Narcotics Control Bureau (INCB, 2007) noted that cocaine use has doubled and tripled in some parts of Western Europe since 2000 as cocaine market in the US matured, drug traffickers have turned to Europe. And that, over the past decades, cocaine use in Spain, the United Kingdom has grown three and four-fold respectively. For example, one kilogram of cocaine in Europe now sells for twice as much as in the US whose consumption has remained stagnant since 1995. However, on the street of European cities its use has continued to soar to unprecedented levels. The appetites of local and western consumers for illegal drugs are creating some of the most dangerous situations in the society.

In Nigeria like any other West African country, historically, illicit drug trafficking became robust due to increased demand for it in America and Europe in the 1960s. For example, there was a period of time that the beetles came on board and a swing in London and smoking marijuana became particularly fashionable. In Nigeria local scene for instance, cannabis remains the consumer's delight which encourages its cultivation for both local consumption and for export. Lagos is one of the states that marijuana and other banned substances markets thrive. There is always a deluge of students, teenagers, prostitutes, streets urchins, police and military officers as well as foreigners (blacks and whites) flocking into dealers' stalls for their daily fix of the stuff. Illicit drug merchants cherish their business and it has not failed them. Most salary earners cannot live like them. They live like kings, big, loud and proud.

#### III. GEOGRAPHICAL LOCATION

The geographical location and the littoral status of some West Africa countries such as Cape-Verde, Guinea and Guinea Bissau, and Nigeria among others along the Atlantic coast that have open and direct high sea routes to drug source countries has particularly attracted drug traffickers to exploit it to their advantage. Most West Africa states are conveniently located and sandwiched between the Andean suppliers and Europe consumers. The close geographical proximity of West Africa countries to European markets which is about six hours away from Europe, and about 1,600 miles across the Atlantic from Latin America the source countries makes it strategically ideal location for drug smuggling. These created favourable condition which encourages and facilitates the flourishing of the resourceful and potentially violent South America cartels to push drugs with impunity.

Many West African states have myriads of coastal islands that are unguarded and unpatrolled with numerous hidden bays and beaches. Their land borders (most of it jungle areas) are porous and seaports and poorly managed, and airports lacked required personnel and security equipments to monitor movement of persons and goods which allows for the easy transhipment of drugs. The point being made here is that, illicit drugs crosses the Atlantic from their source countries in planes including turboprops outfitted extra bladder of fuel such as the Boeing 727 that took off from Columbia land in Mali desert controlled by terrorist and later burnt is an example (*New York Times*, 2011). Also, speed boats are used which goes to high sea and collect drugs from cargo ships and commercial fishing vessels and distribute to owners before they berth at the seaport without the knowledge of the state policing agents.

#### IV. POOR ECONOMIES

The emergence of drug trafficking groups is a function of (global) economic imperatives. Many countries in West Africa have experienced and are ravaged by internal conflicts and wars; exploitation and depletion of its natural resources by imperialist masters and have became poor and weak. Others have been

made poor by the low prices of their agricultural products, and sometimes outright theft. Again, the devaluation of their national currencies and the introduction of structural adjustment programmes (SAP) which most of their leaders at the time knew little or nothing about left them worst. Today, some of these countries lacked viable economic alternatives especially among impoverished rural communities and are facing deep economic stagnation with serious governance gap. For example, Guinea-Bissau has continued to languish in extreme poverty since its independence from Portugal in 1974 and in 2013 ranked 176th out of 184 countries poorest by the U.N. Development Programme's 2013 Human Development Report. Therefore, drug trade is seen as mitigating opportunity or a panacea to their economic poverty. While some of these countries are said to be poor (naturally), that cannot be said with a country as Nigeria. Despite its abundance natural and enormous human resources, the Human Development Index (2006) ranked it the 154 position among African countries in terms of development assessments. It is clear that the large number of people live below (USS \$I dollar per day) poverty line. Since its independence, there have been great economic decline brought about by profligacy, inefficiency, mediocrity in the management of the economy by both military and civilian regimes. Consequently, there was a breakdown in essential social infrastructures and devalued national currency resulting to falling wages, increasing poverty, massive unemployment and general lack of opportunity for viable The quest for survival against the economic activities. background of limited employment prospects in the formal economy made undertaking in the informal economy inevitable. This is one of the things that drives illicit drug trafficking in Nigeria. Gail (2005) averred that Nigeria have been turned into humanitarian tragedy characterised by grand corruption, brutal civil conflicts, and criminal anarchy. Dictators have plunged the country into underdevelopment and poverty and natural resources have been turned into dirty affairs. Though, there was global economic convulsion, but specifically, owing to official profligacy, institutionalised corruption and recklessness in the management of state affairs in earlier times, the situation became worse.

Further, West Africa region is regarded as third world countries and its primary mainstay is agriculture conducted in most obsolete methods. Their economies are weak and poor compared to the advancement seen among their western counterparts. In Nigeria for instance, the ground-nut pyramids and cotton production in the north got vanished with the discovery of black gold. Cocoa production which proceeds was used to build the first and tallest building in Ibadan is given little attention. In the south-south and southeast zone palm oil and kernel were produced in enormous quantity however, this did not last long as the sector started suffering from neglect. There was the general mismanagement of the economy, inconsistent and poorly conceived agricultural policies, and corruption in the distribution of farm inputs such as fertilizers and lack of basic equipments such as tractors and storage infrastructures. The lack of storage system for preservation, and processing factories to convert these produce to finished products for future use, most of them are sold in haste and cheap to minimise waste.

Most economic trees turned over aged and obsolete varieties, some became stagnant and unproductive. Even when

good yield are harvested, they suffered from the vagaries and manipulation of foreign buyers who imposed competitive prices in both extracted raw materials, crude oil and gold and agricultural products such as cocoa, coffee and cotton from the region.

In addition, imports constraints limited the availability of many agricultural and food processing inputs for the whole sector. Most critically, in Africa land tenure system does not encourage wide and long-term investment in technology, and modern production system does not inspire the availability of rural credits. Kym (2009) opined that agricultural sector suffered from extreme low productivity that reflects reliance on antiquated methods. Equally, changes in consumption patterns (the slow growth in consumption of farm products, and the middle-income countries moved away from grains and other staple foods towards livestock and horticultural products) that also altered the net trade situation of developing countries has affected production. Again, this sector failed to keep pace with the country's population growth. For some Nigeria farmers, the move from cash crop production is attributed to failing income from primary commodities and high production cost in that area. Because of the volatility of prices in cash crops such as cocoa in the world market, farmers turned to grow cannabis as an alternative seen more profitable.

Moreover, with the introduction of Structural Adjustment Programme (SAP) as a means of economic constriction that requires deep cut in public spending as advised and imposed by the Briton wood institution - the International Monetary Fund (IMF) to Ibrahim Babangida that lacked understanding of the program and the intrigues involved brought more hardship to the citizenry. Akeampong (2005) pointed that most West African countries including Nigeria had collapsed due to economic recession by 70s, 80s and 90s after the Structural Adjustment Programme (SAP). This condition dispossessed the society of jobs as both public and private employees were laid-off. It aggravated the already worsened economic problems and plunged many individuals into acute financial problems. The formal sector employed few indigenous people and many educated people emigrated. Small and medium businesses and traders found it difficult to compete in an environment where inflation was high and competitors from the informal sector undercut prices. Within this scenario the economy of Nigeria became informal and progressively dominated by criminal networks.

Further, by the 1980s, the Nigeria state has reached a stage of virtual collapse economically and where the national currency (the naira) had collapsed, and free trade had open up the economy to cheap importation of goods from Asia, Taiwan and Dubai and all had become sources of Nigeria traders. The manufacturing industries in Nigeria collapsed as goods become uncompetitive and businesses had problems with liquidity, and people who had achieved their dreams of owning their own business were in danger of going down. Several small business owners and some big ones turned their attention to drug trafficking as well as others illegitimate trade to survive (Akeampong, 2005). Since then Nigerians started struggling economically while feeling the squeeze of poverty. Those who worked, their average salaries were low (underemployment) and unemployment became high. It is these conditions that created desperate plights in its citizens and rendered them vulnerable to exploitation by foreign drug trafficking syndicates in collaboration with the locals. Cockayne and Williams (2007) noted that during the time of Nigeria economic downturn in the early 1980s, many students studying abroad were no longer able to receive support from their families so they turned to drug business which provided them with alternative source of funding for their school programmes. It was at this time that the West Africa global drug trade developed and took roots.

## V. PERVASIVE CORRUPTION AS A SOCIAL CONTEXT PHENOMENON

Corruption is now an ingrained social phenomenon in West African states therefore, it is difficult for employees from within the system to act outside the context. Pervasive corruption (though many scholars have argued that it was never part of the regions cultural heritage but the influence of foreign culture) has played an important role in its flourishing and remained one major challenge in stemming illicit drugs activities in the region. Drug dealing is very lucrative so therefore traffickers will make irresistible monetary offer to public officials to enable them conduct their trade. It is the gains made from the drug trade that make traffickers viciousness and their modus operandi characterised by one deadly philosophy which is: plata o plomo (silver or lead). In Columbia it means "take the bribe or take a bullet (Winifred 1999). This has come to permeate all facets of illicit drugs societies. If given an open choice among those in line of policing, the silver will be more preferable and in fact has been more preferable. Cockayne and Williams (2009) asserted that West Africa exhibit a level of corruption which suggests that government official are willy-nilly once they are provided with the right carrots and sticks. They collude with both local and international drug trafficking organisations. With little oversight and accountability many officials succumb to traffickers' inducement. International Narcotics Control Board (INCB, 2010; 2011) averred that powerful and wealthy organized crime groups corrupt and intimidate public officials who facilitate the illicit drug trade. Corruption undermines global efforts in the fight against the illicit drug problem. Despite the best efforts of individual governments and collective actions, drug trafficking remains a serious cause for concern worldwide. This is because primarily, corruption undermines international efforts to eliminate the multi-billion dollar illicit trade in narcotics. The police and other criminal justice officials despite stepping up the war on drug trafficking, they find the odds stacked against them when they confront some of the wealthy and powerful syndicates involved in this organised crime. It is this scenario that Akeampong noted that:

The truth is that corrupt government begets a corrupt society and vice visa. Nigeria official's corruption is legendary. When Abacha died in a dramatic fashion, members of his family held huge amount of money. His son reportedly had \$800 million in \$100 bills packed in suitcases. This was not legitimate wealth. Ordinary Nigerians who do not have access to the resources of the state, and who are struggling to get by in a decline economy by desperate measures in desperate times have to indulge in such measures which included internet fraud, prostitution, and drug trafficking'' (Akeampong, 2005). He further noted that with the rot starting at the top and spreading across the social fabric many Nigerians feel fully entitled to try their luck where any opportunity arises. According to Tullis and Painter (1994), the fourth dimension to be added to this standard analysis is the connection of corruption and criminality which occurs when administrative and political personnel such as drug enforcement agents become allied to the drug trade. Since government monopolized the law the traffickers will seek the non-enforcement of the law. So those in charge of the law must be bribed because they cannot be entirely bullied, ignored or by-passed.

#### VI. HIGH PROFILE CITIZENS' INVOLVEMENT IN DRUG TRADE

Generally, the success of illicit drug transactions depended on the political leaders' will, the ethical dispositions of the society, and individual's entrepreneurial skills and capacity to crime. The current nature of illicit drug war is not the type that can achieve anything because at a significant level, it is being made difficult by the very persons who ought to fight against it.

And given that drug trafficking groups have the ability to change dynamics, form alliances and reshape relationships with the political class, high level elected public officials and security personnel and their ability at cooptation, developing diplomatic relations with the business community, and equally have skills in maintaining relationships with ordinary citizenry in countries and across the region, the case is made worst.

Since the beginning of illicit drug business the best-known drug traffickers have been related in a special way to the elites or high-ranking politicians at the corridor of power. This was the precursor of drug trafficking that emerged in larger scale in the region. It is difficult to think that illicit drug trade can succeed without the compromise of the elites or those at the top echelon of government. The successes in drugs smuggling by individuals/groups are those that have connection with the agency's senior or government officials. Successful illicit drug trade cannot emerge from the ordinary rung of the society but most seriously developed from within the power structures which include the political class and the elites with the protection of law enforcement agencies. Indications have also emerged that major involvement in illicit drug trade involved high profile figures, privileged and influential citizens of the country including senior military officers and the elites. This gives credence to the assertion made by Micheal Chossudosky that:

The trader can only prosper if the main actors involved in narcotics have political friends in high places. As legal and illegal undertaking are increasingly intertwined, the dividing line between business people and criminals, politicians and members of the international establishment has tainted the structure of the state and the role of its institutions, including the military (Global Economic Crisis: The Great Expression of the XXI Century, Montreal: Global Research, 2010 pp. 195-196).

Thomas Friedman noted that a hidden hand in the drug market will never work without a hidden fist or as the Russians will puts it: 'krysha'. Meaning a web of protector-and facilitatordrawn from business, finance, organised crime and secret world of intelligence (Thoumi, 2009). Robert Gelbard the Assistant Secretary of State for international narcotics matters said Nigerians that are involved in the drug networks are not random mules, or individuals who are doing this on a freelance basis. Rather, they are people working for well-organized groups with the protection of government officials Niki (2008).

The state of Guinea Bissau offers a paradigmatic and unprecedented insight into an explosive state of West Africa drug trade involving high profile political elites and military measured from any perimeters, and it shed light on the nature and spread of the phenomenon across the region. It is an example where alliances between drug traffickers and state authority are commonplace, and has been labelled narcostate by the UNODC. For example, when planes arrives loaded with cocaine, it is the presidential guards that secured the cargo and most of the deals are conducted inside the first lady's private residence or the president's VIP salon car at the international airport to avoid detection. The cocaine is then sent to Europe in the country's diplomatic pouch. High-ranking military and government officials have been directly involved in the drug trade (drug have been found at military bases and seizures made by police disappeared).

In Ghana, Sarpong the Executive Secretary of Narcotic Control Board (NACOB) is worried that Ghanaians with contact in the Foreign Ministry could obtain a pass to the lounge from the State Protocol Office that entitled the traveller to be driven from the lounge to the plane in a protocol vehicle without their persons or luggages undergoing security screening. He accused the government of complicity in drug trafficking noting that traffickers are using the airport VIP lounge to avoid searches. He had questioned why these middle class travellers such as bank managers, pastors, and their wives being given service passports and access to the lounge that was traditional privileges reserved for cabinet ministers (Furuta-Toy, 2009).

The case in Mali is not different as many of its citizens from north and south are deeply angry that notables local figures from the political class and the military were believed to be involved in the lucrative drug trade whom they suspected working with jihadist group in the areas they control in the north and also passes through the parts of the country under government control especially in the region near the border with Mauritania. Mali political system is rotten from the head-down before the tipping of the state collapse. For example, its soldiers are directly involved or complicit in at least two cocaine flights that landed in Mali from 2002 - 2010 (Andrew, 2013). Again, the former president Amadou Toumari Toure was the first to benefit from the drug trade with the hope to leave the country to enjoy the fortune he has amassed. There are ample evidence that the Boeing 727 scandal dubbed 'air cocaine' that landed in the northern desert and drug offloaded was done with the complicity of local government officials and even mayors. The rot set in when the local and national elites started benefitting from drug trafficking and kidnapping for ransom. Though illicit drug trade existed in northern Mali and the Sahel region even before the rule of Toure, but the drug trade became ingrained in the very fabric of the Malian state when the Salafist Group for Preaching and Combat (GSPC) the forerunner of AQIM, was implanting itself in the north. The organisation and its commanders such as Mokhtar Belmokhtar had social ties to local populations including illicit drug trade (Andrew, 2013). At this, they concluded that Salafism only served as an ideological cover for

organising drug trafficking which is cocaine and hashish that added to the profit from taking western citizens hostage.

The case in Nigeria is not different as very senior and high ranking official in the military have been implicated in the drug trade. For instance, Ellis (2009) revealed a significant case from the early period of West African marijuana trafficking which involved a 33 years old Nigeria woman called Iyabo Olorunkoya found guilty and convicted in 1974 of importing 78 kg of marijuana. The woman was connected to Lagos high society members and named her accomplices to be two Nigerian army officers. One of them was retired Brig. Benjamin Adekunle known to the press as 'black scorpion' and was a hero in Nigeria army during the Biafra war. Although he was suspended from duty because of the case and never resumed his military career however, his alleged role was not revealed. Furthermore, among the many scandals of Gen. Ibrahim Babangida was the murder by parcel bomb of the Newswatch Editor Dele Giwa. It is believed in Nigeria that his death is connection with a former drug courier one Gloria Okon who had worked for her principals in very senior positions of the state bureaucracy or for their families. It is noted that from 1985-1993, the country's role in global narcotics trade grew tremendously.

Furthermore, a former member of Nigeria senate was arrested in New York for heroin trafficking and consequently convicted. The said senator had earlier purportedly offered \$20 million of his own money as a patriotic gesture to pay a debt owned by Nigeria airways bus. It could also be recalled that in 2008, Senator Nuhu Aliyu a retired Assistant Inspector General (AIG) of police raised an alarm on the floor of the Nigeria senate that he could identify a handful of his colleagues in the house who had been involved in drug deals and whose cases he had personally investigated as a senior police officer (Etagene, 2010). In Sierra Leone, drug trafficking has since become part of the society culture and is difficult to estimate the volume of drug being trafficked there by high profile citizens. This situation was made worst during the countries' civil war. The ECOMOG soldiers were figured very well in the trade. In 2008, a minister of transport and aviation was dismissed for his alleged involvement in the landing of an air plane carrying 700 kilograms of cocaine in Lungi the only international airport. Mezittelli Antonio head of United Nations of West Africa said the amount of drug trafficking in Sierra Leone is not known but the 700kg seized indicated that it is a major hub and noted that the seizure was only a tip of the ice bergs (Alpha, 2008). Further evidence that senior citizens are involvement in narcotics trade is when Gilbrilla Kamara travelled under protection in the convoy provided by Guinea Bissau president's wife - Zainab (Robert, 2010).

Similarly, in the republic of Guinea, President Lansara Conte established an interest in drug trade after a successful coup in 2008 (Ellis 2009). The existence of elaborate laboratories and vast cache of precursor activities used for the manufacture of ecstasy drugs as well as refine products are abound (New York Times, 2011). More precisely put, politicians are suspected of being directly involved in illegal trade, controlling it or receive protection fees for the business to thrive. Within the context of this scenario, freelance or outsiders would not have any chance to build up their own networks and succeed. Again, because the drug trade has infiltrated the highest level of government and the military officials are directly involved earned it its name as narcostate (Gilbert 2011).

## VII. DEARTH OF LOGISTICS

It can hardly be controverted that the West Africa states are experiencing booming illicit drugs activities which is a reflection that the task is more than what these countries can handle. Their antidrug agencies are plagued by litany of problems such as shortage of dedicated workforce, logistics and poor budgeting. The organisational and logistical assets that drug syndicates can potentially bring to bear in operations are extensive and sophisticated in comparison to those available to antidrug agencies. The war on illicit drug trafficking at the local streets level is almost impossible due to the huge discrepancy between the available resources and that required by policing agencies so it is needless to discuss the maritime front giving the assets needed and the recurrent costs involved in undertaking and maintaining such ventures.

Jonathan (1996) noted that among other failings, the government did not properly fund its own national drug control strategy in 1995. The inability of the agency to function effectively and brings under control the menace of illicit drug is because it is undermanned, under-equipped, and under-budgeted avertedly or inavertedly by the federal government. It is blunt and unwieldy, with platoons of untrained and poorly trained officers with mix and uneven level of skills, knowledge, perceptions, motivations and interests. It cannot confront local street drug traffickers needless to mention international organised trafficking groups. The institutional wellbeing of these organisations continues to be of extremely low priority for the government. Candace (2008) opined that shortage of resources, limited dedicated counter drug forces, and a lack of consistent adequate pay forces the officers to accept bribes to facilitate drug shipments for traffickers. Peter (2008) noted that lack of funding for interdiction and interception is a problem in combating the drug trade. He noted that whereas the number of illicit narcotics vessels and illicit aircraft sorties - one hundred and sixty respectively, the two thousand eighty hundred nautical miles (nm) of coastal line from Nigeria to Cape Verde would demand intensive surveillance and monitoring of these zones. Liana (2009) added that traffickers are likely to face relatively lower risk of monitoring and apprehension by policing agent due to lack of operational logistical such as transport and communications systems. There is also limited maritime, airport, and land surveillance interdiction equipments and human capacity for border post security and goods shipment controls. All these impede tracking and monitoring of illicit drugs.

While Ghanaian security officials lacked capacity in obtaining and analyzing intelligence, surveillance techniques, and ability to investigate and prosecute complex cases such as financial crimes (US embassy cables, 2010), their Nigeria counterpart has the basic training, but are hampered by issues of sentiments such as ethnicity and religion which influences promotions and postings and are only given to loyal officers/relations that most times do not have the competence for such responsibility thereby inducing mediocrity in official functions.

Further, given Nigeria resources, it is difficult to explain why its antinarcotics agency is deliberately being hamstrung. For instance, in 2013, the sum of 100million naira (about US\$611,000) only was allocated to the entire drug agency with formation across the thirty six states of the federation including the capital city Abuja and it was given in piecemeal over the year. Further, akin to the Nigeria problem, the Ghana drug czar Sarpong said that the Mills Administration has so far failed to provide adequate resources to NACOB. He underlined that Ghana's drug force is understaffed, underfunded, and underresourced. All branches of Ghana's civilian law enforcement community are under resourced hence its capabilities are limited. There is lack of equipment and training and the ability to adequately compensate personnel. He is worried that each time he arranged a controlled delivery in Cote d'Ivoire, the drugs would quickly return up back to Ghana. Similarly, drugs originating from Guinea could travel through Mali, Burkina Faso and enter Ghana from the north undeterred. All these cases typified and clearly illustrate the difficulty in effectively policing the inflow of drugs across and highlight the region's nature of illicit drug trafficking. The enormous cost of policing this zone presents a real the security challenge either through the maritime sector, air and land borders. It is by far beyond the capability of individual countries to undertake.

In the 21st century, logistics touches on every aspects of the organization's operational specialty. It is the process by which an organization understands and makes use of strategic planning and coordination, making use of new and better tools, good common sense to achieve its goals. It also means acquiring those things that are necessary for the survival and prosperity of the organization, making certain that each step of the process has all of the prerequisites needs fulfilled for the delivering of services to the citizens. By this it means, the purchase of those components, acquiring or procuring any material provisions or supply such as office equipments, vehicles, work uniforms and paraphernalia that comprise essential tools for delivering its services. Logistics goes beyond strategic planning and resource management, but also includes how organization goes about their day-to day running of the organisation. This enormous task requires an intimate knowledge of the process, design, and process control.

In very recent times, there have been increased in policing by Britain and America antidrug forces in the traditional Caribbean routes curtailing it's used by drug traffickers. Nonetheless, the South America cocaine traders may be reacting to the saturation of the North America markets which has resulted in the strategic shift in drug movement, or increased police patrolling the Caribbean in Central America and in the Pacific Ocean that have made those routes significantly more perilous by interstates cooperation that improved maritime and aerial interdiction as noted by UNODC (2007), and notwithstanding the versatility of transnational criminal organisations for their well known penchant in finding and exploiting vulnerable regions of the world to further their illicit activities, the growing importance of Latin America drug gangs would not have succeeded in taking advantage of and making use of West Africa weak political environment if the necessary logistics and human resources were put in place.

#### VIII. WEAK STATES AND RULE OF LAW

The legacy of a soft or weak state pervades West Africa countries. A major characteristic of a weak or soft state is the near absences of the rule of law. A weak sate is one where formal rules (laws officially stated, administrative rules and practices) are applied capriciously and in a lax rather than in a rigorous and consistent manner. They experiences weak social control on individual behaviour, government laws are easily evaded and social norms tolerate such evasion.

Often, policies decided on are not enforced and the authority even when framing these policies is reluctant to place obligations on people to obey them. Within this context, illegality generates competitive advantage where weak rule of law exist and has provided a fertile ground for all manners of crimes including illicit drug trafficking. The inability of these nations's judicial system to decisively deal with drug offenders is obviously one of the reasons for its resurgence. Generally, there is a reluctance or inability of government to apply effective measures against crimes, and the weakness of the criminal justice system hampers response to crime.

Myrdal Gunner in his study of poverty noted that incompetence of leaders is a major problem. And that some people assumed government responsibilities in poor (West Africa) countries they cannot resolve. Most countries in the region lacked sufficient resources to ameliorate poverty and advance national development. Weak or soft state comprises of all the various types of social indiscipline manifested in legislation deficiencies particularly in law observance and enforcement, widespread disobedience by public officials on various levels to rules and directives handed down to them, and often their collusion with powerful persons whose conduct they should regulate. There is always a discrepancy between law and practice. Further, he opined that such softness is related to corruption. Corruption reduces government effectiveness by undermining the legitimacy of public authority, generating political instability, disrupting public planning and policymaking, and aggrandizing an incompetent and corrupt bureaucracy which further reduced government effectiveness. Presumably, any state exhibiting social indiscipline, lawlessness and public impropriety could qualify as a soft state (Barbara, 2010). Usually, there is no consequence for wrong doers or absence of severe punitive measures especially against high profile citizens and those connected to the political class no matter the gravity of the offence. Antonio Maria Costa opined that:

On the part from their source to destinations, illicit drugs do not necessarily follow the most direct routes. Factors other than geography enter into the calculus of the most 'efficient' trajectory to take. Weak states have a gravity of their own. Law enforcement in these nations are typically under-resourced and subject to corruption. For a variety of reasons, Africa is home to some of the weakest states, in terms of their capacity to enforce the rule of law in their territories, in the world (UNODC 2008).

Cockayne (2009) pointed that the relatively weak state capacity, weak-drug control and low law enforcement capacity of Nigeria have made it a soft target for drug trafficking organisations from Columbia, China, and Lebanon. Drug trafficking is rooted in weak rule of law were genuine lack of capacity to function effectively is identified. A country where the tax based is minuscule and corruption flourishes in an environment where incentives for obeying the law are spares and the likelihood of detection is minimal, crimes flourishes.

West African countries lack a functioning criminal justice system to respond to either the drug trafficking or other criminal enterprises including official corruptions. In some instance, it could be as result of shortage of highly skilled personnel needed to assume the roles of prosecutors and judges and the shortage of funds to retain them or outright lack of courts for crime adjudication. In some other cases, courts faces large case loads, poor pay, and difficult working conditions which most times results to strikes, some in the local judiciary are lured or coerced into cooperation with well resourced drug trafficking hence they have many instances of questionable judicial decisions in drug cases over the years. Those judges who remain honest are avoided through side payments to the clerks in charge of case allocation. Equally, judicial oversight is difficult to maintain in a states that do not have Federal High courts and barely afford judges themselves. As a result of all these shortcomings, the dilemma is, even assuming the ability and the will to arrest drug traffickers is little, and the capacity to successful prosecution is weak.

Furthermore, law enforcement agencies and prosecutors in this region generally lacked the capacity to undertake most complex investigations and prosecutions. Particularly, while judicial and prosecutorial capacity is very limited in Ghana, judges in Nigeria abuse of its discretionary powers is rampant. However, the case of Guinea Bissau is worst because of the absence of the essential infrastructure for arrested traffickers to undergo a successful procedural justice system. Sandra Valle observed that when they arrest a suspect they have to take the person by car to the police station since they do not have official vehicles. The states lack the capacity to conduct a trial due to lack of the necessary infrastructure and trained personnel. Even when a trafficker is sentenced, such a person might not serve jail term as the country does not have a functioning prison. What they have is simply an opened house without security that is passed for a prison in Guinea Bissau (UNODC 2008).

### IX. Amorphous and Anonymous Drug Traffickers Structure

Another characteristic of West Africa drug traffickers that posed a major challenge to antinarcotics agencies is the amorphous and anonymous structure in which they operate. Their modus operandi is diverse and complex which enables them to play and continue to play active and extensive role in the global illegal drug business unnoticed. They are highly adaptive individuals and organisations which varied in structure, hierarchies, networks or self-contained independent cells. There are vertically integrated or nimble independent traffickers which make them much more difficult to detect and be infiltrated. They constantly change and employ new tactics which enables them to flourish and expand locally and internationally.

West Africa drug trade is characterised by a distinctive structure developed over the decades. They have highly flexible mode of operations that constantly form and reformed their business relationships from among a wide pool of acquaintances. The modus operandi closely resembles adhocracy system. It is the ability to fuse experts drawn from different fields into smoothly functioning adhoc project teams particularly suited to the modern business environment. This system is in contrast to the more corporate style relationships of classic American mafias that have exerted powerful influence or popular ideas about how organised crime works.

Drug syndicates in West Africa do not only operate underground but remained loosely organised. They are not large and hierarchically structured but, are in small groups or individuals revolving around loose and fluid network based on personal contacts. Various drug cartels specialised in separate processes along the supply chain which is often localised to maximise efficiency and minimised damages cause by law enforcement. The chain ranges from low level street dealers who may be individual drug users themselves, through street gangs and contract-like intermediaries, up to multinational empires that rival government in size (Wikipedia). Even when interdiction forces make the necessary efforts to counter certain of their directional patterns they developed more complicated and varied travelling methods. MajiriOghene (2008) noted that what is significant about the cartels is that the criminal networks do not have structured identities as those in South East Asia and Latin America. Their identities are usually vague and operate through a complex system where actual carriers are never exposed to barons. Most of them tend to operate alone or in small groups resulting to the expansion of illegal drugs activities with a worldwide distribution system. For instance, those dominated by the Nigeria traffickers, their models are seen as being distinct, highly flexible individuals and dominates West Africa networks. These models eschewed the traditional hierarchical forms associated with the Italian mafia and other loyalty, kinship, and ethnicity based criminal organisations (such as the Japan yakuza) in favour of a higher risk higher profits system of one-off joint ventures and transaction-based partnerships. This approach is the dominant paradigm in a highly connected transnational illicit economy. The model emerged from inter-ethnic relations in an informal economy conducted in hinterland that is beyond the reach and observation of colonial powers of the state.

Many Nigeria drug barons keep a low profile in order not to attract attention. At another level, a drug baron may work with a second layer operator known as striker (usually, is one who can organised or strike deals quite likely or a former courier who has entered the business at the lower level and work his way up and acquiring an excellent networks of contacts). The use of independent specialists provides a vital cut-out between the top level of operation and the humble courier. A courier is normally ignorant of the name or even the very existence of the baron who is the real initiator of the deal. This is one of the features of Nigeria system that makes effective drug detection difficult and most times impossible (if the courier is arrested, s/he cannot be prevailed to give vital information to law enforcement agents). In Sierra Leone, traffickers operate undercover as business tycoons uses different types of business ventures such as airlines, fishing and ferry services as fronts to move drugs to their destinations which might not be known to the public but, not without the compromise or conspiracy of the security force such as the police.

## X. YOUTH BULGES AND UNEMPLOYMENT

The demographic composition of the youth in West Africa is growing at astronomical rate and is inversely related to the availability of employment opportunities in the region. Most of them live under precarious situation with little or no family support or guardians and are homeless, left to fend for themselves scavenging for food from the dustbins a situation that devalues human life. They receive little or no education or acquire useful skills that would enable them engage in viable economic activities and contribute to national development.

West African youth bulge is coming against the against the backdrop of endemic poverty, ignorance, global economic downturn that has resulted to declining overseas aids, private remittances, increasing impact of climate change, coupled with corruption by the governing elites. These conditions are the reasons for the whirlpool of unemployed youth that have become a market and recruitment grounds as foot-soldiers to perpetrate crimes hence they are ready and willing to undertake risks and work for a price that undercuts meaningful labour value. It is this situation that has created desperate times for many young men and women leading to desperate measures including participation in intercontinental drug trafficking. Wealth created encourages the creation of additional wealth so also poverty tends to be selfreinforcing. The region has low level of foreign investments, and economic opportunities have remained limited. Under this circumstance many citizens see the development of indigenous drug trafficking organisations and influx of illegal transnational networks as a major boon. The influx of drug trafficking in the last several years coincided with periods of economic dislocation and recession.

Over two third of these youth do not want to live in their places of births, frequently migrating to fast growing urban cities in search of better economic prospects even when unschooled and lacked the necessary skills to secure well-paid jobs. These influxes (rural-urban drift) to towns and cities have resulted in the shortages of accommodations, and have put pressure on social infrastructures and services such as electricity, transportation system and security. Consequently, it has led to the growth of slumps, camps and squalors alongside these urban areas with substandard conditions, and has become hotpots for crimes, preying on other local dwellers. For instance, in Nigeria, the numbers of ghettos and hotspots have developed and keep increasing everyday in urban areas such as Kano, Maiduguri in the north to Port Harcourt, Warri, Benin down south, through Onitsha and Aba in the east, and areas such as Mushin, and Lagos-Island in the west. Similarly, in Sierra Leone, Lumley Street in the centre of Freetown and Krootown in the west have become ideal places where bored and frustrated idle youth use drugs. These Lumpen youth formed the bulk of the fighting forces during the war which amputated people's limbs, burning down houses and looting properties (Alpha, 2008).

Equally, anonymity of city life has developed thereby dissolving the erstwhile bond between people. The pristine traditional social organisations have been weakened resulting to immoral and delinquent behaviours such as human trafficking and ritual killings, kidnappings and armed robbery in the cities including selling of banned substances such as cocaine, heroin cannabis. The point here is that since most of these settlements are unplanned, it is difficult for the law enforcement officers to police and monitor these areas that lacked access road infrastructure. Again, the chaotic expansion of urban space has significantly reduced the capacity of national governments and security agencies to police most of these areas. Richard Norton termed these as 'feral cities' that are characterised by the inability of the state to exercise control, impose law and order, or make adequate provision for the citizens. Crowed areas of Mushin, Agege, Lagos Island, Aba, Kano, among others in Nigeria is an example. Cockayne and Williams (2009) remarked that urbanisation has open up fissures that drug trafficking has rolled in with ease. This rapid and large-scale urbanization broke down traditional norms and values which govern social relations in rural life. Different forms of delinquency became permissible, lowering barriers to deviance and leaving anomic youth seeking source of fellowship and identity. Gail (2005) noted that rapid and unplanned urbanisation creates conditions for the escalation of crimes. In many West Africa countries despairing young males living in terrible conditions are the 'shock troops' of crimes and political instability which is a security threat to societies.

## XI. PERCEPTION OF ILLICIT DRUG TRADE AS NORMAL BUSINESS

There is a liberal group in the world cum West Africa which holds the view that drug trafficking is an enterprise conducted like any other business in society that involved both willing buyers and sellers and therefore should be allowed to thrive according to the dictate of market forces which is an essential aspect of capitalism. In other words, drug trafficking is seen by this group including some government officials as creating wealth and providing employment opportunities to people rather posing a national security threat to their countries. Interestingly, there is little or no stigmatization attached to drug producers, traffickers and dealers. To them, they could not rationalise why somebody should be punished for simply carrying drugs from one part of the world to the other in an effort to earn a living. Ellis (2008) noted that some people hold the believed that since the drug trade involves willing buyers and sellers at every stage of the chain, it is essentially a legitimate form of commerce. As for the fact that it is illegal, they viewed the black market as the only way to redistribute wealth from those it is concentrated. They argued further that, since the mainstream commercial channels are effectively occupied and job opportunities are highly constricted to a few privilege ones with connections they should be alternative strategy for survival. They could not rationalise the criminalisation of drug trade and the drive to end it. They also viewed the drug war as nothing but a cover for an all attempt to keep less developed countries within the ambit of the super powers' control. But, they propped corrupt and brutal ruling class which owes much of their wealth to illicit drug trade and other forms of underground transactions. Deirdre (1999) opined that for decades the drug trade is a product of capitalism. It attracts capital in the same way any other business does by promising a generous return on investment. It is nothing more than an extreme form of profiteering - one that ranks along with arms trade, prostitution, illegal oil bunkering, slavery, and human trafficking and is directly profiteering from human misery which the western countries perpetrate.

That narcotic trade have grown into a huge industry that relies not only on desperados characters portrayed in movies but even more importantly on the prosaic administrators and managers of legal businesses like banks and brokerage houses. They laundered hundreds of billions that are made from illicit drug profits. Drug money laundering organisations are established to ensure the cash flow to these illegal businesses.

Besides, economic benefits are generated from drug industry. The production of illegal drugs like any other commodity requires a series of activities and processes to convert raw materials (coca, marijuana leafs, poppy) into final consumable goods that can be delivered to the consumers. This production chain passes through several stages including the growth, manufacture, transportation, and distribution. During these processes it generates economic benefits that affect the entire economy. Employment is the most visible outcome of drug business opportunities, cash flows and investments. There are labour intensive because when they are ready for harvesting peasants farmers have to guard the drug fields to avoid being robbed. Again, the harvesting of these crops requires a large amount of workers because it has to be done by hand without the help of modern agricultural technology. Besides the peasants farmers the other common drug-related occupations include chemists, lawyers, managers of laboratories, merchants, transporters, private security. Vigilant agents are hired by the drug industry in order to guarantee not only the appropriate completion of contracts but, also to protect and give personal security to drug smugglers.

## XII. DOUBLE STANDARD/HYPOCRITICAL ATTITUDE IN DRUG WAR

Many scholars, journalists, policing officers and global trend watchers are privy (regardless how activities are hidden or information suppressed) to the fact that those that have championed the war on illicit drug activities are found complicit in the trade. For instance, for over time, America has been in the forefront of illicit drug war spending trillions of dollars of tax payers' money to prosecute. However, indications have emerged that its first class citizens (presidents), top companies and their top executives, respected security outfits such as Central Intelligence Agency (CIA), the military and police are involved or found complicit in the illicit drug trade around the world and they have not been able to shirk the various allegations against them. For example, the Bush family involvement in drug trade is an open secret however it is little known that some major American companies are used as fronts to push drugs. A good example is the Halliburton Corporation's Brown and Root is the Bush and Cheney drug empire which played a key role in maintaining dominance of half a billion dollar a year global drug trade and its profits. Dick Cheney the CEO of Halliburton and largest shareholder (US\$45.5m) saw to it that the success is maintained by providing non official cover for CIA agents (Michael, 2001). Further, the testimony of the Assistant Treasury Secretary Salvatore R. Martoche on October 5, 1989, report to the Subcommittee on Terrorism, Narcotics, and International Operations noted that Bush administration officials admitted that US banks laundered an enormous sum of \$110 billion a year in drug money (New York Times, 1989). However, the investigation of Citibank's private banking practices never found the word drugs or controlled substances in the article, which lumps together private accounts the bank set up for a number of wealthy people. At least one of the cases mentioned was an offshore account that Citibank setup for drug cartel leader Raul Salinas, which was for the laundering of his drug money. But, the SWAT teams never broke into the offices of these white-collar dope pushers or other successful bootleggers and charged them. It is also known that Kennedy's millions originated from the illegal liquor trade. However, that kind of treatment is reserved for the street dealers who take the risks and get peanuts.

Furthermore, even Reagan's administration that launched the drug war in 1970, they were several testimonies in 1986 of trials of drug traffickers that revealed innumerable instances that drugs were being loaded on planes flown from Central America after delivering arms to the Colombia Contras and unloaded at military bases in US with the cooperation of the military and CIA personnel. One such group was Adolfo Chamorro's Contra group supported by CIA and helped transport drugs into US (Potter and Bullington, 1987). Again, the most respected former president Bill Clinton was seen as a strategic when he eliminated the wasted travel time for heroin with the destruction of the Serbian and Kosovo and installed the KLA as a regional power which opened direct line from Afghanistan to Western Europe. The lesson is that Columbia grown opium could be smuggled to New York through the Dominican Republic and Puerto Rico - a virtual straight line that shortened the traditional smuggling routes, reduce costs and increase profits and eliminate competition (Michael, 2001).

In addition, many people do not see any difference with today's drug trafficking from that conducted by British merchants that resulted in the opium war with China in 1800 to correct its trade imbalances of the period. The horror, carnage, destruction of human lives and properties and anguish of the war can only be best imagined. The United Kingdom forced China to allow British merchants to trade in opium with the general population of China. Drug was illegal by imperial decree but, smoking opium became common in the 1800s due to increasing importation by British merchants which an estimated two million Chinese became addicted to drug. The British have not offered any apology or set any reparation to the Chinese people till date.

#### Way Forward

The impetus for the criminalization of individuals and other states involved in drug production, trafficking when the same structural economic conditions that prompted the British to go to war with China (worst in recent times) to sell drugs and balanced it economic deficits, and for the Americans (state and non-state actors) to push drug as part of capital accumulation leaves a sour and disgusting taste in the mind of intellectuals. The inherent contractions for the West and Europe not to criminalize their involvement in drug trafficking while criminalizing other's involvement is untenable and can never be a solution to the problem. It undermines every rational ideology and morality to criminalize, condemn and punish the activities of others while permitting graciously such acts within its folds.

The issue of drug and its use has been in the world as old as the world itself or at least not less than 5 thousand years ago around the global and it is only in the late 20th century that Africa became affected with the trend as a result of global dynamics such pattern of people migration, globalisation and economic liberalisation. Africa may be affected by the trend, and drug syndicates posing peace threat to the region as drug and arms are having symbiotic relation. In many areas where they operate, they end up inciting and arming disgruntled elements to launch a rebellion against government or groups and because the drug trade becomes more lucrative in an atmosphere of instability where security mechanisms are weakened.

Illicit drug problem is not created by anybody and is beyond any person, group or countries in the region. So drug trade will always thrive no matter how heavenly the system of rule adopted, or how angelic are the rulers or security systems in place. Until and unless the West and Europe countries admits that they are the root cause of the drug problem anywhere in the world due to their unquenchable appetite for drugs, greed for money and luxurious life style, the problem will persist for eternity. Also, drug trade has thrived courtesy of capitalism in the same manner arms and human trafficking including illegal oil bunkery that has done so much harm to the region.

West Africa region do not have and will never have the needed recurrent financial capacity, equipments and human technical expertise to monitor its vast region from the infiltration of drug traffickers especially given its current (precarious) fiscal austerity against competing needs. Therefore, what needs be done is for the West and Europe to brace up to genuinely take the challenge and responsibilities to address the issue. Shifting blames and derogative names calling such as criminal gangs and corrupt official will not solve the problem, or developing and promoting 'viable economic alternative' will not sufficed, and is prone to exhaustion. They are window dressing that will not solve the problem.

Illicit drug trafficking have thrived because of lack of genuine and committed fight against the trend, and the repressive policy adapted to address the issue will never work. What needs be done is a total policy shift in drug control measures such as more liberal measures that exclude slightly, the strong long arm of the law against citizens by caring and encouraging them to live within socially accepted norms and formally stated rules as in Africa pristine period. Further, the international communities and bodies should redouble their efforts by bolstering the various law enforcement agencies in the region by providing training needs, and equipment that will effectively monitor crime corridors. For the wealthy citizens/countries that are idle and bored, the government should open up frontiers and encourage them to embark on humanitarian services locally or overseas to occupy their time that will sublimate their instinct for drug use. Further, the leaders of the region should have a conceptual

clarification of the trend and the implications of an illicit drug economy is the first and necessary condition. This is necessary in order to give the needed support in the fight against the trend. Terrorism that has become the region's albatross after decades of warning but ignored is a good lesson. There is the need for ECOWAS which is the regional body to go beyond rhetoric and match words with actions and aggressively pursue its action plan timely against illicit drug activities in the region.

Vigorous enlightenment campaigns against illicit drugs use that will reduce the demand for drugs are imperative such as that International Journal of Scientific and Research Publications, Volume 4, Issue 11, November 2014 ISSN 2250-3153

of HIV/AIDS' campaign success. Monitoring of kids from onset and de-emphasising their human right for proper training is important. There is the need for synergy that will strengthen crime information network from countries of origin of these drugs through transit and destination points.

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#### AUTHORS

**First Author** – Akonbede Rawlings UDAMA (Ph.D), Department of Peace and Conflict Studies, Institute of Africa Studies, University of Ibadan, Ibadan, Nigeria, akonbede@gmail.com

# Heat Source and Radiation Effects on an Unsteady MHD Free Convective Flow past a Heated Vertical Plate in a **Porous Medium**

## K. Anitha<sup>1</sup> P.V. Janardhana Reddy<sup>2</sup> S.venkataramana<sup>3</sup>

<sup>1</sup>Department of Mathematics, Sri Venkateswara University, Tirupathi 517501, India. <sup>2</sup>Department of Mathematics MGIT, Gandipet, Hyderabad, 500075, India. <sup>3</sup>Department of Mathematics, Sri Venkateswara University, Tirupathi 517501, India.

Abstract- In the present paper, we investigate the effects of heat source and radiation on unsteady magneto hydrodynamic free convection flow past an infinite heated vertical plate in a porous medium. The dimensionless governing equations are solved numerically using finite element method. Numerical evaluatation of the analytical results are carried out for different values of dimensionless parameters. The results are presented graphically for velocity, temperature and concentration profiles, and observed that, when the heat source and radiation parameter increases, the velocity and temperature decrease in the velocity.

Index Terms- MHD, Vertical plate, radiation, heat absorption, Finite Element Method

## MSC 2010:76D99, 76W05, 65L60

## Nomenclature

A	Small positive parameter	В	Plank's constant
T'		Greek	symbols:
- w	Wall temperature	ε	Small positive parameter
$T'_{\infty}$	Reference temperature	β	Coefficient of Volume expansion
U'	Dimensional free stream velocity	$v = \frac{\mu}{2}$	
ť	Dimensional time	ρ	Kinematic viscosity
8,	Acceleration due to gravity	$\sigma_{\scriptscriptstyle C}$	Electrical conductivity
$W_0$	Dimensional suction velocity	$\mu$	Permeability
(u',v')	, w') Dimensional velocity components	ρ	Fluid density
(x', y')	) Dimensional Cartesian coordinates	$\omega'$	Dimensional free stream frequency of oscillation
<sup>2</sup>		k	Thermal conductivity
$H_0$	Constant transverse magnetic field	$\alpha^2$	Absorption coefficient
K C	Dimensional porosity parameter	$\chi^{2}$	Non Dimensional permeability parameter
$\mathbf{C}_p$	Specific heat capacity	δ	Radiation absorption coefficient
$M^2$	Non- dimensional Hartmann number	λ	Frequency
Pr	Prandtl number		1 2
Gr	Grashof number		I INTRODUCTION
$R^2$	Radiation parameter		y through porous medium past infinite vertical plate is
$U_0$	Mean velocity of $U'(t')$	row and sci	nmon in nature and has many applications in engineering ence. A number of workers have investigated such flows
$q_z$	Radiative heat flux	and exe be for	cellent literature on the properties and phenomenon may ind in literature $[9, 10, 13 - 15]$ . For example,
EC	Eckert number	Sounda	lgekar [13] investigated the effects of free convection
S	Heat source	current	s on the oscillatory type boundary layer flow past an

infinite vertical plate with constant suction where the plate temperature differs from the free steam temperature.

Recently, attention has been on the effects of transversely applied magnetic field and thermal perturbation on the flow of electrically conducting viscous fluids such as plasma. Various properties associated with the interplay of magnetic fields and thermal perturbation in porous medium past vertical plate find useful applications in astrophysics, geophysical fluid dynamics, and engineering. Researchers in these fields have been conducted by many investigators [1, 3, 4, 6, 8, 11, 12 and 16]. For example, Soundalgekar [12] investigated a two dimensional steady free – convection flow of an incompressible, viscous, electrically conducting fluid past an infinite vertical porous plate with constant suction and plate temperature when the difference between the plate temperature and free stream is moderately large to cause free-convection currents. In another study Israel-Cookey and Sigalo [7] investigated the problem of unsteady MHD past a semi-infinite to vertical plate in an optically thin environment with simultaneous effects of radiation, freeconvection parameters and time – dependent suction. Chamka [5] investigated the unsteady convective heat and mass transfer past a infinite permeable moving plate with heat absorption where it was found that increase in Solutal Grashoff number enhanced the concentration buoyancy effects leading to an increase in the

velocity. Anand Rao and Sivaiah [2] studied the chemical reaction effects on an unsteady MHD free convective flow past an infinite vertical porous plate with constant suction and heat source.

The objective of the present paper is to examine the effects of Heat source and radiation on unsteady MHD free convection flow past an infinite heated vertical plate in a porous medium. The equations of continuity, linear momentum, energy which govern the flow field, are solved numerically by using Galerkin finite element method. Similarity solutions are then obtained numerically for various parameters entering into the problem and discussed them from the physical point of view.

#### II. MATHEMATICAL FORMULATION

We consider the unsteady flow of an incompressible viscous, radiating hydro magnetic fluid past an infinite porous heated vertical plate with time – dependent suction in an optically thin environment. The physical model and the coordinate system are shown in figure 1. The  $x'^-$  axis is taken along the vertical infinite porous plate in the upward direction and the  $y'^-$  axis normal to the plate.



Figure 1. The physical model and coordinate system of the problem

At time t' = 0, the plate is maintained at a temperature  $T_w'$ , which is high enough to initiate radiative heat transfer. A constant magnetic field  $H_0'^2$  is maintained in the y' direction and the plate moves uniformly along the positive x' direction with velocity  $U_0$ . Under Boussinesq approximation the flow is governed by the following equations:

$$\frac{\partial w'}{\partial y'} = 0 \tag{1}$$

$$\frac{\partial u'}{\partial t'} + w' \frac{\partial u'}{\partial y'} = \upsilon \frac{\partial^2 u'}{\partial {y'}^2} + \frac{\partial U'}{\partial t'} - \left(\frac{\mu^2 \sigma_c H_0'^2}{\rho} + \frac{\upsilon}{K}\right) (u' - U') + g\beta \left(T' - T_{\infty}'\right)$$
(2)

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$$\frac{\partial T'}{\partial t'} + w' \frac{\partial T'}{\partial y'} = \frac{k}{\rho C_P} \left( \frac{\partial^2 T'}{\partial {y'}^2} - \nabla q'_{z'} \right) + \frac{\mu}{\rho C_P} \left( \frac{\partial u'}{\partial y'} \right)^2 - \frac{Q_o}{\rho C_P} (T' - T'_{\infty})$$
(3)

$$\frac{\partial^2 q_{z'}}{\partial y'^2} - 3\alpha^2 q'_{z'} - 16\alpha \sigma T_{\infty}^{3} \frac{\partial T'}{\partial y'} = 0$$
<sup>(4)</sup>

The boundary conditions are

 $u' = 0, T' = T'_w, \text{ on } y' = 0$  $u' = 0, T' = T'_w, \text{ as } y' \to \infty$  Since the medium is optically thin with relatively low density and  $\alpha <<1$  the radiative heat flux given by equation (4) in the spirit of Cogley *et al.* [4] becomes

(5)

$$\frac{\partial q'_{z'}}{\partial y'} = 4\alpha^2 \left(T' - T'_{\infty}\right)$$
(6)
$$\alpha^2 = \int_0^\infty \delta \lambda \, \frac{\partial B}{\partial T'}$$
(7)

Further, from equation (1) it is clear that w' is a constant or a function of time only and so we assume  $w' = -w'_0 \left( 1 + \varepsilon A e^{i\omega' t'} \right)$ (8)

Such that  $\mathcal{E}A \ll 1$ , and the negative sign indicates that the suction velocity is towards the plate.

In view of equations (4), (8) and (9), equations (2) and (3) become

$$\frac{1}{4}\frac{\partial u}{\partial t} - \left(1 + \varepsilon A e^{i\omega t}\right)\frac{\partial u}{\partial y} = \frac{1}{4}\frac{\partial U}{\partial t} + \frac{\partial^2 u}{\partial y^2} - (M^2 + \chi^2)(u - U) + Gr\theta$$
<sup>(9)</sup>

$$\frac{1}{4}\Pr\frac{\partial\theta}{\partial t} - \Pr\left(1 + \varepsilon A \, e^{i\omega t}\right)\frac{\partial\theta}{\partial y} = \left(\frac{\partial^2}{\partial y^2} - R^2\right)\theta + \Pr Ec\left(\frac{\partial u}{\partial y}\right)^2 - \Pr S\theta$$
(10)

Where we have used the following dimensionless variables

$$t = \frac{w_0'^2 t'}{4\upsilon}, \quad y = \frac{w_0' y'}{\upsilon}, \quad u = \frac{u'}{U_0}, \quad \omega = \frac{4\upsilon\omega'}{w_0'^2}, \quad U = \frac{U'}{U_0}, \quad \theta = \frac{T' - T_{\omega}'}{T_w' - T_{\omega}'},$$

$$Pr = \frac{\mu c_p}{k}, \quad Gr = \frac{g\beta \upsilon \left(T_w' - T_{\omega}'\right)}{U_0 w_0'^2}, \quad Ec = \frac{U_0^2}{C_p \left(T_w' - T_{\omega}'\right)}, \quad \chi^2 = \frac{\upsilon^2}{K w_0'^2}.$$

$$R^2 = \frac{4\alpha^2}{\rho C_p k w_0'^2} \left(T_w' - T_{\omega}'\right), \quad S = \frac{\upsilon Q_o}{\rho c_p w_0'^2}, \quad M^2 = \frac{\mu^2 \sigma_c H_0'^2}{\upsilon \rho w_0'^2},$$

$$\dots$$
(11)

Equations (9) and (10) are now subject to the boundary conditions  $u = 0, \quad \theta = 1, \text{ on } y = 0$  $u \to 0, \quad \theta \to 0, \text{ as } y \to \infty$ 

(12)

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The mathematical statement of the problem is now complete and embodies the solution of equations (9) and (10) subject to boundary conditions (11).

## III. METHOD OF SOLUTION

By applying Galerkin finite element method for equation (9) over the element  $(e)_{,}(y_j \le y \le y_k)$  is:

$$\int_{y_j}^{y_k} \left\{ N^{(e)T} \left[ 4 \frac{\partial^2 u^{(e)}}{\partial y^2} - \frac{\partial u^{(e)}}{\partial t} + 4B \frac{\partial u^{(e)}}{\partial y} - Du^{(e)} + P \right] \right\} dy = 0$$
(13)

Where 
$$P = \frac{\partial U}{\partial t} + 4(Gr)\theta + DU$$
,  $B = 1 + \varepsilon A e^{i\omega t}$ ,  $D = 4(M^2 + \chi^2)$ ;

Integrating the first term in equation (13) by parts one obtains

$$4N^{(e)^{T}} \left\{ \frac{\partial u^{(e)}}{\partial y} \right\}_{y_{j}}^{y_{k}} - \int_{y_{j}}^{y_{k}} \left\{ 4 \frac{\partial N^{(e)^{T}}}{\partial y} \frac{\partial u^{(e)}}{\partial y} + N^{(e)^{T}} \left( \frac{\partial u^{(e)}}{\partial t} - 4B \frac{\partial u^{(e)}}{\partial y} + Du^{(e)} - P \right) \right\} dy = 0$$

$$\tag{14}$$

Neglecting the first term in equation (14), one gets:

$$\int_{y_j}^{y_k} \left\{ 4 \frac{\partial N^{(e)^T}}{\partial y} \frac{\partial u^{(e)}}{\partial y} + N^{(e)^T} \left( \frac{\partial u^{(e)}}{\partial t} - 4B \frac{\partial u^{(e)}}{\partial y} + Du^{(e)} - P \right) \right\} dy = 0$$

Let  $u^{(e)} = N^{(e)} \phi^{(e)}$  be the linear piecewise approximation solution over the element (e)  $(y_j \le y \le y_k)$  where

$$N^{(e)} = \begin{bmatrix} N_j & N_k \end{bmatrix}, \ \phi^{(e)} = \begin{bmatrix} u_j & u_k \end{bmatrix}^T \text{ and } N_j = \frac{y_k - y_j}{y_k - y_j}, N_k = \frac{y - y_j}{y_k - y_j} \text{ are the basis functions. One obtains:}$$

$$4\int_{y_{j}}^{y_{k}} \left\{ \begin{bmatrix} N_{j}^{'} N_{j}^{'} & N_{j}^{'} N_{k}^{'} \\ N_{j}^{'} N_{k}^{'} & N_{k}^{'} N_{k}^{'} \end{bmatrix} \begin{bmatrix} u_{j} \\ u_{k} \end{bmatrix} \right\} dy + \int_{y_{j}}^{y_{k}} \left\{ \begin{bmatrix} N_{j} N_{j} & N_{j} N_{k} \\ N_{j} N_{k} & N_{k} N_{k} \end{bmatrix} \begin{bmatrix} \mathbf{i} \\ u_{j} \\ \mathbf{i} \\ u_{k} \end{bmatrix} \right\} dy - 4B\int_{y_{j}}^{y_{k}} \left\{ \begin{bmatrix} N_{j} N_{j} & N_{j} N_{k} \\ N_{j} N_{k} & N_{k} N_{k} \end{bmatrix} \begin{bmatrix} u_{j} \\ u_{k} \end{bmatrix} \right\} dy + D\int_{y_{j}}^{y_{k}} \left\{ \begin{bmatrix} N_{j} N_{j} & N_{j} N_{k} \\ N_{j} N_{k} & N_{k} N_{k} \end{bmatrix} \begin{bmatrix} u_{j} \\ u_{k} \end{bmatrix} \right\} dy = P\int_{y_{j}}^{y_{k}} \begin{bmatrix} N_{j} \\ N_{k} \end{bmatrix} dy$$

Simplifying we get

$$\frac{4}{l^{(e)^2}} \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} u_j \\ u_k \end{bmatrix} + \frac{1}{6} \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} \bullet \\ u_j \\ \bullet \\ u_k \end{bmatrix} - \frac{4B}{2l^{(e)}} \begin{bmatrix} -1 & 1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} u_j \\ u_k \end{bmatrix} + \frac{D}{6} \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} u_j \\ u_k \end{bmatrix} = \frac{P}{2} \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

Where prime and dot denotes differentiation w.r.t y and time t respectively. Assembling the element equations for two consecutive elements  $(y_{i-1} \le y \le y_i)_{and} (y_i \le y \le y_{i+1})_{following is obtained:}$ 

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$$\frac{4}{l^{(e)^{2}}} \begin{bmatrix} 1 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 1 \end{bmatrix} \begin{bmatrix} u_{i-1} \\ u_{i} \\ u_{i+1} \end{bmatrix} + \frac{1}{6} \begin{bmatrix} 2 & 1 & 0 \\ 1 & 4 & 1 \\ 0 & 1 & 2 \end{bmatrix} \begin{bmatrix} \bullet \\ u_{i} \\ \bullet \\ u_{i+1} \end{bmatrix} - \frac{4B}{2l^{(e)}} \begin{bmatrix} -1 & 1 & 0 \\ -1 & 0 & 1 \\ 0 & -1 & 1 \end{bmatrix} \begin{bmatrix} u_{i-1} \\ u_{i} \\ u_{i+1} \end{bmatrix} + \frac{D}{6} \begin{bmatrix} 2 & 1 & 0 \\ 1 & 4 & 1 \\ 0 & 1 & 2 \end{bmatrix} \begin{bmatrix} u_{i-1} \\ u_{i} \\ u_{i+1} \end{bmatrix} = \frac{P}{2} \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$$
(15)

Now put row corresponding to the node i to zero, from equation (15) the difference schemes with  $l^{(e)} = h_{is:}$  $\frac{4}{h^2} \left[ -u_{i-1} + 2u_i - u_{i+1} \right] + \frac{1}{6} \left[ \overset{\bullet}{u_{i-1}} + \overset{\bullet}{4u_i} + \overset{\bullet}{u_{i+1}} \right] - \frac{4B}{2h} \left[ -u_{i-1} + u_{i+1} \right] + \frac{D}{6} \left[ u_{i-1} + 4u_i + u_{i+1} \right] = P$ 

Applying the trapezoidal rule, following system of equations in Crank – Nicholson method are obtained:

$$A_{1}u_{i-1}^{n+1} + A_{2}u_{i}^{n+1} + A_{3}u_{i+1}^{n+1} = A_{4}u_{i-1}^{n} + A_{5}u_{i}^{n} + A_{6}u_{i+1}^{n} + P^{*}$$
(17)

Now from equations (11) and (12) following equations are obtained:

$$B_{1}\theta_{i-1}^{n+1} + B_{2}\theta_{i}^{n+1} + B_{3}\theta_{i+1}^{n+1} = B_{4}\theta_{i-1}^{n} + B_{5}\theta_{i}^{n} + B_{6}\theta_{i+1}^{n} + Q^{*}$$

$$Where \quad A_{1} = 2 + 12Brh + Dk - 24r, \quad A_{2} = 8 + 4Dk + 48r, \quad A_{3} = 2 - 12Brh + Dk - 24r, \\ A_{4} = 2 - 12Brh - Dk + 24r, \quad A_{5} = 8 - 4Dk - 48r, \quad A_{6} = 2 + 12Brh + Dk + 24r, \\ B_{1} = 2(Pr) + 12(Pr)Brh + 4R^{2}k - 24r + 4S(Pr)k, \quad B_{2} = 8(Pr) + 48r + 16R^{2}k + 16S(Pr)k, \\ B_{3} = 2(Pr) - 12(Pr)Brh + 4R^{2}k - 24r + 4S(Pr)k, \\ B_{4} = 2(Pr) - 12(Pr)Brh - 4R^{2}k + 24r - 4S(Pr)k, \\ B_{5} = 8(Pr) - 48r - 16R^{2}k - 16S(Pr)k, \\ B_{6} = 2(Pr) + 12(Pr)Brh - 4R^{2}k + 24r - 4S(Pr)k, \\ \end{array}$$
(18)

 $P^* = 12Pk = 12k \left(\frac{\partial U}{\partial t} + 4(Gr)\theta + DU\right), Q^* = 12Qk = 48(\Pr)k(Ec) \left(\frac{\partial u}{\partial y}\right)^2,$ 

Here  $r = \frac{k}{h^2}$  and h, k are mesh sizes along y -direction and time-direction respectively. Index i refers to space and j refers to the time. In the equations (17) and (18) taking i=1(1)n and using boundary conditions (12), then the following system of equations are obtained:  $\mathbf{A}\mathbf{V}$   $\mathbf{D}$  : 1(1)?

$$A_i X_i = B_i \quad i = I(1)2$$
<sup>(19)</sup>

(16)

where  $A_i$  s are matrices of order n and  $X_i$ ,  $B_i$  s are column matrices having n – components. The solutions of above system of equations are obtained by using Thomas algorithm for velocity, temperature and concentration. Also, numerical solutions for these equations are obtained by C – programme. In order to prove the convergence and stability of Galerkin finite element method, the same C – programme was run with smaller values of h and k no significant change was observed in the values of u,  $\theta$  and C. Hence the Galerkin finite element method is stable and convergent.

#### IV. RESULTS AND DISCUSSION

In the previous sections, we have formulated and solved the problem of an unsteady MHD free convection flow past an infinite heated vertical plate in a porous medium with radiation. By invoking, the optically thin differential approximation for the radiative heat flux in the energy equation. In the numerical computation, the Prandtl number (Pr = 0.71) which corresponds to air and various values of the material parameters are used. In addition, the boundary condition  $y \rightarrow \infty$  is approximated by  $y_{\text{max}} = 3$ , which is sufficiently large for the velocity to approach the relevant stream velocity. For various values of Grashof number the velocity profiles u are plotted in figures (2). The Grashof number (Gr) signifies the relative effect of the thermal buoyancy force to the viscous hydrodynamic force in the boundary layer. As expected, it is observed that there is a rise in the velocity due to the enhancement of thermal buoyancy force. Also, as (Gr)increases, the peak values of the velocity increases rapidly near the porous plate and then decays smoothly to the free stream velocity.. Figure (3) illustrate the velocity profiles for different values of Prandtl number Pr. The numerical results show that the effect of increasing values of Prandtl number result in decreasing velocity. The effect of the magnetic field parameter M is shown in figure (4) in case of cooling of the plate. It is observed that the velocity of the fluid decreases with the increase of the magnetic field parameter values. The decrease in the velocity as the Hartmann number M increases is because the presence of a magnetic field in an electrically conducting fluid introduces a force called the Lorentz force, which acts against the flow if the magnetic field is applied in the normal direction, as in the present study. This resistive force slows down the fluid velocity component as shown in figure (4). The influence of the viscous dissipation parameter i.e., the Eckert number Ec on the velocity and temperature are shown in figures (5) and (10) respectively. The Eckert number Ec expresses the relationship between the kinetic energy in the flow and the enthalpy. It embodies the conversion of kinetic energy into internal energy by work done against the viscous fluid stresses. Greater viscous dissipative heat causes a rise in the temperature as well as the velocity.

The effect of the thermal radiation parameter R on the primary velocity and temperature profiles in the boundary layer are illustrated in figures (6) and (12) respectively. Increasing the thermal radiation parameter R produces significant increase in the thermal condition of the fluid and its thermal boundary layer.

This increase in the fluid temperature induces more flow in the boundary layer causing the velocity of the fluid there to increase. Figure (7) and (11) has been plotted to depict the variation of velocity and temperature profiles against y for different values of heat source parameter S by fixing other physical parameters. From this Graph we observe that velocity and temperature decrease with increase in the heat source parameter S because when heat is absorbed, the buoyancy force decreases the temperature profiles. Figure (8) shows the effects of Darcy number  $\chi$  on the velocity profiles for cooling as well as heating of the plate. For a cooling plate fluid velocity increases, whereas for a heating plate it decreases with increase of  $\mathcal{X}$ . Darcy number is the measurement of the porosity of the medium. As the porosity of the medium increases, the value of  $\chi$  increases. For large porosity of the medium fluid gets more space to flow as a consequence its velocity increases. Figure (9) illustrate the temperature profiles for different values of Prandtl number Pr. It is observed that the temperature decrease as an increasing the Prandtl number. The reason is that smaller values of Pr are equivalent to increase in the thermal conductivity of the fluid and therefore heat is able to diffuse away from the heated surface more rapidly for higher values of Pr. Hence in the case of smaller Prandtl number the thermal boundary layer is thicker and the rate of heat transfer is reduced.

#### V. CONCLUSIONS

In conclusion therefore, the flow of an unsteady MHD free convection past an infinite heated vertical plate in a porous medium under the simultaneous effects of viscous dissipation, radiation and heat source is affected by the material parameters. The governing equations are approximated to a system of linear partial differential equations by using Galerkin finite element method. The results are presented graphically and we can conclude that the flow field and the quantities of physical interest are significantly influenced by these parameters.

- 1. The velocity increases as Grashof number Gr, Eckert number Ec, Thermal radiation parameter R, Darcy parameter  $\chi$ , Ec and Soret number Sr increases. However, the velocity was found to decreases as the Hartmann number M, Prandtl number Pr, Schmidt number Sc, and Heat source parameter S are increases.
- 2. The fluid temperature was found to decreases as the Heat source parameter S and Prandtl number Pr are

increases and found to increase as Eckert number Ec, and thermal radiation parameter R are increases.



Figure 2. Velocity profiles for different values of



Figure 3. Velocity profiles for different values of Pr



Figure 4. Velocity profiles for different values of M



Figure 5. Velocity profiles for different values of Ec



Figure 6. Velocity profiles for different values of R



Figure 7. Velocity profiles for different values of S

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Figure 8. Velocity profiles for different values of  $\chi$ 



Figure 9. Temperature profiles for different values of Pr



Figure 10. Temperature profiles for different values of *Ec* 



Figure 11. Temperature profiles for different values of *S* 



Figure 12. Temperature profiles for different values of R

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#### AUTHORS

**First Author** – K. Anitha, Department of Mathematics, S.V. University, Tirupathi, Email: anithareddy1981@gmail.com. **Second Author** – Department of Mathematics MGIT, Gandipet, Hyderabad, Email:Phgjanu@gmail.com.

**Third Author** –Rtd Professor, Department of Mathematics, S.V. University, Tirupathi

#### Correspondence Author – K. Anitha,

Email:anithareddy1981@gmail.com., Contact number :+91 9908755049.

# The Relationship of Social Roles with Various Individual Preferences and Subsequent effects on Various Job Performances

## Dr. Naveed Shibli PhD, Dr. Mudassir Ahmad PhD, Professor Anwar ul Haq, Rafia Mudassir

Abstract- Importance of social roles in societal interconnectivity and cohesion is established and can help study social transition such may be from dictatorship to democracy. Social roles and individual preference are dominatingly harmonious in various social norms and supposed to be there in 'office roles' in the present study in case of various preferences served in the form of a questionnaire to the equal number of officers and men of similar governments ranks of a public sector University and prison department two completely different roles to study role identity of all participants with their selecting 'preferences' in a semi subjective questionnaire revolving around the routine office work related to both departments administered to them. The results revealed 'significant' difference between the role 'demands' and preferences selection among all groups reflecting thereby a 'role confusion' that could be there may be due to political transition.

Index Terms- Role, Preference, Identity, Office Roles

#### I. INTRODUCTION

Expectation of other people is one of the important determents of human behavior for 'people evaluate one another by comparing role expectations with role behavior and that our esteem for others depends on how well their behavior meets the requirements of their roles' (Kolb Rubin Mcintyre1974). Moreover, the studies of 'role taking show that how ' to a considerable degree, we think and act' 'to fit in with patterns of behaviors laid down by society' (Gallatin1980).Youth is a valuable asset for successful nations and educational institutions usually play prime role to groom it. Overall environment, faculty and staff play a vital role to develop students into responsible citizen of society however, a study reveals that ''students are uncertain about their future' in Pakistan (Malik, Shah 2003). Such unrest among the students can be due to various reasons (Kolb. Rubin Mcintyre 1974) including 'preference expectation' confusion.

The role is usually defined as 'the behaviors expected of a person occupying a certain position in a group' like 'the roles of parent, teacher, policemen, etc' (Pennington 1987). As 'the central role of clinicians conducting an assessment should be to answer specific questions' those can help him for 'making relevant decisions' (Marnat 2003). Status also sometimes is related to roles in simplified terms 'status is a position in the social structure, and a role is the expected behavior of person occupying a particular status' (Hoffman Stephen Klesius 1981) The roles are important in our identification process as well because the child is gradually molded by 'various

agencies' (McCrath 1983) including his or her 'identifications with parents siblings, friends, and others and such is important for a child because of the, 'later patterns of' his her behavior and if there is a 'role diffusion' at any stage as Erikson describes it than child usually does not succeeds to integrated with various identifications' (Edwards 1983).

Pakistan is a democracy and unlike 'trivialized democracy' (Ake 1969) in (Animashuam 2008) now true democratic values as claimed prevail here although different 'elements influence existing political system' (Ahmed 2006): So if a stable political system exists than certainly it would be related with clear role realizations and if so then does it relates to different existing social/official positions also for (Khan 2006) noted difference 'between the working of different faiths' and in case of democracy and dictatorship it is established that both are two entirely different social situations.

The proposed study may be related and may be helpful to understand that how this particular study contribute in 'recognition or up-gradation' of societies" (Khan 2006). Moreover the importance of office role realization in case of different 'occupations' could add to job studies in the same manner as work on different 'scales' in national language 'Urdu' is helpful for objectivity' as (Sohail, Khannum 2009) conducted in case of 'Occupational Stress Scale Development'

The roles of prisons and Universities are totally different because of the nature of work of both the departments. The classical study of 'Stanford Prison Experiment' is an example of the different roles of prisons and educational institutions (Pennington 1986) although 'punishing law offenders' (Akreem 2006) may vary culture to culture. In the same manner the basic role of Universities globally is similar but small variations do exist depending on various cultures imparting education may vary but it is established that both set ups are different although 'sometimes the changes in the meanings of concepts in science' may be 'in conflict with the non-specialist's understanding (Stanovich 2004) however, generally almost in all societies roles of education and prisons are not similar and it is also possible that the connotation of both the words 'education' and 'prison' may be different to the extent of 'negative' and 'positive' so the roles there suppose to be different because the word 'hate' can be assumed to create 'negative affect' as described by Wason &Laird in (Wason &Laird1972).

To study the role differences if any between the people related with the education department and with the prisons department many methods were available for example the first was to study roles in the light of written rules and regulations for the employees of both the departments, the other way was to observe and assess the persons working in both the departments by asking them to share their views about their roles but in both the cases the probability of chance error was more due to sociocultural reasons so to be more precise subjects were asked from both the departments to answer the same questions about their preferences in case of certain similar office matters and to see that how do the responses of the people working in two different departments about similar things are different due to their departments requirements and different office roles?

#### II. METHOD/PROCEDURE

To achieve the purpose a semi subjective questionnaire was developed that was consists of two questions depicting routine daily official procedures with 4 multiple choice items each reflecting different preference options about the main questions among these a few were purely related to the University roles of educators and prison department roles. A group of psychology department students were assigned to administer the questionnaire to 8 University Head of the Departments and 16 University employees working against clerical positions and 8 jail officers of similar ranks and 16 jail junior rankers. Before the administration of questionnaire all participants were told that the present research was designed to know their preferences about certain job roles.

#### III. RESULTS

Comparison of the responses of both the groups revealed a 'significant difference' between the role demands and selection of preference by the participants of both the groups reflecting the significant presence of 'role confusion' among the employees of both the departments.

#### IV. CONCLUSION/DISCUSSION

The study reflects that how role realization is related with job productivity and subsequent job success and how such could add to society? The study also proves that 'role confusion' can negatively affect job performance. It also reveals that the performance of an official role is positively correlated with job realization moreover role identification can add to the role performance.

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#### AUTHORS

First Author – Dr. Naveed Shibli PhD Second Author – Dr. Mudassir Ahmad PhD Third Author – Professor Anwar ul Haq Fourth Author – Rafia Mudassir

## **Hodgkins Lymphoma in Pregnancy: A Case Report**

## Dr Neha Goyal, Dr Tushar Palve, Dr Aditi Parmar

BCJ Hospital and Asha Parekh Research Centre

Abstract- Pregnancy is a special phase in every woman's life and demands special care because even a small mishap can turn this happy journey in to a scary nightmare. That's why treating any ailment including malignancy merits special consideration as it can have a long lasting impact on two lives. Hodgkins lymphoma is one of the common malignancy encountered during pregnancy and chemotherapy plays a central role in its management. Chemotherapeutic drugs with their toxic effects can have a profound effect on the outcome of pregnancy. Keeping this view in mind we report our experience of treating such patient in a tertiary care hospital and try to highlight the challenges involved. Lymphoma is a rare diagnosis in pregnancy. Chemotherapy and radiotherapy during the first trimester is associated with fetal malformation risk which diminishes as pregnancy advances. In view of relative rarity of such cases there is a critical need for multicentre cooperation and a central registry to collect data on such cases and their follow up so that treating physicians could assess more accurately the safety of different chemotherapeutic agents in pregnancy.

Index Terms- Hodgkins Lymphoma, Pregnancy, Chemotherapy

### I. INTRODUCTION

Hodgkin lymphoma (Hodgkin's disease, HL) accounts for only 10 percent of all lymphomas, but it is one of the most frequent malignancy diagnosed during pregnancy, occurring in approximately 1:6000 deliveries <sup>1-3</sup> and this accounts for 3 percent or fewer of all patients with HL. In coming years incidence of lymphomas in pregnancy may increase due to the current trend to postpone pregnancy until later in life and the probable association of AIDS-related non-Hodgkin's lymphoma (NHL) in developing countries like India.<sup>4-5</sup> Thus proper diagnosis and management of HL becomes imperative.

## II. CASE REPORT

A 28 yrs old primigravida with 6 months amenorrhea came with pain and swelling in lower extremities, joint pain, weight loss, chronic cough and generalized pain and weakness since. She had h/o pulmonary Koch's 7 yrs back & took AKT for 6 months. Her general condition was poor, she was cachexic and pale. On respiratory examination there were decreased bronchial sounds on right side with occasional crepts. On investigating she had leucocytosis (WBC 33700 with neutrophilia), ESR-110, CRP-positive (45),HIV-negative, RFT &LFT-normal. Chest xray (figure 1)was s/o Rt lower lung mass with Rt. Sided pleural effusion with? Pulmonary Koch's, 3 samples of sputum were negative for AFB but culture showed fluconazole resistant Candida species USG (OBS)- SLIUG 25 wks, Placenta- anterior grade 1, EFW-748 gms, IUGR baby. HRCT (figure 2) showed large lung mass with cavitation in right middle lobe of lung with 10\*9\*9.6 cms with extensive mediastinal & subcarinal adenopathy (fig1). Cylindrical broncheitasis in rt upper & lower lobes. CT guided biopsy of mediastinal mass was done. Biopsy (figure 3) was suggestive of classical Hodgkins Lymphoma (fig.2). On IHC cells were positive for CD30 & MUM-1 and negative for LCA, CD15, CD20, CD3. Oncology referral was done and she was diagnosed with case stage-2-3 hodgkins lymphoma. Chemotherapy was started (ABVD) along with antibiotics. Within 3 days pt. went in spontaneous preterm labour & delivered a preterm female baby of 930 grams vaginally .Her postnatal period was uneventful but unfortunately baby expired on day 8 post delivery.

#### III. DISCUSSION

In women 15–24 years of age, HL is the one of the most frequently encountered malignancy, accounting for 51% of the hematologic malignancies complicating pregnancy.<sup>6</sup> Single women have higher rates of the disease than married women, as do women with lower parity or late age at first full-term pregnancy.<sup>7-8</sup> Many studies suggest that HL presents with typical manifestations in the pregnant woman.<sup>9-10</sup> Pregnancy also does not seem to affect the stage of disease at presentation, the response to therapy, or the overall survival rate from HL.<sup>6</sup>

To establish a diagnosis and classify the subtype of lymphoma, histopathological examination of a lymph node biopsy is mandatory which can be safely done under local or general anesthesia during pregnancy.<sup>2,11</sup> Nodular sclerosis is the commonest subtype encountered even in this subgroup.<sup>2</sup>

The HASTE sequence of MRI provides a rapid and comprehensive imaging of the entire chest that has largely replaced conventional MRI, and provides enough information on lymph node size with no measurable radiation risk to the fetus. PET/CT should be performed after delivery to assess treatment response.

Each patient must be looked at individually for treatment options because HL diagnosed in first trimester does not constitute an absolute indication for therapeutic abortion.<sup>12</sup> If the HL presents in early stage above the diaphragm patients can be followed carefully with induction at 32 - 36 weeks<sup>13-15</sup> and definite treatment can be offered afterwards.<sup>16</sup> Alternatively, these patients can receive radiation therapy with proper shielding.<sup>17-20</sup> In a study at M.D. Anderson authors reported no congenital abnormalities in 16 babies delivered after the mothers had received supradiaphragmatic radiation while shielding the uterus with five half-value layers of lead.<sup>21</sup> Because of theoretical risks that the fetus might develop future malignancies from even minimal scattered radiation doses outside the radiation field,

radiation therapy should be postponed, if possible, until after delivery.  $^{\rm 22}$ 

As far as possible, chemotherapy should be avoided in first trimester because of well documented risk of spontaneous abortion and congenital anomalies<sup>7,9,23-26</sup> but if required a single agent treatment with anthracycline antibiotics (high molecular weight) or vinca alkaloids (highly protein bound) followed by multiagent therapy at the end of first trimester can be considered. Similarly intrauterine growth restriction and low birth weight have been observed during the second and third trimesters, which may be attributed to either nutritional deficiencies from the tumor or chemotherapy-induced anorexia.<sup>13</sup>

Dilutional and iron-deficiency anemia found during pregnancy combined with cytotoxic effects of chemotherapy may increase the risk of anemia.<sup>23</sup> Conversely, studies with long-term follow-up have not shown hematologic or immunologic abnormalities or impairments in learning behavior of children exposed to chemotherapy in the womb. $^{10,13,22,25}$ . As per the study conducted by Bachanova and Conners in 2008, combination of doxorubicin, bleomycin, vinblastin and dacarbazine (ABVD) is a regimen of choice if multiagent therapy is to be used as it appears to be safe for fetal development when used in any trimester.<sup>26-27</sup> In one randomized controlled study, the 20-year survival rate of pregnant women with HL did not differ from the 20-year survival women<sup>28.</sup> nonpregnant Experience rate of regarding chemotherapy during lactation is limited. As dose-dependent as well as dose-independent effects of these drugs cannot be ruled out most authorities consider cancer chemotherapy to be incompatible with breastfeeding.<sup>4</sup>

#### IV. CONCLUSION

Although HL has a relatively high incidence in women of reproductive age, HL in pregnancy is still uncommon, corresponding to 3.2% of all patients with HL. Although prognosis does not appear to be adversely affected, pregnancy imposes significant limitations on HL management. Exposure of the developing fetus to teratogens should be avoided whenever possible, but delaying treatment may be deleterious to the mother. Chemotherapy that is administered in the first trimester has been associated with congenital abnormalities in as many as 33% of infants<sup>13</sup>. Women who present with favorable histologic characteristics and early-stage disease can be followed carefully and chemotherapy delayed until after delivery. Chemotherapy probably can be safely received during the second and third trimesters, but radiotherapy should be avoided late in pregnancy owing to the close proximity of the pregnant uterus to the lower border of the treatment field. Chemotherapy should not be given within 3 weeks of scheduled delivery to prevent fetal myelosuppression. Each patient must be looked at individually to take into account the stage and rapidity of growth of the lymphoma and the patient wishes.

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#### AUTHORS

**First Author** – Dr Neha Goyal, BCJ Hospital and Asha Parekh Research Centre

**Second Author** – Dr Tushar Palve, BCJ Hospital and Asha Parekh Research Centre

**Third Author** – Dr Aditi Parmar, BCJ Hospital and Asha Parekh Research Centre



Figure 1 Chest Xray Showing Rt lower lung mass



FIGURE 2 HRCT image Showing Lung mass with cavitation in right middle lobe of lung



FIGURE 3: microphotograph of mediastinal mass biopsy showing Reedsternbergs cells

## Antibacterial Activities of Aqueous and Ethanolic Extract of Allium cepa (Onion Bulb) Against Some Selected Pathogenic Microorganisms

## Oyebode, J. A. and Fajilade, T. O

Department of Science Technology, Microbiology unit, Federal Polytechnic, P.M.B. 5351, Ado-Ekiti, Ekiti State, Nigeria

Abstract- Antibacterial activities of aqueous and ethanolic extracts of Allium cepa (onion bulb) were investigated against Escherichia coli, Salmonella spp., Streptococcus pneumoniae, Shigella spp., and Staphylococcus aureus with the minimum inhibitory concentration (MIC) of 0.2 g/ml by agar dilution technique. The antibacterial potency of the extract as evaluated by broth dilution technique, showed diameter of inhibition zone of 17.08 mm, 0.00 mm, 19.00, 19.00 and 15.0 mm for E. coli, Salmonella spp., S. pneumoniae, Shigella spp., and Staph. aureus respectively at a concentration of 0.2 mg/ml for aqueous extract and diameter of inhibition zone of 23.0 mm, 20.00 mm, 20.00 mm, 21.00 mm and 21.00 mm for E. coli, Salmonella spp., S. pneumoniae, Shigella spp., and Staph. aureus respectively at a concentration of 0.2 mg/ml for ethanolic extract. The result obtained using the ethanol and hot water extract of the plant showed that the local use of medical plant are based on the efficacy of their active principle which can be discovered scientifically; orthodox medical practices can therefore be complemented with traditional practices.

Index Terms- Allium cepa, Aqueous, Ethanolic, Microorganisms

#### I. INTRODUCTION

It is believed that the history of herbal medicine began with the earliest man (Sofowora, 1993). The first written herbal record was in 2800BC and herbal medicine is practiced today in countries around the world. Some of the advantages of herbs over the formulated drugs are that they typically have fewer side effects and may be less safe to use over time. They are inexpensive compared to formulated drugs and they are readily available (Grubben and Denton, 2004).

Allium cepa (Onion) which belongs to the family Alliaceae, is also known as garden onion or bulb onion; it is called Albasa and Alubosa in the indigenous language of Hausa and Yoruba respectively in Nigeria. It is one of the oldest cultivated vegetables in history. It is thought that bulbs from the onion family have been utilized as food source for millennia (Zohary and Hopf, 2000). Above ground, the onion shows only a single vertical shoot, the bulb grows underground and is used for energy storage, leading to the possibility of confusing it with tuber which it is not. The leaves are blush-green and hallow, the bulbs are large, fleshy and firm. The three main varieties of onion are available red, white and purple skinned (Thompson, 1995). Allium cepa are effective against common cold, heart disease, diabetes, osteoporosis, coughs and sore throat. They also act as bacteriostatic; certain chemical compounds believe to be anti-inflammatory, anti-cholesterol, anti-cancer and antioxidant properties such as suercertin are present in onion. They are high in flavonoids which is concentrated on the outer layer of the flesh onions are also high in polyphenols than other allium vegetables (Thompson, 1995).

In a research works also discovered that crude juices of onion and garlic bulbs exert inhibition on the growth of E. coli, Pseudomonas pyocyaneus, Salmonella typhi, Bacillus subtilis, in vitro (Abdou et al., 2001). Also, Nolan et al., (2007) confirmed the sensitivity of certain food-borne bacterial pathogens to Allicin, which is the major component of garlic extracts, including onion (Jeffrey and Herbert, 2003). Nolan et al., (2007) used chemically synthesized and purified Allicin and discovered the inhibitory property of Allicin on Salmonella typhimurium, Shigella dysentariae. All these food-borne pathogens were inhibited by Allicin in a dose-dependent manner. Thus, various medicinal properties have been ascribed to natural herbs. Therefore, since it had been confirmed that the extracts from onion have some inhibitory effects on some foodborne pathogens generally have antimicrobial properties (Purseglove, 2005), it is therefore necessary to confirm the scope of the inhibitory properties of aqueous and ethanolic extracts of onion some microorganisms implicated in various infections such as impetigo contagiosa often caused by Streptococcus pneumoniae (Bruce, 2001), diarrhea caused by E. coli, salmonellosis caused by Salmonella spp., shigellosis caused by Shigella spp., and furuncles and carbuncles caused by Staph. aureus.

#### II. MATERIALS AND METHODS

#### A. Collection of sample plant

Fifty bulbs of the plant sample (*A. cepa*) were purchased at Bisi market in Ado-Ekiti, Nigeria. The plant sample was identified at The Department of Science Technology, Federal Polytechnic Ado-Ekiti and a voucher specimen was kept in the laboratory No: Med Plant 2011/098. The method described by Osho *et al.* (2007) for extraction of plants active components was used. Samples were air-dried at room temperature of  $(26^{\circ}C \pm 1^{\circ}C)$  and milled using a Thomas Willey Milling Machine. 100grams of the milled samples was soaked with 200ml of distilled water, and another 100grams of the milled sample was soaked in another 200ml of ethanol. The aqueous and ethanolic extracts were filtered and evaporated to dryness at 20°C using a rotary evaporator.

B. Extraction of bioactive components from the plant materials

Extraction method described by Ajibade and Famurewa (2011) was employed. Fifty grams (50 g) of the powdered plant materials (*A. cepa*) was poured into different beakers and 500 ml of distilled water and ethanol were poured into each beaker respectively and beaker with distilled water was boiled on electric cooker at 100°C. The contents are stirred using a sterile glass rod and allowed to stand for 72 hours at room temperature ( $25^{\circ}C \pm 1$ ). The contents were filtered through a filter paper (Whatman No. 1) and the filtrate concentrated and evaporated using water-bath at the temperature of +95°C. Extracts are then kept at 20°C prior use.

#### C. Reactivation of organism

The bacteria were re-suspended in 20 test tubes containing Nutrient broth and these test tubes were incubated at  $37^{\circ}C$  for 18 – 20 hours.

## D. Determination of Minimum Inhibitory Concentration (MIC)

This was carried out using the agar dilution method previously described by Odelola and Okorosobo (1996). A colony from each stock were sub-cultured into 5 ml of nutrient broth and incubated at  $37^{\circ}$ C for 18 hours. 0.1ml of the overnight broth of each organism were pipette into 9.9 ml of the broth to yield a  $10^{1}$  dilution. The procedure was continued to obtain a final dilution of  $10^{3}$  (Smith *et al.*, 2000). A 2cm streak of bacterial strains were made on an oven-dried nutrient agar plates containing increasing concentrations (0.2 – 0.8 mg/ml) of the extracts. The lowest concentration that gave no visible growth

after overnight incubation at 37°C was taken as the Minimum Inhibitory Concentration (MIC) of each extract.

#### E. Determination of the Degree of Antibacterial Potency

The disk diffusion method described by Brady and Katz (1990) was employed. Various concentrations of the extracts were prepared in test tubes (0.8 mg/ml – 0.2 mg/ml). Disks obtained from Whatman No. 1 filter paper was sterilized in an oven at  $160^{\circ}$ C for 30 minutes and soaked in the extracts for 24 hours. A loopful of the final dilution ( $10^{3}$ ) of the test bacterial suspension was spread on an oven-dried nutrient agar. The disk of different concentrations of the extracts were placed at equidistance on the agar and incubated at  $37^{\circ}$ C for 24 hours. Zones of inhibition were measured in millimeters (mm) with a meter rule. Whatman No. 1 filter paper disks were placed at the center of each agar plates as a control.

#### III. RESULTS

The tables below show the antibacterial activities of the plants extract against the test organisms. The clear zone observed around the punched plate containing plant extract indicated that the extract prevent the growth or survival of the test organism been used.

The susceptibility of different concentrations of the aqueous and ethanolic extracts on test microorganism is shown in Tables 1 and 2 respectively.

	Diameter of Zones of Inhibition (mm)							
Test organisms	Concentrations (mg/ml)							
	0.20	0.40	0.60	0.80				
E. coli	17.00	21.00	25.00	28.00				
Salmonella spp.	0.00	17.00	17.00	17.00				
Streptococcus pneumoniae	19.00	21.00	24.00	29.00				
<i>Shigella</i> spp.	19.00	26.00	28.00	31.00				
Staphylococcus aureus	15.00	22.00	22.00	25.00				

#### Table 1: Antibacterial activity of aqueous extracts of A. cepa on selected microorganisms

#### Table 2: Antibacterial activity of ethanolic extracts of A. cepa on selected microorganisms

	Diameter of Zones of Inhibition (mm)							
	Concentrations (mg/ml)							
Test organisms								
	0.20	0.40	0.60	0.80				
E. coli	23.00	24.00	25.00	25.00				
Salmonella spp.	20.00	20.00	20.00	22.00				
Streptococcus pneumoniae	20.00	20.00	24.00	25.00				
<i>Shigella</i> spp.	21.00	21.00	22.00	22.00				
Staphylococcus aureus	21.00	22.00	22.00	25.00				

#### IV. DISCUSSION

From the result of this experiment, it was well illustrated that the extract from the plant were active against the test organism. This showed that punched plate method reviewed the antibacterial activities of the plant extracted. The active principles were exclusively extracted with ethanol and distilled water by using the soaking method.

The plant *Alium cepa* showed active potency against highly pathogenic test organism like *Staph. aureus* the causative agents of boil. The micro-organism was inhibited by the plant with the punched plate bioassay techniques used also it showed active potency against *E. coli* which is known to be causative agent of diarrhea, therefore drug develop from the plant would be effective in curing diseases associated with *E. coli*: *Allium cepa* also showed its potency against *Salmonella* spp. which is known to be causative agent of typhoid fever. It could then be said from the result obtained to be effectives in inhibiting the growth of other microorganism used in this experiment.

*Streptococcus pneumoniae* was another pathogenic organism that was used as test organism in this study when the organism spread from nasopharynx to distal loci such as lung, paranasal and ear it causes pneumonia. It is usually found in the blood and sputum and causes disease like arthritis, bronchitis etc. with symptom like cough producing greenish or yellow sputum, high fever, chest pain etc. *Allium cepa* is noted to inhibit this organism.

This plant could then be suggested to be good sources of wide spectrum antibiotic which could therefore be used in the control of these micro-organism from the body where they cause diseases. Antibacterial drugs, which might be made from this part of the plants, would be very effective against the organisms.

#### V. CONCLUSION

The observation reviewed that the extract of the tested part of the plant using punched plate method was active *in vitro* against some pathogens that affect humans which are *Staph. aureus*, *E. coli*, *Shegella* and *Salmonella* spp.

It could therefore be concluded from the result obtained using the ethanol and hot water extract of the plant that the local use of medical plant are based on the efficacy of their active principle which can be discovered scientifically; orthodox medical practices can therefore be complemented with traditional practices.

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#### AUTHORS

**First Author** – Oyebode, J. A, HND, PDG, The Federal Polytechnic, Ado-Ekiti, Nigeria, oyebodemirace@yahoo.com **Second Author** – Fajilade, T. O, HND, PDG, MSc., The Federal Polytechnic, Ado-Ekiti, Nigeria, ollytame@yahoo.com

#### Correspondence Author - Oyebode, J. A,

oyebodemirace@yahoo.com, +2348064407510

# Indian Mutual Fund Market - A Tool to Stabilize Indian Economy

## A Study based on Existing Literature

## **Ratheesh K Nair**

Assistant Professor of Commerce and Management Studies, Department of Commerce and management Studies, Sri. Achuthamenon Government, College,Kuttanalloor .Po, Thrissur (dist), kerala, South India. Research Scholar, University of Kerala.

*Abstract*- This paper focuses on three aspects: (a) Mutual fund a tool to stabilize Indian economy. (b) Review of existing literature with respect of mutual fund performance and (c) Asset management and channelization of scattered savings in the infrastructural development of India. The result shows that mutual fund is a powerful tool and financial product to mobilize scattered savings among investors and channelize these fund to infrastructural development and thereby economic development of the country. The total asset management of mutual fund business is increased from 1079.46 billion rupees to 7014.43 billion rupees from the last ten years. The role of Banks and Financial institution to promote mutual fund business is ever increasing in the market regulated economy in India.

Index Terms- Mutual Funds, Asset Management, Net Resource.

#### I. INTRODUCTION

The overall development of an economy is mainly depends upon the development of financial and economic situation prevailing in that country. The degree of depth and efficiency in the provision of financial services depends on several factors, all of which—along with their respective interactions—must be taken into account when one is looking to understand and measure the degree of financial development. Conceptually, in an index that measures financial development, the various aspects of development can be seen as seven "pillars" grouped into three broad categories. 1. Factors, policies, and institutions: the foundational characteristics that allow the development of financial intermediaries, markets, instruments, and services. 2. Financial intermediaries and markets that provide financial services. 3. Financial access: access by individuals and businesses to different forms of capital and financial services.



According to the Financial Development Report 2011 of the World Economic Forum, India ranks 36 (37 last year)in terms of financial development among 60 countries. While in terms of financial stability, India's rank was 47.The report further says that "India's particular strength lies in its non-banking financial services (5<sup>th</sup>), with Initial Public Offering (IPO) activity(5<sup>th</sup>), Insurance (7<sup>th</sup>) and securitisation (4<sup>th</sup>), and at the same time a low level of financial sector Liberalisation (56<sup>th</sup>) an inability to enforce contracts (57<sup>th</sup>), an underdeveloped infrastructure(56<sup>th</sup>), and a high cost of doing business (55<sup>th</sup>) all contribute to a weak institutional and business environment ranked (54<sup>th</sup>). Weakness in financial acess (47<sup>th</sup>) was a feflaction of indias lack of acess to capital (41<sup>st</sup>).

India ranks  $40^{\text{th}}$  in the 2012 Financial Development Report a four-spot decline from last year among 60 countries. Weak results in the institutional (56<sup>th</sup>) and business environment (55<sup>th</sup>) pillars continue to be driven by an inability to enforce contracts (60<sup>th</sup>), a low degree of financial sector liberalization (58<sup>th</sup>), inadequate infrastructure (58<sup>th</sup>), and a high cost of doing business (56<sup>th</sup>). Although its factors, policies, and institutions are quite weak, India did experience a slight improvement in the financial stability pillar (46<sup>th</sup>). The change was due to score improvements across the currency stability (16<sup>th</sup>) and risk of sovereign debt

crisis (47<sup>th</sup>) sub pillars. India's financial intermediation results are mixed. While India ranks quite high in non-banking financial services (9<sup>th</sup>), banking financial services (45<sup>th</sup>) are an area for improvement. Financial access (45<sup>th</sup>) results are also inconsistent, with India having a development advantage in the commercial access (25<sup>th</sup>) sub pillar but a development disadvantage in the retail access (51<sup>st</sup>) sub pillar.

While comparing these two reports and positions of India among other countries of the world reveals that, general conditions and financial positions and developmental factors of India is low as the results of inefficiency in strong policy decisions, Lack of financial Inclusion and market orientation and political instability. And global financial crisis add turmoil in Indian financial system. The weak areas are really the areas of concern and proper attention for embarking upon the future financial development of the country.

#### II. SIGNIFICANCE OF THE STUDY

Mutual fund is a mechanism by which, the savings of large numbers of small investors are polled together and collective instrument is made with the objective of attractive yield and capital appreciation, holding the safety and liquidity as prime parameters. Generally mutual fund is a tool to make financial investments in the financial instruments or assets of the business sector corporate business sector for mutual benefits of the members.

Mutual funds are managed by asset management companies, ideally a hub of business institutions whom have business qualification and professional insights, who manage the funds and invest in a number of securities and bonds and thereby reducing the risk of investing in a single security. This inherent diversification of portfolio that the investor can achieve by investing ina mutual funds, coupled with attraction of liquidity and transparency has been the factors in a continuous growth of the mutual fund industry all over the world.

In India , SEBI the market regulator defined mutual fund as, "a fund established in the form of a trust by a sponsor , or to raise money by the trustees through the sale of units to the public under one or more schemes or investing in securities or gold related instruments and real estates in accordance with the regulations". This definition does not specifies anything about the liquidity and security of investment portfolios and funds to protect the interest of the investors.

## **Objectives of the Study**

- To evaluate the role of mutual fund business in India to mobilize scattered savings within the country.
- To study the past performance of mutual fund industry in India based on resource mobilisation.

- To analyse the present and future of mutual fund business service based on past performance.
- To evaluate the role of mutual fund as a tool of strengthen the market economy.

#### PRESANT SCENARIO

Financial distress and liquidity crisis are two major problem faced by the present world order. The global financial institutions are facing the problem of distress, the inability to manage funds, sustain liquidity, which ultimately leads to the position of insolvency of the financial institutions like, Banks/ mutual fund Organisations and financial service providers.

## MUTUAL FUNDS IN INDIA

Mutual fund institutions in India largely dealing with the funds in the nature of . Equity Funds, Growth Funds, Mid-Cap Funds, Value Funds, Equity Income Funds, Index Funds, Exchange Traded Funds (ETFs), Sector Specific Funds, Segment Specific Funds, Equity Linked Savings Schemes, Debt Funds, Corporate Bond Funds, Gilt Funds, Floating Rate Schemes (FRFs), Bond Index Funds, Hybrid Funds, Money Market fund Schemes (MMFs), etc..

## INSTITUTIONAL SETUP

In India, the formation and management of mutual fund is well managed by Securities Exchange Board of India (SEBI) and Reserve Bank of India (RBI) and the Central Government (GOI) in order to ensure the interest of investors or beneficiaries.

## STRUCTURE OF MUTUAL FUND ESTABLISHMENT IN INDIA



Three tier structure of mutual fund establishment in India

## **REVIEW OF LITERATURE – PERFORMANCE EVALUATION OF MUTUAL FUND.**

Sharpe (1964) made a significant contribution in the method of evaluating mutual funds. His measure is based on Capital Asset Pricing Model, market condition with the help of risk and return possibilities. Sharpe (1966) developed a theoretical measure known as reward to variability ratio that considers both average return and risk simultaneously in its ambit. Treynor (1965) advocated the use of Beta Coefficient instead of the total risk. He argues that using only naive diversification the unsystematic variability of returns of return of the individual assets in portfolio typically average out of zero. So he considers the measuring a portfolio's return relative to its systematic risk more appropriate.

Jensen (1967) conducted an empirical study of mutual funds in the period 1954-64 for 115 mutual funds. His results indicate that these funds are not able to predict security prices well enough to outperform a buy- the market and hold policy. His study ignores the gross management expenses to be free. There was very little evidence that any individual fund was able to do significantly better than which investors expected from mere random chance.

Jensen (1968) measured the performance as the return in excess of equilibrium return mandated by Capital Asset Pricing Model. Smith and Tito (1969) conducted a study into 38 funds for 1958-67 and published results relating to performance of natural funds (Born, 1983).

Mc Donald (1974) found that on an average, mutual funds perform about as well as native' Buy and Hold strategy. Elton, Grubes and Blake (1996) examined the predictability of stock mutual funds performance based on risk – adjusted future performance .It also demonstrated application of modern portfolio techniques on past data to improve selection, which permitted construction of portfolio funds that significantly outperformed a rale based on the past rank alone. The portfolio so selected was re[ported to have small, but statistically significant, positive risk adjusted return during a period when mutual funds in general had negative risk adjusted return.

Jayadev (1996) papers enlighted performance evaluation based on monthly returns. Study was on the basis of monthly return compared to benchmark returns. Balaramaswamy and Yeung (2003) survey focus on Malasiya, a conjoint analysis was employed to generate the questionnaire and analyse its results. The result point out that three important factors which dominate the choice of mutual funds. These are consistent past performance, Size of funds and cost of transaction. Arrif and Johnson (1990) who found that the performance of the Singapore unit trusts spread around the market performance with approximately half of the funds performing below the market and another half performing below the market and another half performing above the market on risk adjusted basis.

Verma (1990, 1992) a study on mutual fund covers the conceptual and regularity aspect of India Mutual fund with some information task and guidelines to the investors in selection of mutual fund. Volkman and Wohar (1995) extend this analysis to examine factors that impact performance persistence and shows performance persistence is negatively related to size and regularly related to level of management fees.

Carhart (1997) shows that expenses and common factors in stock returns such as beta, market Capitalisation, one-year return momentum, and whether the portfolio is value or growth oriented " almost completely" explain short term persistence risk-adjusted –return.

Detzel and Weigand (1998) use a regression residual technique to control for the effect of investment style, size and expense ratios. They find, after controlling for these factors, no evidence of performance persistence.

Shankar (2008) find that the mutual fund industry is mostly caused by over-reaction of regulatory authorities. Non-equity assets under management were about 4,00,000 crores in April,2008 declined to 2,50,000 crores in October-2008. This may due to environmental issues caused by events outside India.

## EMPIRICAL ANALYSIS NET RESOURCES MOBILISED BY BANK-SPONSORED AND FI-SPONSORED MUTUAL FUNDS

Table-I

(Rs: Billion)

YEAR	BANK-SPONSORED						FI-SPONSORED			TOTAL
	SBI MF	Canara Robeco MF	Indiab Bank MF	BOI MF	PNB MF	Baroda Pioneer MF	GIC MF	LIC MF	IDBI MF	
1991-92	5.25	12.68	1.27	0.73	1.47	-	1.98	2.30	-	25.68
1992-93	10.41	0.16	1.17	0.05	0.25	-	3.71	3.89	-	19.64
1993-94	1.05	0.43	-	-	-	-	2.27	0.11	-	3.86
1994-95	2.18	2.06	0.94	0.54	1.56	0.38	3.20	0.69	1.87	13.42
1995-96	0.76	0.03	-	-	0.10	0.24	0.65	1.17	0.53	3.48
1996-97	0.03	0.02	-	-	-	0.02	-0.32	1.69	-	1.44
1997-98	1.90	0.47	-	-	-	-	-0.19	1.00	1.23	4.41
1998-99	-0.72	-0.17	-	-	-	-	-0.12	3.48	2.11	4.58
1999-00	6.59	-3.61	-	-	0.40	-0.02	-2.68	2.85	2.79	6.32
2000-01	2.52	-0.05	-	-	0.02	-	-0.43	5.66	7.50	15.22
2001-02	6.14	1.40	-	-	0.50	0.59	-0.56	6.40	-1.78	12.69
2002-03	6.86	2.37	-	-	0.14	0.96	-0.97	5.78	3.80	18.94
2003-04	19.27	4.95	-	-	18.41	2.63	-1.47	9.34	-	53.13
2004-05	10.24	-0.11	-	-	-	-3.07	-0.33	-33.51	-	-26.78
2005-06	52.80	0.56	-	-	-	0.29	-	21.12	-	74.77
2006-07	32.08	-0.96	-	-	-	-0.79	-	42.26	-	72.59
2007-08	73.39	2.95	-	-	-	-0.38	-	21.78	-	97.74
2008-09	26.17	13.17	-	-	-	5.56	-	59.54	-	104.44

2009-10	54.37	31.30	-	-	-	12.88	-	48.71	-	147.26
2010-11	42.42	-24.17	-	-	-	-5.20	-	-169.88	-	-156.83
2011-12	4.22	-3.64	-	-	-	3.31	-	-30.98	-	-27.09
2012-13	44.99	-0.46	-	-	-	13.77	-	13.12	-	71.42

Table 1, shows that, the net resources mobilised by Bank and Financial Institution sponsored mutual funds in India. During 1991 to 92 the Net resources mobilised by both Banks and other financial institutions through mutual fund was only rupees 25.68 billion. In the year 2004-05 shows a negative trend in the net resource mobilisation by both sectors.2010-2011 shows a decline of Rs:156.83billion the huge loss incurred in that year was on LIC sponsored mutual fund. Only State Bank of India mutual fund was better performing among all mutual funds during 2010-11 period. From the last twenty years growth of mutual fund business and resource mobilisation in India through banks and financial institutions depicts a clear picture about the

sector and express the direct relations and growth of mutual fund industry and the impact of general economic conditions of the country and the global economic conditions and slowdowns. Six mutual fund institutions viz. Indian Band Mutual fund, Bank of India Mutual Fund, Punjab National Bank Mutual Fund,General Insurance company Mutual Fund, Industrial Development Bank of India Mutual Fund, have shown a negative market intervention and resource mobilisation. In the public sector mutual fund shows a total decline of Rs:210.70 billion in the last 20 years. Life Insurance Corporation of India score the first place among the public sector mutual fund industry in India.

Year (end-March)	Amount
1	2
2000	1079.46
2001	905.87
2002	1005.94
2003	1092.99
2004	1396.16
2005	1496.00
2006	2318.62
2007	3262.92
2008	5051.52
2009	4173.00
2010	6139.79
2011	5922.50
2012	5872.17
2013	7014.43

Table IIASSETS UNDER MANAGEMENT OF MUTUAL FUNDS(Rs: in Billion)





The mutual fund business, services, asset under management during the last decades and percentage change and the growth in the sector shows dramatic change and development. The last ten plus years was the booming period of mutual fund business in India. From the analysis it is evident that the future of mutual fund business in India as brighter as ever.Indian mutual funds are playing a vital role in the resource mobilisation from small and medium investors. The trend shows the positive growth and increasing tendency of assets management under mutual fund business in India. The total asset management of Mutual fund business in India during the year of 2013 was rupees 7014.43 billion.

### Growth of mutual funds in India

Mutual funds are the important constituent of the capital market in developed countries. Now the modern world witness a change that the developing countries like India, China, Brazil, And Russia becoming a an investment friendly countries by various financial instruments especially mutual fund instrument, that constitute a dominant role in the short term market instruments. The recent trend in the money market in India shows that the mutual fund became one of the important money market instruments ever. The mutual fund market plays a vary important role in the economic, financial and social development of our country by channelizing the scattered saving from the middle income group and small investors to the overall development of India. But at the same time there is some negative voices arising due to the selection of portfolios, asset management, and investment decisions.

The overall country's economic and financial growth shows a good future of mutual funds in india. It is proved that the countries savings rate and investment activities in financial assets risen especially in the case of mutual funds. The share of mutual funds ( net resources) in gross domestic savings (GDS) was 5.78% in 1990-91. It increased to 8.08% in 2007-08. The global financial crisis during 2009-10 was a big blow in the mutual fund market in India and witnessed a sharp decline to 3.56%.

The mutual funds share in gross household savings (GHS) increased from 7.17% in 1991-92 to 13.26% in 2007-08. The past data and positive figures show a better future to the mutual fund market in India.
## NET RESOURCES MOBILISED BY MUTUAL FUNDS

(Rs: in Billion)

Year	UTI	Bank sponsored mutual funds	FI-sponsored Mutual funds	Private sector Mutual funds	Total (2 to 5)
1	2	3	4	5	6
		1	1		
1973-74	0.31	-	-	-	0.31
1974-75	0.17	-	-	-	0.17
1975-76	0.29	-	-	-	0.29
1976-77	0.35	-	-	-	0.35
1977-78	0.73	-	-	-	0.73
1978-79	1.02	-	-	-	1.02
1999-80	0.58	-	-	-	0.58
1980-81	0.52	-	-	-	0.52
1981-82	1.57	-	-	-	1.57
1982-83	1.67	-	-	-	1.67
1983-84	3.30	-	-	-	3.30
1984-85	7.56	-	-	-	7.56
1985-86	8.92	-	-	-	8.92
1986-87	12.61	-	-	-	12.61
1987-88	20.59	2.50	-	-	23.09
1988-89	38.55	3.20	-	-	41.75
1989-90	55.84	8.89	3.15	-	67.88
1990-91	45.53	23.52	6.04	-	75.09
1991-92	86.85	21.40	4.28	-	112.53
1992-93	110.57	12.04	7.60	-	130.21
1993-94	92.97	1.48	2.38	15.60	112.43
1994-95	86.11	7.66	5.76	13.22	112.75
1995-96	-63.14	1.13	2.35	1.33	-58.33
1996-97	-30.43	0.07	1.37	8.64	-20.35
1997-98	28.75	2.37	2.04	7.49	40.65
1998-99	1.70	-0.89	5.47	20.67	26.95
1999-00	45.48	3.30	2.96	169.38	221.18
2000-01	3.22	2.49	12.73	92.92	111.36
2001-02	-72.84	8.63	4.06	101.34	101.19
2002-03	-94.34	10.33	8.61	121.22	45.82
2003-04	10.50	45.26	/.8/	415.10	4/8./3
2004-05	-24.67	7.06	-33.84	79.33	27.88
2005-06	34.24	53.65	21.12	415.81	524.82
2006-07	/3.26	30.33	42.26	/94.//	940.62
2007-08	106.78	/5.9/	21.78	1382.24	1586.77
2008-09	-41.12	44.89	59.54	-305.38	-242.08
2009-10	156.53	98.55	48./1	4/9.68	/83.4/
2010-11	-166.36	13.04	-169.88	-162.81	-486.00
2011-12	-31.79	3.89	-30.98	-395.25	-454.13
2012-13	46.29	58.30	13.12	707.53	825.24

The data released by SEBI and RBI and Central Statistical Organisation shows that the resource mobilised through mutual funds by Unit Trust of India, Bank-Sponsored mutual funds, Financial Institution Sponsored mutual fund and private Sector mutual funds increased from 0.31 billion rupees from the year 1973 to 825.24 billion up to 2013. This evidences that mutual fund is a better financial product or tool to mobilise scattered savings and there by motivate the economy and infrastructural development of the country.

Table 3 shows that, the net resource mobilised by Banks, Financial Institutions and private Sector mutual funds in the last 40 years. At the early stage of mutual fund business in India witnessed a developmental trend with gradual growth and inclusion of more and more market players. At the early stage of development the unit Trust of India was the only institutions in the mutual fund market. From the period of 1973 to 1979 UTI dominated the mutual Fund industry. Banks and other market players entering only in the period of 1987.

#### III. CONCLUSION

This paper focuses on three aspects: (a) Mutual fund a tool to stabilise Indian economy. (b) Review of existing literature with respect of mutual fund performance and (c) Asset management and channelization of scattered savings in the infrastructural development of India. The result shows that mutual fund is a powerful tool and financial product to mobilise scattered savings among investors and channelize these fund to infrastructural development and thereby economic development of the country. The total asset management of mutual fund business is increased from 1079.46 billion rupees to 7014.43 billion rupees from the last ten years. The role of Banks and Financial institution to promote mutual fund business is ever increasing in the market regulated economy in India.

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### AUTHORS

**First Author** – Ratheesh K Nair, Assistant Professor of Commerce and Management Studies, Department of Commerce and management Studies, Sri. Achuthamenon Government, College,Kuttanalloor .Po, Thrissur (dist), kerala, South India. Research Scholar, University of Kerala., and Email ID: rateeshknairkollam@gmail.com

## Modality of Treatment for the Distal End Radius Fracture

## Dr Bhuvnesh Chaturvedi, Dr Sk Irfan Ali, Dr Sumit Krishna

Abstract- Fracture of the distal end of radius is one of the most common fractures. It occurs in middle aged and elderly women commonly. It also occurs in young men with high velocity, injury. With increase in longevity and activity in middle aged to elderly population, there is increase in number of this fractures various surgical interventions are available presently, like percutaneous pinning, intra focal pinning, external fixator and plate fixation.

## **Methods and Materials:**

30 Patients who have sustained fractures of the distal radius admitted in the department of orthopaedics at M.V.J. Medical College & Research Hospital from July 2011 to July 2013 Inclusion criteria 1) Adults between age group of 20 years to 60 years with fracture lower end of radius 2) All patients having isolated Distal end radius fracture Exclusion criteria 1) Distal radius fracture associated with other injuries around the wrist joint .2) Open Fracture.3) Pathological Fracture .4) Distal radius Fracture associated with neurovascular complications **Results:** 

The assessment of functional outcome was made according to modified clinical system of Green and O'Brien 1978 and Brad way et al 1989 Overall results were graded as acceptable (excellent and good), fair or poor. In our study, 6 patients had full range of movements, no pain, returned to previous job and had 100% strength to that of normal side and the results were considered as excellent. Another 3 patients had full range of movements as compared to that of opposite side with mild pain not affecting the function of wrist. They also scored more than 90% and the results were considered as excellent. There was 9 case of Excellent, 14 cases of Good, 5 cases of Fair and 2 cases showed poor Result.14 patients had limitation of movements of wrist and forearm by 20% and decreased hand strength by 15-20% as compared to that of normal side, but they did not have pain. The function of hand was not affected and they continued their previous profession. They scored 80% and the result was considered as good.

Five patients had limitation of movements of wrist and forearms by 25% as compared to that of normal side, with mild pain, unable to lift heavy weights and their hand grip strength was also decreased by 20 to 25 % as compared to that of normal side. They scored between 65 - 79% and the results were considered as fair. Two patients had moderate pain, which subsiding with analgesics. They were unable to do heavy manual work, but could carry out daily activities. They had Restriction of wrist movements by 50% as compared to that of normal side. They scored less than 65% and the result was considered as poor.

From the present study on 30 patients with distal end radius fractures after analyzing the observation and looking at the results we conclude the following. Fracture of distal end of radius is having a bimodal age distribution in our study we find young individual between 21-30yrs mostly male sustain road traffic accident as a common mode of injury. Right side was affected more than the left side. Restoration of anatomy of distal end of radius, early mobilization and less complication were achieved using Platting .Platting is a better method of treatment for fracture of the distal end of radius

### I. INTRODUCTION

Fracture of the distal end of radius is one of the most common fractures. It occurs in middle fractures. It occurs in middle aged and elderly women commonly. It also occurs in young men with high velocity injury .With increase in longevity and activity in middle aged to elderly population, there is increase in number of this fractures.

Patients with fracture distal end of radius have many complications more frequently are generally appreciated and Failure in management may cause Permanent disability. Distal radius fractures crush the mechanical foundation of the man's most elegant tool, the hand and the grip.

Pain and disability have resulted due to subsequent malunion of unstable fracture of distal radius which were managed by conservative method like plaster cast alone.

Recently surgical management has been widely recommended and performed to prevent disability. Several studies has shown convincingly that functional outcome is good when the anatomy is restored by obtaining good reduction of fracture fragments, maintaining the angulations of the articular surface of radius and radial Length.

Various surgical interventions are available presently, like percutaneous pinning, intra focal pinning, external fixator and plate fixation. External fixator may be performed in a bridging technique and a non bridging technique. Bridging external fixator allows distraction across the radio carpal joint.

The present study "A Comparative study of management of the fracture of the distal end radius by external fixator Vs plating" was undertaken in department of Orthopaedics at M.V.J.M.C & R.H to study fracture healing & functional outcome in distal radius fracture following external fixation & platting.

## II. ANATOMY OF THE WRIST

#### SURFACE ANATOMY

The surface anatomy of the wrist offers many clues to the features of the underlying structures and their inter relationships.

**Conclusion:** 

## Posterior aspect

The skin of the posterior aspect of the wrist is thicker and more mobile than the anterior skin and is covered by short hairs, which are more numerous on the ulnar side than the radial side. The dorso radial flares of the radial metaphysis and the ulnar head forms prominent features that are visible and palpated over proximal part of dorsal aspect of wrist. Just distal to the course of the out-cropping tendons Extensor pollicis brevis (EPB), abductor pollicis longus, Extensor carpi radialis longus (ECRL) and Extensor carpi radialis brevis (ECRB) muscles can be palpated. Between the second and third extensor compartment is a bony prominence called Listers' tubercle, which behaves as a pulley for the tendon of extensor pollicis longus (EPL) and also serves as a critical landmark because it marks one's orientation to the scapholunate joint and the interfacet prominence of the distal radius.

## **Anterior Aspect**

This area is covered by thin, practically hairless skin, which is rather adherent to the underlying fascia and has limited mobility, especially distally. The fascia about the wrist and the distal radius begins in the forearm as ante brachial fascia and becomes thick distally as it coalesces with deeper fascia to form the flexor retinaculum and transverse carpal ligament. These tendinous longitudinal protrusions are the limits of grooves on the lateral and the medial sides where the radial and the ulnar artery can be palpated. The central protrusion corresponds to the flexor tendons parallel to the median nerve, lateral to the Flexor Carpi Radialis (FCR) tendon and the medial to the Flexor Carpi Ulnaris (FCU). Three transverse skin creases proximal, middle, and distal correspond respectively to the ulnar head, the radio carpal joint and the mid carpal joint.

## Radial aspect

The hallmark of the radial surface of the wrist is the "anatomical snuff box". It is the region between the EPL and EPB tendons and it is made most pronounced by extending and abducting the thumb. Radial styloid process can be palpated at the proximal part and the waist and distal pole of the scaphoid at the distal part of this region. The radial artery, if patent, can be traced through the anatomical snuff box as it courses dorsally. The branches of superficial radial nerve can be palpated through this region coursing in a distal direction.

#### **Ulnar Aspect**

Analogous to the anatomical snuff box an "ulnar snuff box" can be imagined in the interval between the tendons of ECU and FCU muscles on the ulnar surface of the wrist. The ulnar styloid process is palpable within the ulnar snuff box when forearm is in neutral position.

## The Bones of forearm The distal end of radius

The widest part, it is four sided in section. Its lateral surface is slightly rough projecting distally as a styloid process palpable when tendons around it are slack. Distal is the smooth carpal articular surface, divided by a ridge into medial and lateral areas. The medial is quadrangular and the lateral is triangular and curving on the styloid process. The anterior surface is a thick prominent ridge palpable even though over lying tendons, 2cms proximal to the thenar eminence. The medial surface is the ulnar notch, smooth, anteroposteriorly concave for the articulation with the ulna's head. The posterior surface displays a palpable dorsal tubercle limited medially by an oblique grove and in line with the cleft between the index and the middle fingers. A wide shallow grove lateral to it is divided by a faint vertical ridge.

## III. CLASSIFICATION OF DISTAL RADIUS FRACTURES

The presentation of a classification of fractures of the distal radius must begin with an initial recognition of the different common types of fractures. Colle's' fracture is the most common.

(1) Colle's fracture: It is a distal metaphyseal fracture of distal radius, which occurs within 2 cm of the articular surface and may extend into the distal radio-carpal or radio-ulnar joints. Dorsal angulation (silver fork deformity), dorsal displacement, radial angulation and radial shortening are present. There is often an accompanying fracture of the ulnar styloid, which may signify avulsion of the TFC insertion.

(2) Smith's fracture or reverse colle's' fracture: It is a palmer angulated fracture of the distal radius with a "Garden spade" deformity. The hand and wrist are displaced forward or palmarly with respect to the forearm. The fracture may be extraarticular or intra-articular, or part of a fracture-dislocation of the wrist. Smith fractures are classified as modified Thomas classification into three types as follows.

(3) Barton's fracture is actually a fracture-dislocation or subluxations in which the rim of the distal radius, dorsally or palmarly, is displaced with the hand and carpus

(4) Pouteau fracture: In 1783 Pouteau of France first described the fractures of distal radius.

## I. Radiological appearance or fracture displacement direction

- 1. AO classification
- 2. Sarmiento classification
- 3. Linstrom classification

## II. The mechanism of injury

- 1. Castainign classification
- 2. Fernandez classification
- 3. Linscheid classification

## III. Articular joint surface involvement

- 1. Myo classification
- 2. McMurtry and Jupiter classification
- 3. Melone classification

### **IV. Degree of comminution**

- 1. Gartland and Werley classification
- 2. Jenkins classification
- 3. The Older classification

## V. Bone calcification and resistance

1. Sennwald and Segmuller classification

# VI. More recent classifications tend to provide therapeutic options and prognosis to prevent redisplacement and malunions.

1. Cooney's classification

2. Mathoulin, Letrosue and Saffar classification

## The Frykman's Classification

It is now used to recognize the intra-articular distal radius fracture that we identify as the Frykman fracture to separate it from the colles' and smith fractures.

## **AO classification**

There are three AO categories:

1) 'Extra-articular' fractures which do not involve the radiocarpal joint surface at all.

2) 'Partial articular' fractures which involve this joint, but a portion of the articular surface remains in continuity with the diaphysis.

3) 'Complete articular' fractures which are distinguished by complete separation of the involved articular surface and the diaphysis



IV. TREATMENT OF THE DISTAL RADIUS FRACTURES

**Percutaneous Direct Pinning** 

An early technique, in fact, one of the first used for fixation of distal radius fractures, was percutaneous pinning, usually entering at the level of the radial styloid Process. Some variations in the point of penetration and the direction of the pins were presented, but the aim was always to fix the mobile fragment to the opposite cortex proximal to the fracture. This type of pinning cannot prevent re displacement of certain fragments, and this is particularly true of intra-articular and osteoporotic fractures. Direct pinning of the fragments, especially the posterior medial fragment (which can involve DRUJ), through the distal ulna, adds stability to the structure.

## **External Fixation**

This technique was proposed for comminuted fractures, and it has improved the reduction of comminuted intra-articular fractures. Ligamentotaxis can exert influence on fragments in which capsule ligamentous attachments are still intact. The traction is exerted mainly by the strong volar ligament plane on the anterior rim of the distal radius. The dorsal tilt may not be completely reduced because dorsal ligaments are thinner and in a transverse plane.

## **Plate Fixation**

This is indicated in fractures with volar displacement, such as Barton's and Smith's fractures and in selected cases of dorsal displacement where rigid fixation can provide for early wrist motion. Plate fixation can provide either a buttress effect or hold the distal epiphysis by cortico cancellous screws. The pre molded plates reproducing the distal curvature of the radius are best, as they give an anatomic reduction. The disadvantage of this technique is difficulty in screw placement if the fracture is severely comminuted and number of soft tissue complications have been noted.

## COMPLICATIONS OFTHE DISTAL RADIUS FRACTURES

- 1. Distal radioulnar subluxations, dislocation.
- 2. Depressed major articular components
- 3. Difficult reduction; unstable reduction maintained only by extreme position.
- 4. Median or ulnar nerve stretch, contusion or compression.
- 5. Acute carpal tunnel syndrome.
- 6. Tendon damage.
- 7. Peripheral nerve injury in external fixation errors.
- 8. Post-reduction swelling, compartment syndrome.
- 9. Carpal tunnel syndrome.
- 10. Associated carpal injury.
- 11. Radial nerve Dysaesthesias.
- 12. Pain dysfunction syndrome

## V. MATERIALS AND METHODS

## Source of Data

30 Patients who have sustained fractures of the distal radius admitted in the department of orthopaedics at M.V.J. Medical College & Research Hospital from July 2011 to July 2013.

## Method of Collection of Data

Inclusion criteria

1) Adults between age group of 20 years to 60 years with fracture lower end of radius

2) All patients having isolated Distal end radius fracture

## **Exclusion criteria**

1) Distal radius fracture associated with other injuries around the wrist joint

- 2) Open Fracture
- 3) Pathological Fracture

4) Distal radius Fracture associated with neurovascular complications

Sample size: 30 cases (15External fixator and 15 Plating)Sample Procedure: a prospective study

## Methods

Patients with distal end radius fractures admitted in MVJ hospital after meeting the inclusion and exclusion criteria were taken up. All patients were evaluated preoperatively by clinical and roentgen graphic examination. Systemic, hematological investigations, chest X-ray and assessment of cardiac status using ECG were done as a routine and pre anesthesia evaluation done. Preoperatively patients were immobilized with POP or splints. Patients were informed about the operative procedure and consent taken.

## Selection of patients:

1. Patients were randomly selected for external fixator or platting

## **External Fixator**

The Joshi type of External fixator was used in our study. This fixator consists of, distractor bar attachment with the schanz pins (screws). In our series, the joshi type of External fixator was applied in all the cases. We have used two 3mm schanz screws for radius and two 2.5 mm schanz screws for the second metacarpal, and 4 mm connecting rods.

## **Instruments Used for the Procedure**

- 1. External fixator set
- 2. Spanner No 7&8
- 3. Drill-bits
- 4. Electric drill & hand drill
- 5. T handle
- 6. Scalpel blade
- 7. Image intensifier

## Surgical Technique (EXTERNAL FIXATOR)

Under regional block Anesthesia (Brachial block) or GA depending upon anesthesiologist preference, patient was placed supine on the operating table. The forearm and hand were scrubbed with Betadine and saline. The tourniquet was applied over the arm. The forearm and hand were painted with Betadine and draped. The operating forearm was placed on a radiolucent arm-board. Closed reduction was done under C-arm.

In this technique , 5mm incision for 4 shanz pins, 2 in the middle third of the radius on the dorso lateral aspect about 10-

12cm from distal end and 2-3cm apart. We have done soft tissue dissection using a hemostat, care taken to avoid injury to radial nerve. Another 2 incision over the base of the second metacarpal on dorso lateral aspect about 1-2cm apart were done, 3mm shanz pin were inserted in the radius, and 2.5mm shanz pins was introduced in second metacarpal, then with fixator pins securely in place, clamps and external fixator rod were mounted to shanz pin. The clamps were loosened and longitudinal traction was given with manual molding of the fracture fragments back into a more normal alignment and gentle flexion and ulnar deviation was maintained. The reduction was confirmed through image intensifier and then external fixation device was locked into place. The tension across the wrist generated by the external fixator device which provides enough ligamentotaxis was confirmed by image intensifier wherein, radiocarpal articulation was seen to be 1 mm wider than the midcarpal joint in A-P projection.

## SURGICAL TECHNIQUE (PLATTING) INSTRUMENTS USED:

Ellis Buttress plate or locking compression plate of varying length

2.5mm drill bit and 3.5mm drill sleeve system.

3.5mm LCP drill bit and sleeve system.

Hand drill and power drill.

Tap for 3.5mm cortical screws and 3.5mm depth gauge.

Hexagonal screw driver for 3.5mm cortical screws and locking screw driver.

Other instrument like retractors, periosteal elevator, reduction clamps, bone lever.

Pneumatic tourniquet.

## **Postoperative Care and Rehabilitation**

The check X-rays were taken in both A-P and Lateral views. The reduction of the fracture was confirmed and amount of distraction was also studied by radio carpal joint space in A-P view, which should be 1 mm wider than the midcarpal joint space.

Active exercises of fingers, thumb, elbow, forearm and shoulder were commenced from the day 1 of operation. On the 3rd post operative day the dressing was removed. The pins were cleaned in external fixator and small dressing done applied in platting case. Patient was discharged after the 3rd day with an advice to clean the pins alternate days and was reviewed after 1 week followed by fortnightly. The patient was followed up after 2 weeks, 4 wks, 6wks, 8 wks and 12 wks. On demonstration of the radiological union, the external fixator was removed after 5-7 weeks (average 6 weeks) and physiotherapy of the wrist was commenced. A removable splint for forearm was applied during night time and was removed during day time for physiotherapy for another 2 weeks and wrist and finger exercises were taught to continue at home.

The follow up period was ranging from minimum 3 months to a maximum of 24 month (Average 9 months). During the follow up, all the patients were observed for any possible complication. Each patient was evaluated for functional recovery at the end of three months and also at the latest follow up visit up by clinical and radiological examination.

## VI. OBSERVATION AND ANALYSIS

AGE GROUP	EXTERNAL FIXATOR	PLATING
21-30	13	10
31-40	1	4
41-50	1	1
TOTAL	15	15

## Table 1: Age Distribution



The commonest age group was between 21-30 years of the age (P=0.1534) [NOT SIGNIFICANT]

SEX	EX FIXATOR	PLATTING
MALE	9	8
FEMALE	6	7
TOTAL	15	15





Male patient are affected more as compare to the women's patients (P=0.7125) [NOT SIGNIFICANT]

## Table 3: Mode of injury

MODE OF INJURY	EXTERNAL FIXATOR	PLATING
RTA	11	7
FALL	2	5
FALL FROM HEIGHT	2	3
TOTAL	15	15



Road traffic accident was the most common mode of injury in both the type (P=0.3050) [NOT SIGNIFICANT]

SIDE AFFECTED	EX FIXATOR	PLATTING
RIGHT	9	13
LEFT	6	2
TOTAL	15	15





Right side is more common site of the injury in both the series (P=0.0986) [NOT SIGNIFICANT]

TYPE OF	EX FIXATOR	PLATING
FRACTURE		
CLOSED	5	11
OPEN	10	4
TOTAL	15	15

## Table 5: TYPE OF FRACTURE



More number of the open type fractures was noted in case of the external fixator (P=0.0281) [SIGNIFICANT]

CLASSIFICATION	EX FIXATOR	PLATING
A2	1	4
A3	5	3
B2	3	2
B3	0	0
C2	3	4
C3	3	2
TOTAL	15	15

## Table 6: AO CLASSIFICATION



A3 was the commonest type of the fracture noted in the series (P=0.5845) [NOT SIGNIFICANT]

RESULTS	EX FIXATOR	PLATTING
EXCELLENT	4	5
GOOD	7	7
FAIR	3	2
POOR	1	1
TOTAL	15	15

## Table 7: RESULTS



Platting shows better results as compared to the external fixator (P=0.9579) [NOT SIGNIFICANT]



Extension



Radial Deviation



Pronation



Flexion



Ulnar Deviation



Supination



Flexion



Supination

Extension



**Radial Deviation** 

Pronation



**Ulnar** Deviation



## CASE NO.1 (EX FIX)



Pre-op



Post-op



After 6 weeks



After 3 months

## CASE NO.5 (EX FIX)



Pre-op



Post-op



After 3 months



After 6 months





Pre-op



Post-op



After 6 weeks



After 3 months



After 12 months

## VII. RESULTS

The assessment of functional outcome was made according to modified clinical system of Green and O'Brien 1978 and Brad way et al 1989.

This modified score includes independent scores for motion, strength, pain, and activity level, which can be objectively graded as per the table below. To achieve an excellent result full range motion of wrist and forearm, strength, function of hand and comfort must be present.

Category	Score	Findings
Pain	25	None
	20	Mild
	15	Moderate (medication required)
	00	Severe (requires narcotics)
Function	25	same job
	20	Different job
	15	Able, no job
	00	Unable
Motion	25	100%
	15	75-99%
	10	50-74% of normal side
	5	25-49%
	00	0-24%
Strength	25	100%
	15	75-99%
	10	50-74% of normal side
	5	25-49%
	00	0-24%

## Table 8: The Modified Green- O'Brein clinical scoring system.

Scoring	:	Excellent	:	90-100%
Good	:	80-89%		
Fair	:	65-79%		
Poor	:	<65%		

Overall results were graded as acceptable (excellent and good), fair or poor. In our study, six patients had full range of movements, no pain, returned to previous job and had 100% strength to that of normal side and the results were considered as excellent. Another three patients had full range of movements as compared to that of opposite side with mild pain not affecting the function of wrist. They also scored more than 90% and the results were considered as excellent. There was 9 case of Excellent, 14 cases of Good, 5 cases of Fair and 2 cases showed poor Result.

Exceller	nt	: 9 [5- Plating & 4- Ext Fixator] cases (30.2%)
Good	:	14 [7- Plating & 7- Ext Fixator] cases (46.66%)
Fair	:	5 [2- Plating & 3- Ext Fixator] cases (16.66%)
Poor	:	2 [1- Plating & 1- Ext Fixator] cases ( 6.66%)

## Third Author – Dr Sumit Krishna

#### VIII. CONCLUSION

From the present study on 30 patients with distal end radius fractures after analyzing the observation and looking at the results we conclude the following.

Fracture of distal end of radius is having a bimodal age distribution in our study we find young individual between 21-30yrs mostly male sustain road traffic accident as a common mode of injury. Right side was affected more than the left side. Restoration of anatomy of distal end of radius, early mobilization and less complication were achieved using Platting

Platting is a better method of treatment for fracture of the distal end of radius.

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#### AUTHORS

First Author – Dr Bhuvnesh Chaturvedi Second Author – Dr Sk Irfan Ali

## Changes of Sugar and Starch Levels in Ambient Stored Potato Derived from TPS

## Apurbo Bhattacharjee<sup>1</sup>, Tuhin Suvra Roy<sup>1</sup>, Md. Nazmul Haque<sup>1</sup>, Md. Ashraful Islam Pulok<sup>2</sup> and Md. Mahfuzar Rahman<sup>1</sup>

<sup>1</sup>Department of Agronomy, Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh. <sup>2</sup> Seed Technology Discipline, Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh.

Abstract- The experiment was conducted at the Laboratory of Agronomy Department, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during March to August 2013 to study the influence of variety and date of harvesting on changes of sugar and starch levels of potato derived from TPS at ambient storage condition. Potato variety and time of harvest had significant effect on nutritional aspects. Reducing sugar, total sugar increased with advancing storage period, whereas specific gravity, non-reducing sugar and starch content decreased with increasing storage period. Among the varieties HPS 364/67 was the best in respect of nutritional aspects. At harvest and 100 days after storage, the highest total sugar (0.61% and 0.82%) was observed from Lady Rosetta and harvest at 110 days after planting, while the lowest total sugar from HPS-364/67 and harvest at 80 days after planting. The results revealed that HPS 364/67 showed superior nutritional quality than other varieties when harvested at 100 days after planting.

*Index Terms*- TPS, sugar, starch, specific gravity and ambient condition

### I. INTRODUCTION

**D**otato (Solanum tuberosum L.) is one of the most important Vegetable crops of the world (Solomon and Barker, 2001). It is consumed almost absolutely as a vegetable in Bangladesh. It contributes as much as 55% of the total vegetable demand in Bangladesh (BBS, 2011). Potato is not only a vegetable crop but also an alternative food crop against rice and wheat. Potato is a rich crop of nutrient substances so it is consumed in very large quantities. Each 100 g of potato tuber contains 79.8 g water, 76 calories, 2.1 g protein, 0.1 g lipids, 17.1 g carbohydrates, 0.5 g fibers and 0.9 g ash as well as it contains a little quantity of nutrient elements and some vitamins(C and B). It contains 0.1 mg thiamin, 0.4 mg Riboflavin, 1.5 mg Niyasin and 20 mg Ascorbic acid (Hassan, 2003). Potato is a highly nutritious, mild flavored, easy to blend food that has possibilities for "building in" desired nutrients (Arvanitoyannis et al., 2008). True Potato Seeds (TPS) is sexual seed of potato crop, which is produced through open pollination as well as artificial pollination for producing hybrid seeds in between two known parents as male and female. Recently, the use of TPS for the production of high quality seed potatoes has been well established as an acceptable technology instead of tuber seeds in many countries including Bangladesh. The use of TPS for potato production has increased recently in Europe, North America and Asia, especially in the

developing countries (Burton, 1989; Devaux, 1984; Wiersema and Cabello, 1987). This is due to low transmission of disease, high multiplication rate and good tuber yield (Siddique and Rashid, 2000). In Bangladesh, this technology has been highly promising (Renia and Hest. 1998; Roy et al., 1999; Siddique and Rashid, 2000). However, knowledge on TPS progenies and appropriate harvesting period for keeping quality under storage condition is not sufficient in our country. But the information of the ambient storage and its mechanism is of great importance for the selection of TPS progenies having good keeping quality. Knowledge of proper storage environment obviously helps to maintain the quality, extend the storage period and increases the value of stored potato. In Bangladesh, the use of TPS for potato production has increased recently but very few reports are available regarding different TPS variety and their lifting period which can play an important role on natural storage of potato. The purpose of the present research is to provide the information on lifting period for different TPS variety under natural storage condition to meet the produced demand. In the context of the mentioned above situation the present piece of research work was carried out to study the quality assessment of some TPS variety and non-TPS cultivar under natural storage condition.

### II. MATERIALS AND METHODS

The experiment was conducted at the Laboratory of the Department of Agronomy, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh. It was located in  $24.09^{\circ}$ N latitude and  $90.26^{\circ}$ E longitudes during the period from March to August 2013 to study the influence of variety and date of harvesting on changes of sugar and starch levels of potato derived from TPS at ambient storage condition.

The temperature and relative humidity of the storage room were recorded daily basis during the study period with a digital thermo hygrometer (TERMO, TFA, Germany). The minimum and maximum temperature during the study period of the storage room was  $26.4^{\circ}$ C to  $33.6^{\circ}$ C, respectively. The minimum and maximum relative humidity was 54% and 83%, respectively.

The tubers used for the experiment were BARI TPS-1, BARI TPS-2, HPS-364/67 and Lady Rosetta, and were collected at harvest from Sher-e-Bangla Agricultural University farm using uniform cultural practices. The collected tubers were free of any visible defects, disease symptoms and insect infestations and transported to the Laboratory with careful handling to avoid disease and injury. Tubers were randomly selected after harvest from the experimental field and placed on the floor of the

Laboratory at natural condition to find out the better harvesting period as affected by different variety/genotypes under quality observation. The potatoes were harvested as per the experimental requirements.

The experiment was laid out in a 2 factors Completely Randomized Design (CRD) with 3 replications. The experiment consisted of 2 factors: Factor A: Potato variety (4 varieties) as- $V_1$ : BARI TPS-1,  $V_2$ : BARI TPS-2,  $V_3$ : HPS-364/67 and  $V_4$ : Lady Rosetta; Factor B: Time of harvest (4 times) as- $D_1$ : 80 DAP (Days after planting),  $D_2$ : 90 DAP,  $D_3$ : 100 DAP and  $D_4$ : 110 DAP.

There were 16 (4×4) treatment combinations of the collected potato tubers. Thirty tubers (10 for each replication) for specific treatment combination were selected for conducting the experiment. The selected tubers of each combination with 3 replications were kept in netted plastic basket and were stored in a well ventilated room under diffused light condition.

Starch, reducing sugar, non-reducing sugar and total sugar were determined by Nelson-Somogyi (1944).

The mean values of all the recorded characters were evaluated and analysis of variance was performed by the 'F' (variance ratio) test. The significance of the difference among the treatment combinations of means was estimated by Duncan's Multiple Range Test (DMRT) at 5% level of probability (Gomez and Gomez, 1984).

## III. RESULTS AND DISCUSSION

## 1.1. Specific gravity

Specific gravity of potato showed significant variation for different variety. At harvest and 100 DAS, the highest specific gravity was recorded from  $V_3$  whereas the lowest was observed from  $V_1$  (Table 1). Statistically significant variation was also recorded for specific gravity of potato for different time of harvest. Table 1 showed that specific gravity gradually increased with increasing harvesting time. Jeong et al. (1996) reported gradual increase in specific gravity until 100 days after planting, and showed a decrease thereafter. Combined effect of different variety and time of harvest also varied significantly for specific gravity. Data revealed that at harvest and 100 DAS, the highest specific gravity (1.13 and 1.16) was observed from  $V_3D_1$  (HPS 364/67 and harvest at 80 DAP), while the lowest (1.06 and 1.09) was recorded from  $V_1D_4$  (BARI TPS-1 and harvest at 110 DAP), respectively for same data recording days (Table 1). Results revealed that specific gravity decreased with increasing storage period is due to metabolism of starch (Thornton, 2002).

## 1.2. Reducing sugar

Different variety showed statistically significant variation for reducing sugar of potato under the present trial. At harvest and 100 DAS, the lowest reducing sugar was observed from V<sub>3</sub>, whereas the highest was recorded from V<sub>4</sub>, respectively for same data recording days (Table 1). Reducing sugar of potato also showed statistically significant variation for different time of harvest. At harvest and 100 DAS, the lowest reducing sugar was recorded from D<sub>1</sub>, while the highest was observed from D<sub>4</sub> due to increasing concentration of glucose and fructose respectively for same data recording days (Table 1). Similar trend of increasing reducing sugars in tubers has been reported by Kibria (1983) and Boyed and Duncan (1982). This was might be due to breakdown of sucrose and starch. The combined effect of different variety and time of harvest was also significant for reducing sugar. At harvest and 100 DAS, the lowest reducing sugar (0.23% and 0.43%) was recorded from  $V_3D_1$  (HPS-364/67 and harvest at 80 DAP), while the highest (0.32% and 0.62%) was observed from  $V_4D_4$  (Lady Rosetta and harvest at 110 DAP), respectively for same data recording days (Table 1).

## 1.3. Non reducing sugar

Significant variation was recorded for non reducing sugar of potato for different variety under the present trial. Data revealed that at harvest and 100 DAS, the utmost non reducing sugar was recorded from  $V_4$ , whereas the lowest was observed from  $V_3$ , respectively for same data recording days (Table 1). Different time of harvest also showed statistically significant variation for non reducing sugar. At harvest, the maximum non reducing sugar was observed from D<sub>4</sub>, while the minimum was recorded from  $D_1$ . At 100 DAS, the highest non reducing sugar was observed from  $D_2$ , while the lowest was recorded from  $D_4$  (Table 1). Combined effect of different variety and time of harvest showed statistically significant variation for non reducing sugar of potato. At harvest, the highest non reducing sugar (0.32%) was observed from V<sub>3</sub>D<sub>4</sub> (HPS-364/67 and harvest at 110 DAP), while the lowest (0.19%) was recorded from V<sub>1</sub>D<sub>1</sub> (BARI TPS-1 and harvest at 80 DAP). At 100 DAS, the highest non reducing sugar (0.24%) was observed from V<sub>1</sub>D<sub>1</sub> (BARI TPS-1 and harvest at 80 DAP), while the lowest (0.17%) was recorded in V<sub>1</sub>D<sub>3</sub> (BARI TPS-1 and harvest at 100 DAP) (Table 1).

## 1.4. Total sugar

Total sugar of potato varied significantly for different variety. At harvest and 100 DAS, the highest total sugar was recorded from  $V_4$ , whereas the lowest was observed from  $V_3$ , respectively for same data recording days (Table 2). Statistically significant variation was also recorded for total sugar of potato for different time of harvest. At harvest and 100 DAS, the highest total sugar was observed from D4, while the lowest was recorded from D<sub>1</sub>, respectively (Table 2). The total sugar increased with increasing storage period. This might be due to enzymatic hydrolysis of starch to sugar (Cochrane et al., 1991; Nielsen et al., 1997). Combined effect of different variety and time of harvest showed significant variation for total sugar of potato. At harvest and 100 DAS, the highest total sugar (0.61% and 0.82%) was observed from V<sub>4</sub>D<sub>4</sub> (Lady Rosetta and harvest at 110 DAP), while the lowest (0.44% and 0.63%) was recorded from V<sub>3</sub>D<sub>1</sub> (HPS-364/67 and harvest at 80 DAP), respectively (Table 2).

## 1.5. Starch content

Different variety showed significant differences for starch content of potato. At harvest and 100 DAS, the highest starch content was recorded from V<sub>3</sub>, whereas the lowest from V<sub>2</sub>, respectively (Table 2). Rainys and Rudokas (2005) recorded the highest starch were recorded for Lady Rosetta (17.0-17.9%). Statistically significant variation was also recorded for starch content of potato for different time of harvest. At harvest and 100 DAS, the highest starch content was observed from D<sub>1</sub>, while the lowest was recorded from D<sub>4</sub>, respectively for same data recording days (Table 2). Jeong et al. (1996) reported gradual increase starch content until 100 days after planting, and showed a decrease thereafter. Starch content of potato showed statistically significant variation due to the combined effect of

different variety and time of harvest. At harvest and 100 DAS, the highest starch content (21.12% and 19.50%) was observed from  $V_3D_1$  (HPS-364/67 and harvest at 80 DAP), while the

lowest (18.50% and 16.97%) was recorded from  $V_2D_4$  (BARI TPS-2 and harvest at 100 DAP), respectively for same data recording days (Table 2).

Table 1: Effect of different variety	and/or time of ha	rvest of potato at di	fferent days afte	r		
storage on specific gravity	, reducing sugar,	non reducing sugar	in potato			
Treatment	Specific gravit	y at	Reducing sug	ar at	Non reducing s	sugar at
	Harvest	100 DAS	Harvest	100 DAS	Harvest	100 DAS
Variety						
$\mathbf{V}_1$	1.04 c	1.07 c	0.28 b	0.53 b	0.26 b	0.20 ab
$V_2$	1.05 b	1.08 b	0.27 b	0.52 b	0.27 a	0.20 ab
V <sub>3</sub>	1.06 a	1.09a	0.24 c	0.49 c	0.25 c	0.19 b
$V_4$	1.06 a	1.08 ab	0.29 a	0.55 a	0.28 a	0.21 a
SE	0.015	0.024	0.012	0.005	0.016	0.018
Level of significance	0.01	0.01	0.01	0.01	0.01	0.05
Time of harvest						
D <sub>1</sub>	1.07 a	1.09 a	0.25 d	0.45 d	0.21 d	0.23 a
$D_2$	1.07 a	1.09 a	0.27 c	0.47 c	0.25 c	0.22 a
$D_3$	1.05 b	1.08 b	0.28 b	0.58 b	0.28 b	0.19 b
$D_4$	1.03 c	1.06 c	0.29 a	0.59 a	0.30 a	0.18 b
SE	0.015	0.024	0.012	0.005	0.016	0.018
Level of significance	0.01	0.01	0.01	0.01	0.01	0.01
Variety × Time of harvest						
V <sub>1</sub> D <sub>1</sub>	1.01 d	1.04 f	0.26 f-h	0.46 gh	0.19 f	0.24 a
$V_1D_2$	1.04 c	1.06 de	0.28 с-е	0.48ef	0.23 d	0.23 a
$V_1D_3$	1.05 bc	1.08 bc	0.29 b-d	0.59 bc	0.26 c	0.17 c
$V_1D_4$	1.05 bc	1.08 bc	0.29 bc	0.59 bc	0.29 b	0.18 c
$V_2D_1$	1.02 d	1.05 ef	0.25 g-i	0.45 h	0.22 de	0.23 a
$V_2D_2$	1.04 c	1.07 cd	0.27 d-f	0.47 fg	0.26 c	0.22 a
$V_2D_3$	1.07 a	1.09 ab	0.28 с-е	0.58 c	0.29 b	0.18 bc
$V_2D_4$	1.07 a	1.09 ab	0.29 b-d	0.59 bc	0.31 a	0.18 bc
$V_3D_1$	1.04 c	1.07 cd	0.23 j	0.43 i	0.21e	0.20 b
$V_3D_2$	1.06 ab	1.09 ab	0.24 ij	0.44 hi	0.26 c	0.20 b
V <sub>3</sub> D <sub>3</sub>	1.07 a	1.10 a	0.25 hi	0.55 d	0.29 b	0.19 bc
$V_3D_4$	1.08 a	1.11 a	0.25 hi	0.55 d	0.32 a	0.20 b
$V_4D_1$	1.05 bc	1.07 cd	0.27 e-g	0.47 fg	0.21 e	0.20 b
$V_4D_2$	1.06 ab	1.08 bc	0.29 b-d	0.49 e	0.25 c	0.23 a
$V_4D_3$	1.07 a	1.09 ab	0.30 b	0.60 b	0.28 b	0.20 b
$V_4D_4$	1.07 a	1.09 ab	0.32 a	0.62 a	0.29 b	0.20 b
SE	0.047	0.030	0.024	0.010	0.031	0.035
Level of significance	0.05	0.05	0.01	0.01	0.01	0.01

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.05 level of probability

 $V_1$ : BARI TPS-1,  $V_2$ : BARI TPS-2,  $V_3$ : HPS-364/67,  $V_4$ : Lady Rosetta.  $D_1$ : Harvest at 80 DAP,  $D_2$ : Harvest at 90 DAP,  $D_3$ : Harvest at 100 DAP,  $D_4$ : Harvest at 110 DAP.

Table 2: Effect of different variety and/or time of harvest of potato at different days							
after storage on total sugar and starch content in potato							
Treatment	Total sugar at		Starch content at				
	Harvest	100 DAS	Harvest	100 DAS			
Variety							
V <sub>1</sub>	0.52 c	0.73 b	19.12 b	17.33 b			
$V_2$	0.54 b	0.73 b	19.11 b	17.32 b			
V <sub>3</sub>	0.51 d	0.69 c	20.51 a	18.89 a			
$V_4$	0.55 a	0.75 a	19.14 b	17.35 b			
SE	0.014	0.016	0.415	0.315			

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Level of significance	0.01	0.01	0.01	0.01
Time of harvest				
$D_1$	0.46 d	0.67 d	20.03 a	18.22 a
$D_2$	0.52 c	0.69 c	19.74 b	17.92 b
$D_3$	0.56 b	0.76 b	19.26 c	17.51 c
$D_4$	0.59 a	0.78 a	18.86 d	17.25 d
SE	0.014	0.016	0.415	0.315
Level of significance	0.01	0.01	0.01	0.01
Variety × Time of harvest				
V <sub>1</sub> D <sub>1</sub>	0.45 g	0.69 g	19.74 b	17.79 e
$V_1D_2$	0.51 e	0.71 f	19.47 bc	17.52 f
$V_1D_3$	0.55 c	0.76 cd	18.77 de	17.02 gh
$V_1D_4$	0.58 b	0.77 c	18.92 с-е	17.00 gh
$V_2D_1$	0.47 f	0.68 gh	19.53 b	17.78 e
$V_2D_2$	0.53 d	0.69 g	19.28 b-d	17.53 f
$V_2D_3$	0.57 b	0.76 cd	18.75 de	17.00 gh
$V_2D_4$	0.60 a	0.77 c	18.50 e	16.97 h
$V_3D_1$	0.44 g	0.63 i	21.12 a	19.50 a
$V_3D_2$	0.50 e	0.64 i	20.72 a	19.10 b
$V_3D_3$	0.54 cd	0.74 e	20.72 a	18.97 c
$V_3D_4$	0.57 b	0.75 de	19.50 bc	18.00 d
$V_4D_1$	0.48 f	0.67 h	19.75 b	17.80 e
$V_4D_2$	0.54 cd	0.72 f	19.49 bc	17.54 f
$V_4D_3$	0.58 b	0.80 b	18.78 de	17.03 g
$V_4D_4$	0.61 a	0.82 a	18.52 e	17.02 gh
SE	0.028	0.031	0.890	0.630
Level of significance	0.05	0.01	0.05	0.01

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.05 level of probability

 $V_1$ : BARI TPS-1,  $V_2$ : BARI TPS-2,  $V_3$ : HPS-364/67,  $V_4$ : Lady Rosetta.  $D_1$ : Harvest at 80 DAP,  $D_2$ : Harvest at 90 DAP,  $D_3$ : Harvest at 100 DAP,  $D_4$ : Harvest at 110 DAP.

## IV. CONCLUSION

For different varieties, at harvest and 100 DAS, the highest specific gravity, lowest reducing sugar, lowest total sugar and maximum starch content were recorded from HPS-364/67. Specific gravity decreased with increasing storage period but the reducing sugar, total sugar increased with advancing storage period irrespective of varieties. From the nutritional point of view the variety HPS-364/67 showed best performance compared to those of other varieties when harvested at 80 days after planting.

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### AUTHORS

**First Author** – Apurbo Bhattacharjee, MS in Agronomy, Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh., kbd.apurbo@outlook.com

**Second Author** – Tuhin Suvra Roy, Doctor of philosophy, Shere-Bangla Agricultural University, Dhaka-1207, Bangladesh., tuhinsuvra2002@yahoo.com; Alternate Email:

tuhinsuvraroy@gmail.com., Mobile no: +8801710515090

Third Author – Md. Nazmul Haque, B. Sc. Ag. (hons), Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh.,

sumon2539@gmail.com

**Fourth Author** – Md. Ashraful Islam Pulok, B. Sc. Ag. (hons), Sher-e-Bangla Agricultural University, Dhaka-1207,

Bangladesh., kbdpulok@gmail.com

**Fifth Author** – Md. Mahfuzar Rahman, B. Sc. Ag. (hons), Shere-Bangla Agricultural University, Dhaka-1207, Bangladesh., mahfuz.sau08@gmail.com

**Correspondence Author** – Tuhin Suvra Roy, Doctor of philosophy, Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh., tuhinsuvra2002@yahoo.com; Alternate Email: tuhinsuvraroy@gmail.com., Mobile no: +8801710515090

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## **APPENDIX A: SCHEMATIC EVALUATION OF BILINGUAL PROFILES**

Jame	
tudent #	

Sex: Male/Female

1. What was your performance level in the following examinations? *Circle the grade obtained if applicable*.

Examination	Grade obtained				ed
O/L Sinhala	A B C S W			W	
O/L Tamil	Α	В	С	S	W
A/L Sinhala	A B C S V		W		
O/L English Language	Α	В	С	S	W
O/L English Literature	Α	В	С	S	W
A/L General English	A B C S V		W		

The appropriate box in the following

## 2. What was your method of learning English?

Instructed in school	
Natural acquisition at home	
Both	

3. If instructed # of years of English instruction in school/s:

Grade	1-13	1-11	3-11	3-13

4. Of the two forms given below which category are you a bilingual in?

Sinhala /Sri Lankan English	Tamil /Sri Lankan English

#### 5. Now

- Please handover this form to the data collector
- Then you are required to read out loud a selection of English words.
- This is needed purely for experimental purposes.
- Start pronouncing the words given in a list to you at the signal to commence.

## Official use only Data collector's assessment of SLE pronunciation in Sinhala/ SLE bilinguals

✓ Indicates the correct pronunciation. An X mark denotes that the target deviation is present. Please insert any other deviations in the third column.

#	Target	Lexicon with target phoneme/phonotactic feature								
	deviation	1	2	2		3			5	
1.	o / ɔ	bowl	b <b>a</b> ll		hole		yoghurt		boat	
2.	f/p	paddy field	program		past		<b>p</b> ro <b>f</b> it		air <b>p</b> ort	
3.	s / ∫	auction	pu <b>sh</b>		sheet		pressure		cousin	
		station	screen		style		smile		screw	
4.	i+s									
5.	Syllable	envi <b>ron</b> ment	iden <b>ti</b> ty		overciso		tomporery		government	
	omission				exercise		tempor ary		government	

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